

## Advanced Case Studies, Emerging Trends, Articles

Level	CPA Final-II	Subject Code	FP601	Exam Marks	100
				Exam Hours	12

**Assessment Level: Advanced/Conceptual/Practical/Expert/Professional/Application**

**Assessment Strategy**

Please go through the following Guidelines carefully on which the assessment strategy will be based.

### **Requirements:**

This requires using information or concepts in new situations, solving problems, organizing information and ideas, using old ideas to create new ones, generalizing from given facts, analyzing relationships, relating knowledge from several areas, drawing conclusions, evaluation worth, etc.

## Guidelines:

### INTRODUCTION

Research is about discovery, the testing of hypotheses and of ideas. It is about the establishment of facts through enquiry and exploration. The outcome of research is new knowledge leading to improved understanding of mechanisms and the development of new and improved procedures. To ensure that the use of research results is maximised, it must be disseminated in an appropriate manner. In many senses, the dissemination of the research results is just as important as the research activity itself.

There are many ways to disseminate research results, and the production of a research dissertation or thesis is one of them. Although a research dissertation is a usual requirement for academic degree programmes that include a research element, it is more than an instrument for student assessment. A common mistake is to regard it as a "beefed-up" laboratory report. It must be written such that the results presented can be validated and to form the basis for further investigations. Procedures adopted must be justified; claims and conclusions must be supported by experiments or reasoned arguments and deductions. A research dissertation contains elements which distinguishes it from other types of reports, and because it is the culmination of several months or years of work, the publication can be quite voluminous. Writing one therefore requires some thought, planning and organisation.

This set of guidelines intends to give some ideas and tips on how to go about writing a research dissertation. The first thing we will consider is the layout of the dissertation.

(Note: While the subsequent pages are not instructions on how to carry out research, their contents should also give an idea of what is required in terms of research tasks and how research should be approached.)

### STRUCTURE

Structure, as opposed to layout, refers to the organisation of the chapters or sections that make up the dissertation. Unlike layout, which is usually dictated by Institutional requirements, strictly speaking, there are no fixed rules governing the structure of a research dissertation. However, it is generally accepted that a dissertation should have the following chapters:

- **Title page**  
where you enter the full title, and the sub-title if any, of the research work; the name of the author; a statement about the degree programme under which the dissertation is submitted; the date of submission.
- **Abstract**  
which is usually a one page summary of the objectives of the research; the methodology used and the main findings of the work
- **Contents list**  
which lists the chapter and section headings with their corresponding page numbers
- **List of tables, diagrams and illustrations**  
which list the figure and table numbers, together with captions and their corresponding page numbers
- **Nomenclature list**  
which provides a list of nomenclature and definitions of acronyms used in the dissertation. Make sure that the corresponding units, if applicable, are included. It is good practice to have a different section for nomenclature involving Greek symbols as might be encountered in equations and one for acronyms.
- **Acknowledgements**  
if any are due, but it is nice gesture to acknowledge the contributions and help of sponsors and friends
- **Main text** divided into chapters, with appropriate chapter headings, to include
  - a chapter to introduce the research; the motivation and the objectives; and to provide an overview of the dissertation
  - a chapter reviewing the work that has done in the area
  - a chapter or two to describe in detail the methodology adopted or proposed
  - a chapter or two presenting the main results of the work
  - a concluding chapter that summarises the main findings of the research; statements about the main contributions of the research and recommendations for future work
- **References**  
lists the references that have been cited in the dissertation
- **Appendices**  
contain those parts of dissertation that are either well known or does not contribute directly to the main text, but needs to be included for completeness. Examples are sample calculations; derivation of a published result which forms the basis for the work; background information.

*(Note: the British Standards Institute had guidelines for the production of dissertations: BS 4821:1990, but this has since been withdrawn)*

## Tips

- **Spend some time planning the structure of your dissertation before starting to write.** Not only will this save time and effort in the long run, it will reduce duplicate text and the dissertation will be more compact and readable.
  - Think about the objectives of the project; what you did and the results that you obtained.
  - Divide the contents into the appropriate chapters and sections; this will help you rationalise the contents
  - Seek the advice of your project supervisor
- Try to **get a copy of a thesis or dissertation written by a student in your department** to gain a visual feel for how the dissertation is organised, formatting conventions, and to get an idea of what material should be placed in which chapters.
- **Use a new page to start each distinct part of the dissertation** (such as those above).
- **Do not include blank pages.** They do not contribute to the dissertation, and worse, they can cause confusion for the reader. Common questions on encountering a blank page are:
  - *"Has the author forgotten to include something?"*
  - *"Has the photocopier missed a page?"*
- **Write the Abstract and Introduction chapter last** - once you have written the other main chapters, it is easier to summarise the work done, and to give an overview of the dissertation.

With a plan for the structure, you can start the important task of writing the dissertation, keeping in mind that the various parts of the publication must be linked together in a coherent manner. This aspect, loosely termed content flow, is covered next.

## FLOW OF CONTENTS

Writing a research dissertation or thesis is like writing a novel. It is a novel that begins with a story about the background to the research; describing the methods used to establish facts or test hypotheses and ideas; the results that were observed; and the conclusions that are drawn. Like the good novel that compels you to read it from cover to cover, a dissertation should be written so that it can be read at a refreshing tempo, engaging the reader's undivided attention. To accomplish this, organise the contents of the dissertation so that they "flow" smoothly from one aspect to the next, and take particular care in sentence construction.

## Tips

- One of the techniques to achieve smooth flow of contents is to maintain a thread between adjoining chapters; ensure that each section within a chapter lead on to the subsequent section; and paragraphs of sections are connected to each other. A common practice is to use "joining" words or sentences, particularly at the end and beginning of each chapter. A joining sentence at the end of a chapter tells the reader what to expect, while one at the beginning of a chapter reminds the reader of the contents of the previous chapter. Flow and readability are sometimes used interchangeably, but while smooth flowing content is readable, readability does not necessarily mean that the contents are threaded.
- Flow is interrupted when the reader pauses to ponder the material. This typically occurs in sections discussing new concepts, and when making statements based on interpreted results. Where such areas of the text are identified, pay extra attention to the phrasing of the content and be conscientious in providing clear explanations. When making calculations, define all the variables (include units where applicable) and justify all simplifying assumptions. You should also be fastidious in describing experimental, simulation and test conditions. Do not presume that the reader knows what you are trying to do or are familiar with the techniques that you are employing.
- Material that do not contribute directly to the discussion; argument; or development of a theme or idea, also interrupts flow. Such material should be excluded. If, for the sake of completeness, you wish to include them, place them in an Appendix and refer to them in the main text.
- Avoid one sentence paragraphs. Too many and a page will be filled with numerous gaps, imparting a feeling of discontinuity with the content. Similarly, avoid long sentences. Long sentences are difficult to read, and can obscure an otherwise simple explanation. Try to keep sentence length to less than two lines, and at the same time, make appropriate use of punctuation. Punctuation break a sentence into readable chunks, reduce ambiguity and, if used wisely, can for increase effect and emphasis. A word of warning though - do not apply punctuation at random as they can change the meaning of a sentence.
- The repeated use of words can make a dissertation difficult, if not boring, to read. Use a thesaurus to get synonyms to introduce variety, but make sure that they are used in the proper context. Do not employ bombastic words to show how clever you are with the language. Explanations using commonly encountered words are more effective than pompous soundling but rarely used vocabulary.
- Presentation also plays an important part in giving the impression of smooth flowing content. The font size should not be too small, and the line-spacing should be wide enough. Choose 12-point for Serif fonts (e.g. Times-Roman, Bookman) and 10-point for Sans-serif fonts (e.g. Arial, Helvetica, Verdana, Tahoma). A 1.5 line spacing for both font types should ensure that the lines are sufficiently far apart to enhance reading comfort.
- Writing in the "active voice" improves the reading pace, and hence flow. Take for example, the following two sentences:

*Advanced control improves plant profitability.* (active sentence)

*Plant profitability is improved by advanced control.* (passive sentence)

Although both sentences convey the same message, the first is more authoritative and positive. In the active sentence, the emphasis is on "Advanced control" while the passive sentence emphasises "Plant profitability". Moreover, the passive sentence expresses the same information in a round-about way. Passive expressions have their uses though. As another example:

*Excessive drinking can cause dementia.* (active sentence)

*Dementia can be caused by excessive drinking.* (passive sentence)

When you do not have strong evidence to support a statement, express it in the passive voice as the tone is less assertive. This is a "trick" adopted usually to avoid getting into sticky arguments with assessors.

Now that you have an idea of how to improve the flow of contents in a dissertation, the next thing to consider is the content of key chapters.

## CONTENTS OF KEY CHAPTERS

As mentioned in the discussion on "structure", there are certain chapters which are common to all dissertations and these contain, namely:

- the Abstract
- the Introduction
- the Literature Review
- the Conclusions and Recommendations for Future Work

These are important components, each fulfilling a distinct role. Click on the above links to find out more.

## THE "ABSTRACT"

The Abstract provides the reader with a summary of the contents of the dissertation. It should therefore be brief but contain sufficient detail, telling the reader the motivation for the work; project objectives; techniques employed; main results and conclusions. Abstracts should not normally exceed a page and should be self-contained.

The Abstract is the "gateway" to the contents of the dissertation, and therefore it is important that the Abstract gives the reader a good initial impression. Try to write Abstract with a "punchy" style.

### Tip

Write the Abstract last. The dissertation will be easier to summarise once all the bits are in place.

## THE "INTRODUCTION"

The first chapter of a dissertation is normally given the title **Introduction**, and it serves many purposes. It is the place where you should

- discuss the motivation for the work that is being reported
- state and define the problem that the dissertation is trying to address or solve
- state the aims and objectives of the work
- give an indication of how the work will be progressed
- provide a brief overview of each of the main chapters that the reader will encounter

When writing the motivation for the research work that has been carried out, do not go into the details. Leave this for later chapters. Give a brief overview of the problem that you are tackling, and be specific about what the work is trying to achieve, and what you will be doing to meet these objectives. From an assessment point of view, one of the measures of success is whether the objectives listed in this chapter have been achieved. While a research project may start off with a set of objectives, it is often the case that these will change as the project evolves. Such is the nature of research. You should take this into consideration when stating the objectives of the project.

Like the Abstract, the Introduction should be written to engage the interest of the reader. It should also give the reader an idea of how the dissertation is structured, and in doing so, define the thread of the contents.

### Tip

Leave the Introduction chapter as one of the last to write. By then, the structure of the dissertation would be fixed, making it easier to give the overview of the chapters and what they contain. Also, based on the results that have been included, you would have an idea of what the "real" contributions of the dissertation are, enabling you to state the objectives accordingly.

## THE "LITERATURE REVIEW"

There are many titles for this chapter, e.g. "Literature Survey"; "Previous Work", and other similar phrases. The Literature Review is there for you to:

- provide details about the motivation for the project
- state why the problem addressed by the dissertation is important
- set the scene for the work described in the dissertation
- describe what others have done and hence sets a benchmark for the current project
- justify the use of specific solution techniques or problem solving procedures in your work

It is called the Literature Review because the contents of this chapter are based on published material. A thorough literature review is essential because it shows that you have studied rigorously what others have done. This lends credibility when you state the problem the dissertation is addressing, and when you provide reasons as to why obtaining a solution is important. Where applicable, you should also include a critique of the available solutions to the problem that you are tackling. This would implicitly provide justifications for the project and, at the same time, establish benchmarks against which your contributions can be assessed. Therefore, make sure that you seek out the most recent information relating to your field of study. You may, if you wish, include a discussion about your approach to the problem, and which of the published work will form the basis of your investigations.

The Literature Review is obviously a very important chapter. However, students doing research for the first time often find it difficult to write. There are a number of reasons for this:

- they do not know where to look for information
- there may be a huge amount of published work on the subject area, dating back many years, and they find it difficult to judge which material is relevant
- the work is a "hot-topic" and keeping track of the state-of-the-art is difficult
- they find it difficult to summarise the ideas and results of numerous publications into a coherent single account

Unfortunately, much of these skills can be gained only through experience. The following tips will, hopefully, make life that much easier.

## Tips

- Most libraries have personnel who specialise in certain disciplines. Ask them for information about publications relevant to your field of study, whether they are held in stock and where they are located in the library.
- Nowadays, an increasing number of journals are available on-line, accessed via web browsers. Many libraries subscribe to these electronic journals, meaning that you can read, download or print articles from the comfort of your computer workstation. Even if your library does not have a subscription to a particular journal, you should still be able to read the abstract. If the article looks interesting and relevant, you could order a copy. Again, approach your librarian for advice (and your supervisor or advisor for finance).

Students at Newcastle will find the following links useful:

- **An Introductory Guide to the Robinson Library** is a slide show that tells you all you need to know about the Library and the facilities it offers.
- All about **Searching for Information**
- **Library News** - news of things that are happening at the Robinson Library
- Find that book using the **web-based catalogue**
- Go straight to the **database section** to do your literature search
- Peruse the **electronic journals**
- Brief list of **resources for Chemical Engineering** and related areas like **water**, and **Environmental Engineering**
- Make it a point to keep abreast of developments in your field of study by making regular visits to the library and to the electronic journals websites.
- When reading a technical paper, jot down the key points and make a note of the journal or technical publication where the paper was published. Devise a cataloguing system that will allow you to retrieve the paper quickly. This will come in handy when you write the Literature Survey, and when you compile the reference list.
- When writing the Literature Review
  - **include only those work that is relevant to your research.** You may have read dozens upon dozens of papers, but there will be some that do not contribute to the points that you are trying to



make, or there will be papers that give identical information. Because of the time you spent trying to understand them, you may be tempted incorporate all that you have read. Attempting to do this will make what is already a difficult task impossible.

- **make sure that you have read and understood cited work**, otherwise you can get into hot water. Assessors like to ask questions like: "*So tell me what you understand about the proposal by Smith and Wesson 1945*".
- **organise your content according to ideas instead of individual publications**. This helps ensure the smooth flow of contents and make the chapter more readable. It also shows that you have an appreciation of the subject area.
- **do not simply quote or paraphrase the contents of published articles**. You should try to weave the information into focussed views, incorporating where possible, your own opinions and comments. This will demonstrate your deeper understanding of the topic.

## THE "CONCLUSIONS AND RECOMMENDATIONS FOR FURTHER WORK"

After reading your Abstract and Introduction, most assessors will make a beeline for the Conclusions and Recommendations for Further Work (or similarly titled) chapter. There are three distinct parts to this, the last of the main chapters, and arguably the most important of the lot. It is here where you wrap up the dissertation by providing:

- a summary of the main findings of the dissertation
- a list of the contributions of the work
- directions for further research

The assessors would want to know whether the project objectives been achieved and whether the work has contributed to knowledge - two of the most important criteria in judging the research work. Therefore, when compiling this chapter, you should focus on answering these questions.

Any conclusions drawn should be those resulting from your work. You may make references to the relevant chapters that support the listed finding. You may also refer to the work of others for comparison purposes. However, you should not be discussing your results here. All statements should be concise, and should be written to lead on to the contributions that you have made. One way to present the conclusions is to use one paragraph for each conclusion. Alternatively, use a point-by-point format.

When writing the dissertation, you should be aware of the worth and relevance of your work in relation to the current state-of-the-art (another reason for a rigorous Literature Review). Probably the best way to present this information is in point form. You should not be embarrassed about stating what your contributions are to the field of study. However, be realistic and do exercise restraint: your claims must be backed up by the results of your work, otherwise you might "hammered" by the assessors.

The Recommendations for Further Research section is also important. Research often exposes further problems and introduces more questions. As a student, there is a time limit to your research project, so it is unlikely that your work would have solved all the problems associated with the area of study. Therefore, you will be expected to make suggestions about how your work can be improved and, based on the your findings, whether there are areas that deserve further investigation. What you write in this section will show whether you have a firm appreciation of your work, and whether you have given sufficient thought to its implications, not only within the narrow confines of the research topic, but to related fields. These reflect your ability for original thought, and your potential to carry out original research; key issues in a research degree. In the case of a PhD thesis especially, where you are expected to be the expert, it would be more than embarrassing if an assessor can make more suggestions about how your work can be progressed.

### **Tips**

- As with the Introduction, this chapter should be written using a punchy style and should not be too long.
- Present your conclusions and contributions concisely and factually.

Is that it then? Afraid not. There are details such as citation styles; styles for numbering of chapters, figures and tables; how results should be presented and analysed, and so on. The following pages will cover each of these in turn.

## CITATION STYLES

One of the things that confound first-time writers of research papers and dissertations is how to cite references. The two most common methods for citing published work:

- the number system
- the name-year system

You should be consistent and stick to one of these citation styles. The system you use will also determine how you compile and present the Reference list. Which one you use will depend on institutional guidelines or regulations.

### The Number System

With this system, references to published work is via the use of numbers, e.g.

There are many undergraduate texts on Process Control [1-4]. The most popular seems to be the book by Luyben [2]. However, the only one to deal with process design and process control in an integrated manner is that by Marlin [4].

or

There are many undergraduate texts on Process Control <sup>1-4</sup>. The most popular seems to be the book by Luyben <sup>2</sup>. However, the only one to deal with process design and process control in an integrated manner is that by Marlin <sup>4</sup>.

In both examples above, three citations were made. The first referred to publication number 1, 2, 3 and 4; the second citation referred to publication number 2; while the last citation referred to publication number 4. The fact that the numbers relate to items in the reference list is indicated by the square parentheses [...] or by the superscripts. Again, which convention you follow will depend on the guidelines and regulations of your institution.

When using the number-system citation style, the order of the corresponding reference list is important. By convention, the first cited publication will be the first on the list and assigned the number "1". The second cited publication will be the second on the list and assigned the number "2" and so on. That is, **the publications in the reference list is presented in the order that they were cited**. However, **the reference list must not contain duplicates**. This means that you will have to keep track of the publications that you have cited and their associated order in the reference list, so that you use the appropriate number when you cite a publication more than once, as in the above examples.

## Tips

- If all you are told is that you should use the number-system, you should choose the one that is easiest to type and correct. Using square-parentheses is probably easier, as you do not have to mess about with subscripts.
- Compile the reference list as you write your chapters, keeping it open in the word processor but in a separate file. Add new cited publications to the list as you work, and refer to it for the number to use with publications that have been cited.
- Check for duplicates whenever you add publications to the reference list. Making corrections to citations when duplicates are discovered later is a most painful and frustrating process.

## The Name-Year System

Using the name-year citation style, the above example becomes:

There are many undergraduate texts on Process Control (Coughanowr, 1991; Luyben, 1990; Marlin, 1995; Shinskey, 1988). The most popular seems to be the book by Luyben (1990). However, the only one to deal with process design and process control in an integrated manner is that by Marlin (1995).

The first citation named 4 authors using their surname (last name). Associated with each surname, is the year of the publication. Notice that they are **presented in alphabetical order**, within round parentheses, (...). The *author* part is separated from the *year* part by commas, ','. *Author-year* pairs are separated by semi-colons ';'. The next two citations named the authors using their surnames with the year of the cited publications enclosed in parentheses. Therefore, there are two ways to use the "name-year citation style. When using **this citation style, the reference list is presented in alphabetical order.**

How a publication is cited also depends on the number of authors. If there are two authors, then cite as follows:

Clarke and Gawthrop (1979) modified the Minimum Variance objective function to include ...

or

The Generalised Minimum Variance self-tuning algorithm was proposed in the late 1970s (Clarke and Gawthrop, 1979).

When a publication has more than two authors, cite as follows:

Montague and co-workers (1987) considered ...

or

There are many variations to the algorithm (e.g. Cox, 1991; Willis and colleagues, 1990).

You can use the phrases "co-workers" and "colleagues" interchangeably. You can also use "*et. al.*", the short form for the Latin phrase "*et alii*", which means "and others". The preceding two forms are preferred as they tend to cause less disruption to the flow of the sentence. Also, since "*et. al.*" is Latin, it should be in italics - unnecessary work.

### Tips

- If you are not restricted to a particular citation style, use the name-year system. Most word processors have a "sort" tool, making the reference list easy to maintain. Duplicated items are easily detected, and there is no need to make corrections to citations when duplicates are discovered.
- Compile the reference list as you write your chapters, keeping it open in the word processor but in a separate file. Add new cited publications to the list as you work.
- Check for duplicates by sorting the reference list alphabetically.

Now let us move on to the presentation of the reference list.

## THE REFERENCE LIST

As mentioned previously, how the Reference list is compiled and presented depends on the citation style that you use. If you use the number system, then the references are listed in the order that they have been cited. On the other hand, if you cite publications using the name-year system, the references should be listed alphabetically. Whichever citation system you use, you have to stick to one convention, otherwise the inconsistency will confuse the reader.

The Reference list is related closely to the Literature Review chapter and is therefore also quite an important part of your dissertation. Examiners have been known to scrutinise the list to find out if it contains the most relevant and important publications. It is also a good idea to include the publications of your examiners, if you know beforehand who they are especially if they are working in the same research area. However, do not go overboard and try to impress by including all sorts of references. This can be counter-productive. List only those publications you have cited. If you have read other supporting articles that have helped in the research, but have not cited them in the dissertation, place them in a separate "Bibliography" section. The publications in both Reference and Bibliography lists are presented in the same manner.

There are a number of types of publications, and they can be broadly classified as follows:

- articles published in journals
- conference proceedings
- books
- dissertations; theses and research reports
- company reports and manuals
- information from the world-wide-web
- personal communications

Each category requires a different presentation. Let us consider each type in turn:

### Journal Articles

These are the most common sources of cited material, and include specialist technical journals as well as trade journals. Use the following format to present articles from technical journals:

Author(s), (year). Article title, Name of journal, Volume Number, Issue Number, page range.

For example:

Chidambaram, M. and Malleswararao, Y. (1992). Model reference control of nonlinear systems with relative order two: application to a semibatch reactor, *Journal Proc. Cont.*, 2, 1, pp 9-15.

McLellan, P.J. (1994). A differential-algebraic perspective on nonlinear controller design methodologies, *Chem. Eng. Sci.*, 49, 10, pp 1663-1679

Instead of issue numbers, some journals have a month of issue. In such cases, substitute the month for the issue number.

The author(s) surname appears first, followed by initials. The year is enclosed in parentheses and terminated with a full-stop. The first letter of the title is capitalised while the rest are in lower case. You may use an abbreviated form for the journal name, but make sure that it is the recognised one. Most journals will have the "official" abbreviated title printed at the top of its pages.

## Conference Proceedings

Papers presented at conferences are also common sources of research information. Use the format below when listing them:

Author(s), (year). Article title, Name of conference, Location of conference, page range.

For example:

Dore S.D., Perkins, J.D. and Kershenbaum, L.S. (1994). Application of geometric nonlinear control in the process industries - a case study, *Proc. IFAC Symposium, ADCHEM '94, Kyoto, Japan*, pp 501-506.

Again, the author(s) surname appears first, followed by initials. The year is enclosed in parentheses and terminated with a full-stop. The first letter of the title is capitalised while the rest are in lower case. You may use an abbreviations to indicate the type of publication and the name of the conference. For example "Proc." is usually used in place of "Proceedings"; "Pre." for "Preprints"; "Conf." for "Conference"; "Symp." for "Symposium" and so on.

## Books

To list books, use the following format:

Author(s), (year). *Title of book in italics*. Edition number, Name of publisher, place of publication.

For example:

Rawlings, J.O. (1988). *Applied Regression Analysis: a research tool*. Wadsworth and Brooks, California.

Turk, C. and Kirkman, J. (1996). *Effective Writing - improving scientific, technical and business communication*. 2nd Edition, E & FN SPON, London.

The format for author(s) is identical to the above, but the the first letter of key words in the main title are in capitals, and the title is in italics. There is not need to indicate the edition of the book if it is the first edition.

Some books are compilations of articles from different authors. For such cases, the format used is a cross between that for journal articles and books,

Author(s), (year). Title of article in book, In: Name of book, Edition number, Chapter number, Name(s) of editors, Name of publisher, place of publication.

For example:

Rumelhart D.E., Hinton G.E. and Williams, R.J. (1987). Learning internal representations by error propagation, In: *Parallel Distributed Processing: Vol. 1*, Ch. 8, D.E. Rumelhart and J.L. McClelland [editors], MIT Press, Cambridge MA.

Note the use of the word "In:" and the difference in which the names of the authors and the names of the editors are presented: editors' names are listed with their initials first. However, when you list the book without reference to authors of particular chapters, editors are considered the authors, in which case the item will be listed as:

Rumelhart, D.E. and McClelland, J.L. [editors], (1987). *Parallel Distributed Processing: Vol. 1*, MIT Press, Cambridge MA.

## Dissertations; Theses and Research Reports

Dissertations, theses and academic research reports are listed using the format below:

Author(s), (year). *Title in italics*. Type of publication, Research Group, Name of institution, Country.

For example:

Peel, C. (1995). *Aspects of Neural Networks for Modelling and Control*. PhD Thesis, University of Newcastle-upon-Tyne, UK.

Bloggs, J. and Other, A.N. (1998). *The Effects of Vodbull on Class Attendance*. Research Report No. 123, Social Impact Research Group, Smirnoff Institute of Technology, Vladistock, Russia.

When listing a research report, include the report number where applicable.

## Company Reports and Manuals

Sometimes, you may need to cite material contained in publications by companies and from manuals. In such cases, there are no named individuals for authors. Use the format below:

Name of company or organisation, (year). *Title in italics*. Place of publication.

For example:

Mathsoft Inc., (1999). *Mathcad 2000 Reference Manual*. Cambridge, MA.

## Information from the WWW

Nowadays, much information can be obtained from the internet, typically websites but sources include newsgroups and on-line forums. The format to use for such publications is:

Name of Author(s) or company or organisation, (year), Title of article, URL, date found.

The URL (Uniform Resource Locator) is the full internet address of the article. Due to the transient nature of on-line

information, it is important to include the date when you found the information. For example:

Tham, M.T., (1997). *Distillation: an introduction*, <http://lorien.ncl.ac.uk/ming/distil/distil0.htm>, 30 May 2001.

## Personal Communications

Sometimes, you may have used information passed on to you by a colleague or another person, via a phone conversation; letter; email or other forms of communication. You can, and should, include these in the reference list. The format to use is:

*Name, (year). Personal communication, Affiliation of named person.*

For example:

Blogg, J. (1996). *Personal communication, University College London, UK.*

That is about all, where the format for listing publications in the Reference list is concerned. You should be aware that the material presented here is not exhaustive; there are many variations. However, in the absence of other instructions, and as long as you are consistent, the guidelines presented above should be sufficient.

### Tips

- Include only those publications that you have cited.
- If you use the [number system](#), then the references are listed in the order that they have been cited. On the other hand, if you cite publications using the [name-year system](#), the references should be listed alphabetically.
- Check the guidelines or regulations for your institution.
- Be consistent in the presentation format for the various types of publications.
- Compile the reference list as you write the chapters of your dissertation

## NUMBERING AND CAPTIONS

Now let us get to the details about the format to use to number

- chapters and sections in chapters
- figures and diagrams
- tables and lists
- equations

how to refer to them in the text, and the format for figure and table captions.

### Chapters and Sections in Chapters

Each chapter of the dissertation should be assigned a number. For example, the first chapter,

#### **Chapter 1. INTRODUCTION**

or the literature review chapter,

#### **Chapter 2. LITERATURE REVIEW**

Chapter sections and subsections should also be assigned a numerical index. For example, the first section of Chapter 1 could be:

##### **1.1 Statement of the Problem**

while a subsection of Section 4 in Chapter 4 could be:

##### **4.2.1 Simulation results**

Notice the use of different cases in the 3 heading categories. The title of chapter is in upper case (capitalised); the heading of a section has the first letter of key words in upper case; while only the first letter of the first word in a subsection is capitalised. These styles are used as visual cues to indicate the different levels of headings. Avoid having more than 3 levels, e.g. **2.1.3.2**, as they can make the text messy especially when referring to them. If you need to categorise further, the contents of a

subsection, use a different font style. Bold and underlined text is a popular format.

To refer to a particular chapter, use the formats given by the following examples:

Chapter 2 provides a review of work in this area.

The reason for this modification, stated in Chapter 3, ....

Notice that the word "Chapter" is written in full with a capital "C".

The following examples show how references are made to sections or subsections:

The procedure outlined in Section 5.3 was employed to ...

Section 3.2.2 discussed the implication of ...

Here, the word "Section" with a capital "S" is used to refer to both sections and subsections; the latter being obvious from the numerical index.

When you compile the table of contents, include all heading levels and their titles. This is another reason not to have more than 3 heading levels - the contents list becomes overly complex.

## Figures and Diagrams

All figures and diagrams must be captioned and given a numerical index. Captions should appear below the figure or diagram, and should be sufficiently descriptive without being too long. Simply state what the illustration is showing and do any explaining in the main text. Captions for figures and diagrams have the format:

Figure Chapter number. Figure number. Description.

The word "Figure" is used generically to cover all illustrations, e.g. drawings, flow charts, sketches, etc. Spell out the word in full. Note too, the positions of the full-stops. The numerical index is composed of the **chapter number**, a full-stop, followed by the **figure number**, terminated with another full stop. Thus, the third illustration appearing in Chapter 4 would have the caption:

Figure 4.3. Schematic of control system for the methanol-water column.

You may use the abbreviated form, "Fig.", when referring to illustrations if the reference appears in the middle of a sentence. For example:

The control scheme, shown in Fig. 4.3, is quite common.

Otherwise, write the word "Figure" in full, e.g.

Figure 4.3 shows a common control scheme for a distillation column.

## Tables and Lists

All tables and lists, must be captioned and given a numerical index, and the numbering style is identical to that used for figures and diagrams. Lists would include snippets of computer code; step-by-step instructions or procedures. The captions should be placed below each table and list. So, for example, the second table in Chapter 3 would have the caption:

Table 3.2. Performance measures obtained using the proposed procedure.

Abbreviations should not be used when referring to tables and lists - write out the word "Table" in full, with a capital "T".

## Equations

"Equations" is used to mean mathematical as well as chemical expressions. Each major equation should be assigned a numerical index, with the following format: (Chapter number.Equation number). The following shows equation number 6 in Chapter 4.

$$A = 2B + C \quad (4.6)$$

Use the following rules when referring to equations.

- When a sentence starts with the word "Equation", write it out in full followed by the numerical index
- Otherwise use either the abbreviation "Eq." or "Eqn.", making sure that you maintain consistency throughout the dissertation. When referring to a collection of equations, use the corresponding plural forms, i.e. "Eqs." or "Eqns."

For example:

Equation (5.1) shows the effect of ...

Substituting Eq.(3.3) into Eq.(3.7) yields ...

The process model, given by Eqs.(4.4) to (4.10), ...

When referring to equations in text contained within parentheses, you need not enclose the equation's numerical index within parentheses. For example:

The process model, (Eqs. 4.4 to 4.10), ...

is much neater than:

The process model, (Eqs.(4.4) to (4.10)), ...

## In Summary ...

Again, you should check your institution's guidelines and regulations concerning the presentation and layout styles for dissertations and theses. Where numbering and caption styles are concerned, the key thing to remember is to be consistent.

### Tips

- Some word-processors have a tool to keep track of figure and table captions as well as equation numbers. If present, the tool can also generate lists which you can use in the sections following the Table of Contents [[see Structure](#)]. **Learn to use this well** as it can save you a lot of time and effort.
- If the word-processor you are using does not have this capability, you should maintain the lists as you write.

## FINAL REMARKS

The dissertation is a testament to your research efforts. In research degree programmes, it is the only tangible output upon which you will be assessed, and in most cases, the dissertation is probably your first major publication. To ensure that you do justice to yourself and your work,

- plan the structure well
- be consistent in the format, layout and presentation
- maintain threads between all parts of the dissertation
- justify all assumptions and define all symbols and acronyms - never expect the reader to "read between the lines"
- be aware of important milestones and achievements in your field of research, and keep up to date with developments
- try as much as possible to write in the active voice and be authoritative
- use clear and simple language to explain concepts and present arguments - keep sentences reasonably short and do not try to impress by using bombastic words
- use a spell checker but be aware of its limitations
- be critical when analysing results and be objective when making comparisons
- be aware of your contributions and the impact that your work has in your research field

Writing a dissertation is a substantial undertaking. This series of pages has hopefully made the task less stressful and bewildering. Bearing in mind that different institutions may have dissimilar requirements, you should consult your project supervisor or thesis advisor for more specific guidance.

Remember - to be able to finish a dissertation, you must start writing it. Good luck!

## RESOURCES AND TOOLS

### Writing Skills Resources on the WWW

- [A collection of links to Writing Skills resources](#)

### Books

- Kirkman, J. (1996). *Good Style - writing for science and technology*. E & FN SPON, London.
- Turk, C. and Kirkman, J. (1996). *Effective Writing - improving scientific, technical and business communication*. 2nd Edition, E & FN SPON, London.

### Tools

- **WordWeb** is a standalone Thesaurus and Dictionary which is available for free at <http://www.wordweb.co.uk>