Recommendations for

THE UNDERTAKING OF MSC PROJECTS AND THE SUBMISSION OF DISSERTATIONS

Revised July 2004

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This guide is based on the guide for undergraduate dissertations (based on BSI 4821) and a guide issued by the Department of Computing at Imperial College, London. Please direct your comments and suggestions to the MSc Computer Science Tutor.

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1. Introduction

The individual project is in many ways the most important single piece of work in the MSc programme. It provides the opportunity for you to demonstrate independence and originality, to plan and organise a large project over a long period, and to put into practice the techniques you have learnt throughout the course. Whatever your level of academic achievement so far, you can show your individuality and inspiration in this project. It should be the most satisfying piece of work in your course.

2. Assessment

It is important in planning, implementing and writing up your project to understand the way in which it will be assessed.

Projects are assessed internally by two markers: your supervisor and another member of staff who acts as internal examiner. A second internal examiner can be called in to assess your work if there is a major difference in opinion between your supervisor and the internal examiner. All dissertations are sent to the External Examiners.

We also have an External Examiner, who is a senior academic member of staff at another UK University. He assesses every dissertation produced by students on the MSc course. The marks awarded by the internal examiners have to be approved by the External Examiner. Thus your dissertation will be assessed by at least three people, and maybe more. Only when all the assessors agree on the worth of your dissertation can you be awarded an MSc.

Of these assessors only one (your supervisor) will be intimately familiar with the work you have put in to the project. The internal examiner will have the opportunity of seeing a demonstration of your project, and may well have had some contact with you during the twelve months of the course. The External Examiner only has the dissertation to guide him, along with comments from the internal assessors, your examination record, and the comments of other members of staff who have taught you. The dissertation is thus all important. Although it is important to produce reliable well-written software the ultimate aim of the project is to produce an excellent dissertation.

A distinction level project (roughly equivalent to a first class mark in an undergraduate degree) will involve a combination of sound background research (and hopefully the production of the Project Specification document, as part of CSM74, will have given you a good start here), a solid implementation, and a well-structured and well presented dissertation detailing the project's background, objectives and achievements. The very best projects inevitably cover some new ground *eg* by developing a complex application which does not already exist, or by enhancing some existing application or method to improve its functionality, performance *etc*.

3. Equipment

You are permitted to develop software or hardware on your own equipment, provided that suitable arrangements can be made to demonstrate it to your supervisor and the internal examiner. This usually means that the equipment can be duplicated within the University. However, you should prepare a fall-back position in case your equipment misbehaves. Remember that the software on some cheap home computers is not reliable. It is not unknown for a potentially good project to be spoilt by bugs in compilers, libraries *etc* on home computer equipment. Remember this project is likely to be larger and more complex than most things you have done before on your own equipment. If you lose your program or your data, or your report because of a system failure no allowance can be made. Whether you use your own equipment or the

department's it is your responsibility to ensure that you keep proper and adequate backups. It is your responsibility if using your own equipment to ensure that you have the proper licences for any software you use.

4. Dissertation

The dissertation is extremely important. It serves to show what you have achieved and should demonstrate that

- You understand the wider context of computing by relating your choice of project, and the approach you take, to existing products or research.
- You can apply the theoretical and practical techniques taught in the course to the problem you are addressing and that you understand their relevance to the wider world of computing.
- You are capable of objectively criticising your own work and making constructive suggestions for improvements or further work based on your experiences so far.
- As a computing professional, you can explain your thinking and working processes clearly and concisely to third parties who may not be experts in the field in which you are working.

Don't make the mistake of leaving the write-up to the last minute. Ideally you should produce the bulk of the report as you go along and use the last week or two to bring it together into a coherent whole. Remember to keep notes on all the design decisions you make, and all the sources of information you use. If these are well kept in a machine readable form then the final production of the dissertation can become just a cut and paste operation.

The following list of topics provides a guide as to what to include in your dissertation:

- discussion of the subject area and its history;
- a literature survey;
- formulation of scientific questions and the answers to them;
- theoretical background and mathematical prerequisites;
- technical problems considered and methods used to solve them;
- discussion of issues arising in specifying, designing and implementing the system (e.g. requirements analysis, user interface, system architecture, algorithms, major data structures, etc.);
- evaluation of results (e.g. complexity, efficiency, user-friendliness, reliability, etc.);
- user and system manuals;
- progress and achievement of the project;
- suggestions for further work.

5. Contact with your Supervisor

The relationship between you and your supervisor is an individual matter, but can make all the difference to how your project proceeds. You must keep in regular contact with your supervisor. This will normally involve face-to-face meetings, but regular email contact can provide an alternative for some of the time. Meetings may be brief, but the supervisor needs to kept informed as to how the work is progressing. Don't pretend that you aren't having problems if you are; your supervisor will be willing and able to offer guidance and advice, but only if they know what you are doing and where you are having problems. They will not, however, write your project for you and you must be able to convince them that you are putting sufficient effort into the work. One way of doing this is at every meeting to always have a list of what you have managed to do since the last meeting, and a list of points you wish to raise.

Keep notes of the points discussed and advice given. These notes can be used to form the basis of parts of your final report.

6. Pitfalls

Some of the most useful things to know about individual projects are the common pitfalls. Why do some projects go horribly wrong? Here are some common causes of failure.

- *Starting too late.* The idea behind getting you to write a the earlier Project Specification as part of CSM74 was in part to give you a good start with the project. Although you may feel the need to relax after the examinations it is much better to get a good start on your project. You should aim to have completed most of the project work by the middle of August.
- *Failing to meet your supervisor regularly*. If you arrange a meeting with your supervisor, turn up at the agreed time. If you are stuck for any reason and have no meeting arranged (or the next meeting is a long time off), contact him/her immediately. You gain *no* sympathy from anyone if you lose contact with your supervisor and produce a poor project as a result. Your supervisor will be happy to help you, but they can do nothing if they are unaware that you are having trouble. Furthermore they do not have the time to chase after you. If a supervisor does not hear from you they can only assume that everything is going well.
- *Allowing too little time for the report.* As has been said elsewhere in this document the dissertation is the main product of your work by which you are going to be assessed. You should try to produce as much of the report as possible as you go along, even though you don't know in advance its exact structure. Your supervisor will also have more time to read through drafts earlier rather than later. The last two or three weeks of the project should be dedicated to pulling together the material you have accumulated and producing a polished report. You can spend time improving any implementation after you have submitted the report. Don't forget to allow time for binding.
- *Failing to plan a fall-back position if the planned work is not completed on time*. Try to plan your project in stages so that if things go wrong at a later stage you have a completed earlier stage to fall back on. With software always keep a working version, and modify a copy. Never be in the position of working on your only version of the software.
- *Trying to satisfy an external customer at the expense of your academic work*. Do not let outside interests interfere with your work. The guidance for your project should come from your supervisor not any outside body who may or may not be a prospective employer. The primary aim of your project is for you to obtain an MSc.
- *Over/Under Ambition*. Try to be realistic about what you can achieve in the time available. A good project requires a lot of input from you and should be technically challenging throughout. At the same time, however, it is better to do a small job well than it is to fail to do a big job at all. Your supervisor should be able to advise you on what he expects out of the project, and this will help you set your sights accordingly.

7. Submission

Further guidelines and details of the requirements for submission can be found in the Academic Handbook for Taught Masters students issued by the University. You should have received a copy when you enrolled. You should aim to submit by the end of September. Each student is required to submit the following:

- two bound copies of the dissertation;
- two copies of the notice of candidature form fully completed (these are contained in a submission pack issued by the University of Wales and which can be obtained from the department when are ready to submit - we find that if we issue them early many people (but not you!) lose them);
- a disk (floppy or CD) containing the program (including source and executable code) unless the project has been developed on the Linux network when a directory named PROJECT should be set up in your filestore which contains this material, and only this material- check with your supervisor as to the most appropriate way in which we can keep a copy of the software you have developed;
- either a loose, unbound copy of your dissertation, or an electronic copy of your dissertation (for example on the same disk as your software);
- you may be required to submit either a loose bound set of program listings printed on A4 size paper, or line-printed program listings contained in a computer file cover- we used to insist on this, but its relevance depends upon the nature of your project so, once again, talk to your supervisor.

The documentation from the University of Wales contains further details on the form the dissertation must take, and the nature of the binding. The main requirements are mentioned later. There are a limited number of places in Swansea that can undertake book-binding so don't leave it to the last minute; you should allow at least a week to be on the safe side. Because of the potential problems in contacting students who have left Swansea after completing the course in order to get dissertations bound the department does not accept submission in temporary binding.

If the project was proposed or sponsored by an external body, an unbound copy of the dissertation will probably also be required (the binding cost for which will be met by the Department).

You will be given a receipt for your dissertations. It is no longer necessary to obtain a Gold fees certificate. This is done on your behalf by the department, but you should ensure that any fees due have been paid.

The University of Wales sets a deadline for submission for full-time students as two years after the start of the course (*ie* September 2005). The department is unable to guarantee close supervision and access to computing facilities to students who fail to submit by the end of September 2004, but we will accept dissertations submitted after this date, and will attempt to continue to provide supervision and computing facilities. Part-time students have four years from the start of their course to submit. Extensions may be granted in extenuating circumstances (personal/medical problems, or excessive work commitments), but these will have to be well documented. As a rule we have found that the better dissertations are those that are submitted by the first deadline. Attempting to finish off a project at the same time as starting a new job proves to be an almost impossible task for many students.

The assessment of dissertations submitted after the deadline may also be delayed and thus the awarding of an MSc may be delayed. We usually hold two meetings a year to discuss dissertations - one around Christmas to discuss dissertation submitted by the end of September, and the second along with the Part One Examiners' meeting in June which can consider dissertations submitted by Easter.

8. Length of Dissertation

The text of the dissertation including the main body and appendices but excluding program listings, preliminaries and other functional parts, such as bibliography, list of references and index shall not exceed 20,000 words. Remember that quantity does not automatically guarantee quality. A 150 page report is not twice as good as a 75 page one, nor a 10,000 line implementation twice as good as a 5,000 line one. Conciseness, clarity and elegance are invaluable qualities in report writing, just as they are in programming, and will be rewarded appropriately.

9. Format

The dissertation shall be presented in permanent and legible form in typescript on A4 white paper, which should of good quality and sufficient opacity for normal reading. Print on one side only.

- **Layout** — Margins at the binding (left) edges shall be not less than 1 in and other margins not less than 0.5 in. Recommended left margins are 1.25 in (32mm) and other margins 1 in (25 mm).
- **Font** — Characters used in dissertations shall be not less than 10 pt. It is recommended to use a 12 pt traditional serifed font, such as "Times" or "Bookman", for the main text; and to use a 10 pt fixed width font, such as "`Courier`", for program code segments and computer outputs.
- **Headings** — Headings shall be capitalised (i.e. all words, except prepositions and conjunctions with less than five letters, shall have a capital initial). Top-level headings may have all their letters capitalised. The recommended font sizes and styles for headings are shown in Table 1.

Heading	Size	Style
TOP LEVEL HEADING	24pt	bold
2nd Level Heading	18pt	bold
3rd Level Heading	14pt	bold
4th Level Heading	12pt	bold
5th Level Heading	12pt	italic

Table 1. Recommended font sizes and styles for headings.

- **Spacing** — For the main text of dissertations, one-and-a-half or double spacing shall be used. For the Summary, the Contents pages, indented quotations, bibliography, list of references and index, single spacing may be used. For footnotes, program code segments and computer outputs, single spacing shall be used.

- **Captions** — Figures shall be numbered with Arabic numerals consecutively throughout either the whole dissertation (e.g. Figure 1, Figure 2, etc.) or each chapter (e.g. Figure 4.1, Figure 4.2, etc.). Tables should be numbered in the same

manner. It is recommended that captions are positioned underneath the associated figures, but above the tables.

- **Pagination** — Pages shall be numbered consecutively throughout the dissertation including appendices, but excluding the program listings which may be numbered independently. Preliminaries may be numbered independently with Roman numerals except the title page(s) which shall not be numbered.

- **Equations** — Equations shall be typewritten and preferably numbered with Arabic numerals placed in parentheses at the right margin. If equations are numbered, reference to them shall use the form "Eq. (5.3)" or simply (5.3).

10. Structure

10.1 Preliminaries

10.1.1 Title Page (Compulsory)

A title page shall be provided for each binding volume of the dissertation, and shall give the following information:

(a) the full title of the dissertation and the subtitle if any;
(b) the full name of the author;
(c) the month and year of submission (*eg* "September 2003");
(d) "Project Dissertation submitted to the University of Wales Swansea in Partial Fulfilment for the Degree of Master of Science";
(e) the department and the university where the project was conducted (*ie* Department of Computer Science, University of Wales Swansea).

10.1.2 Declarations/Statements

The University of Wales requires the following declarations and statements to be included:

DECLARATION

This work has not previously been accepted in substance for any degree and is not being currently submitted in candidature for any degree.

STATEMENT 1

This dissertation is being submitted in partial fulfilment of the requirements for the degree of MSc.

STATEMENT 2

This dissertation is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

STATEMENT 3

I hereby give consent for my dissertation, if accepted, to be available for photocopying and for inter-library loan, and for the title and summary to be made available to outside organisations.

These declarations should be accompanied by your signature and date of signature.

10.1.3 Acknowledgements (Optional)

Any acknowledgements shall be on the page following the Declaration.

10.1.4 Table of Contents (Compulsory)

The table of contents shall immediately follow the declarations (or acknowledgements if included). It shall list in sequence, with page numbers, all relevant subdivisions of the dissertation.

10.1.5 Lists of Figures and Tables (Optional)

The lists of figures and tables, if any, may be given in this section, which shall list all tables, diagrams, photographs, etc., in the order in which they occur in the text, with page references.

10.1.6 Summary (Compulsory)

There shall be a summary of the dissertation not exceeding 300 words. The summary shall provide a synopsis of the dissertation and shall state clearly the nature and scope of the work undertaken and of the contribution (if any) made to the knowledge of the subject treated.

10.1.7 Abbreviations (Optional)

Where abbreviations are used a key may be provided in this section that shall follow the Summary section and precede the List of Symbols (if any).

10.1.8 List of Symbols (Optional)

A list of all symbols (excluding variables in program code segments) used in the dissertation may be given in this section, where symbols shall be identified typographically.

10.2 Main Body

The dissertation shall be divided as appropriate into chapters, sections and subsections. The system of headings shall be consistent and should provide a clear indication of changes in content, emphasis and other features which occur at each stage of the work.

It is recommended that the first chapter shall be an introductory chapter, defining the relation of the project to other work in the same field and stating aims and objectives of the project.

It may be appropriate to include a separate chapter or chapters covering the background to the project including the results of any literature surveys you have carried out. A well-written survey of the background to a project can serve as a useful reference point for a final chapter summarising your achievements by relating what you have done to the work of others.

The final chapter(s) should contain an objective evaluation of the projects successes and failures and suggestions for future work which can take the project further. There is no such thing as a perfect project. Even the very best pieces of work have their limitations and you are expected to provide a proper critical appraisal of what you have done. Your assessors are bound to spot the limitations of your work and you are expected to be able to do the same.

Arabic numerals shall be used for numbering chapters and main sections.

10.3 End Matter

10.3.1 List of References (Compulsory)

The list of references shall be arranged either alphabetically by authors or in the order in which the references are first cited in the dissertation. Every reference in the list should enable the reader to identify the work cited and to locate the specific passage referred to. Various forms of citation are used depending upon where a document is publsihed. Table 2 illustrates the style of citation used in the body of the text (right hand column), and the corresponding style to be used in the list of references (middle column) in documents published by (a) the Association for Computing Machinery (CACM), (b) the publisher Addison-Wesley, and (c) the publisher Springer-Verlag. Note the ways in which books and articles are listed in the list of references.

Standard (Type)	Example	Citation
CACM (book)	[1] Silberschatz, A. and Galvin, P.B. *Operating System Concepts*. Addison-Wesley, Reading, Massachusetts, 1994.	text [1]
CACM (article)	[2] Kenville, R. F. Optical disk data storage. *Computer*, 1982 *15*, 7, pp 21-26.	text [2]
Addison-W (book)	[Si94] Silberschatz, A. and P.B. Galvin, *Operating System Concepts*, Addison-Wesley, Reading, Massachusetts, 1994.	text [Si94]
Addison-W (article)	[Ke82a] Kenville, R. F. "Optical Disk Data Storage," *Computer*, Vol. 15, No. 7, July 1982, pp. 21-26.	text [Ke82a]
Springer (book)	A. Silberschatz and P.B. Galvin, *Operating System Concepts*, Addison-Wesley, Reading, Massachusetts, 1994.	Silberschatz and Galvin (1994)
Springer (article)	R.F. Kenville, Optical Disk Data Storage, *Computer*, **15**(7), 21-26 (1982).	Kenville (1982)

Table 2. Commonly-used forms for references.

10.3.2 Bibliography (Optional)

If a bibliography is supplied, it shall be arranged in a logical order, for example alphabetically by authors or in broad subject classes. Essentially this is a list of sources used, but not directly cited. The listing style should be the same as for cited references.

10.3.3 Appendices (Optional)

Appendices shall follow the List of References and Bibliography (if any) and precede the Index (if any). Appendices may consist of supporting material of considerable length or of lists, documents, commentaries, tables or other evidence which, if included in the main text, would interrupt its flow. Depending upon the nature of the project a User Manual may be included as an appendix. Another common appendix is a system manual which would enable someone to take your software and develop it further. Often the main body of the report can be considered to give enough detail, but if the description of the software development in the main part of the report is intimately linked with a discussion of theory it might be appropriate to extract the relevant details into a manual for someone who did not wish to get embroiled in the detail of the theory.

10.3.4 Index (Optional)

An index is generally not required provided the Table of Contents is detailed.

11. Demonstration/Viva

You will be required to give a demonstration of your project to your supervisor and the internal examiner as near as possible to the date of your submission. If either of your assessors is likely to be away during that period you may need to demonstrate your software earlier. It is often useful to demonstrate your software at an earlier stage to your supervisor to ensure you are on the right track. In addition allowing your fellow students to try out your software can be a very quick way of discovering that what you thought was a reliable interface is in fact very easy to crash.

In the case of projects which do not have a suitable piece of software whose use can be demonstrated in a 10-15 minute session a viva will be held in which your supervisor and the internal examiner will question you on the work you have done.

12. Plagiarism

The following wording is taken from a notice issued by the University of London, but is equally applicable in Swansea. Also see the guidelines and regulations in the Academic Handbook issued by the University.

You are reminded that all work submitted as part of the requirements for any examination of the University must be expressed in your own words and incorporate your own ideas and judgements. Plagiarism - that is, the presentation of another person's thoughts or words as though they were your own - must be avoided, with particular care in course-work and essays and reports written in your own time. Direct quotations from the published or unpublished work of others must always be identified as such by being placed in quotation marks, and a full reference to their source must be provided in the proper form. Remember that a series of short quotations from several different sources, if not identified as such, constitutes plagiarism just as much as does a single unacknowledged long quotation from a single source. Equally, if you summarise another person's ideas or judgements, you must refer to that person in your text, and include the work referred to in your bibliography. **Failure to observe these rules may result in an allegation of cheating.** You should therefore consult your tutor or course director if you are in any doubt about what is permissible.