MANCHESTER METROPOLITAN UNIVERSITY
SCHOOL OF COMPUTING, MATHEMATICS AND DIGITAL TECHNOLOGY

COMPUTING AND DIGITAL TECHNOLOGY POSTGRADUATE PROGRAMME

MSc PROJECT HANDBOOK

Units covered:
6G7Z1015 Masters Project
6G7Z1029 MSc Data Science Project
6G7Z1030 MSc Data Analytics Project
6G7Z1016 MSc Information Systems Project
6G7Z1051 Masters Project (MComp)

Contents

Chapter 1

Introduction

This guide is provided for the taught MSc Computing Network candidates in the School of Computing, Mathematics and Digital Technology. It gives important information and a set of general guidelines to support the MSc Computing Network project and its accompanying dissertation. As well as these guidelines, it is important that candidates follow the advice and instructions given by their supervisors in order to meet the specific requirements of their project.

Within the network, the following named routes have a common project process and are collectively referred to using the "Masters Project" name, code (6G7Z1015) and Moodle area.

- M.Sc. Computing (6G7Z1015)

- M.Sc. Cyber Security (6G7Z1015)

- M.Sc. Advanced Computer Science (6G7Z1015)

The following named routes each have sufficient distinction from Masters Projects to merit their own names, codes and Moodle areas:

- M.Sc. Data Science Project (6G7Z1029)

- M.Sc. Data Analytics Project (6G7Z1030)

- M.Sc. Information Systems Project (6G7Z1016)

- MComp(Hons) Computer Science (6G7Z1051)

1.1 Document Structure

The guide is organised into sections, each explaining a stage in the project process. Some additional useful information is included in the appendices.

Appendix A project proposal form. Include details of the Terms of Reference (ToR), which should be completed after you have been allocated a project.

Appendix B gives an explanation of features which the British Computer Society expects to see in an M.Sc. project.

Appendix C shows the University standard descriptors for work at Master's level

Appendix D contains assessment grids and assessment criteria.

1.2   Project Assessment

All projects are assessed by means of a written dissertation (project report, worth 95%) and a viva (worth 5%). The project viva may vary to satisfy specific requirements of a named route, but every viva contains at least one question used to meet assessment requirements for the project workshops / seminars and at least two questions to assess academic content.

Due to the academic calendar for the MSc and the nature of the UK visa process, overseas students may not be resident in the UK at the time of the viva, therefore all students are provided with their viva questions during the marking period and allowed to submit a recorded presentation which answers them. Alternative methods of making the viva presentation will be available to students with exceptional factors.

Example assessment sheets are shown in Appendix D. Projects are marked separately by a supervisor and second reader who then meet to agree the recorded mark (if agreement is not reached a the reader is appointed to adjudicate). Projects and the marks are also scrutinized by the external examiner. The pass mark is 50%. Should the mark be below 50% the supervisor and second reader write a specification of what is required to bring the project up to a pass, which is fed back to the student by the supervisor. The exact nature of the final mark achieved by a student who fails to get 50% at the first attempt will depend on Exceptional Factors etc., governed by separate University regulations.

Chapter 2

Project Calendar

In Term Two, a series of workshops is run which orientate students towards the project. General areas covered in the series include: the expectations of a project; research techniques; legal, social, ethical and professional issues; initial project selection and project management.

Any part time students whose other commitments prevent them from attending project workshops on a regular basis will be catered for by material placed on Moodle and by other mechanisms.

2.1 Project allocation

The project selection process takes place during Term Two. Exact calendar dates vary from year-to-year based on the position of the Christmas and Easter vacations in the academic calendar.

- Project descriptions (referred to as "topics", but note that they typically define precise hypotheses to be addressed) from staff supervisors are collected into a project selection booklet by the project coordinator, who publishes this online.

- Around the time of the publication, a series of pitching sessions takes place in the project support workshop slots. These are used by prospective supervisors to make brief pitches of their project topics and interests to the students.

- This is followed by period in which students can arrange one-to-one meetings with supervisors to discuss potential topics. Students and supervisors who have agreed project topics on the basis of these discussions will submit signed project proposals to the coordinator via Moodle at this point.

- Finally, the project selection period begins. This uses a web-based selection process. Students are required to list their desired topics

in order of preference, subject to the availability of staff and of the different topics.

Following this, the project coordinator allocates the topics by balancing multiple criteria:

- Allocation results in every student (who submits the selection form on time) getting a project topic;

- Where a meeting has taken place between a supervisor and a student, resulting in both of them expressing an interest in working together (signified by submission of a topic proposal signed by the supervisor);

- Allocating no more than 3 projects per supervisor, unless the supervisor states a preference for more;

- Taking account of the time of submission on a first-come / first-served basis;

- Taking account of the order of preference stated on the selection form.

2.2   Execution of the project

Topic and supervisor allocations can be expected to be announced in early May. Full-time students should begin the project in earnest in late May, after the undergraduate exam period. They may have one initial meeting with their supervisor earlier, to discuss the initial tasks.

- The first stage of the work involves turning the description of their allocated topic (from the project selection booklet) into a Terms of Reference document (about 1,000 words) and submitting the topic for ethical approval. These activities are performed in conjunction with the supervisor.

- Part-time candidates begin the project in September and are assessed with the relevant cohort in the following September.

- MComp students begin the project in September and are assessed with the undergraduate students in the following Spring.

- Full-time students work full-time on the project after the Easter vacation.

- There are regular/periodic supervision meetings over this period, arranged at mutually convenient times.

- Supervisors make themselves available over the Summer vacation period.

- Supervisors may allocate another member of their research team to advise the student during a supervisor's vacation.

2.3   Student deadlines

- Terms of Reference

  - 3 weeks after project allocations are published.

- Ethical approval

  - This is assessed by the supervisor and submitted as part of the Terms of Reference.

- Dissertation

  - The standard deadline for submission of dissertations is Friday the 27th September, 2019.
  - The standard deadline for MComp students is Friday the 5th of April, 2019.
  - Referred projects will be allocated deadlines by the Exceptional Factors panel.

- Viva

  - The standard deadline for submission of vivas is Wednesday the 2nd of October, 2019.
  - The standard deadline for submission of vivas by MComp students is Wednesday the 10th of April, 2019.
  - Referred projects will be allocated deadlines by the Exceptional Factors panel.

2.4   Submission

The normal form of submission will be via Moodle. The Terms of Reference is a formative assignment intended to ensure clear communication between the supervisor and the student and is a normal Moodle submission; it states the aims and objectives of the project and so provides criteria against which its success can be measured. The dissertation will be a Moodle Turnitin submission allowing students to identify and address potential plagiarism problems. The Viva will be a Moodle video assignment. This allows students who have left the area (possibly due to visa requirements) to participate in the viva. Video presentation is not compulsory; alternative arrangements will be made for students with PLPs etc. It should also be noted that

there are no marks allocated to aesthetic (recording quality, editing etc.) properties of the video submission, it only assesses answers to the questions put by the supervisor(s) and project coordinator.

2.5   Results

Projects submitted by on time will be considered by the Board of Examiners at a meeting in early November.

Chapter 3

Project Selection

When choosing a project you should ensure that it contributes to the intended learning outcomes of your MSc named route. If you need guidance with this, you should focus on projects supervised by lecturers for the modules taught on your named route, pay particular attention to their pitching sessions and visit them before submitting your project selections. Note that not all of the supervisors are involved in taught MSc units, so you should also investigate the papers and research interests of the School's academic staff. These are available from `https://www2.mmu.ac.uk/scmdt/staff/`.

You should also consider your own interests, your background and your particular strengths. You may also wish to consider the skills that a particular topic is likely to engender. These issues are discussed during the project workshops / seminars.

Full-time and part-time candidates will normally be allocated a topic by the School, usually from the project booklet which contains a list of ideas generated by academics within the School. Candidates undertaking such topics are advised to talk to potential supervisors about the project suggestions in the list so that further information may be obtained. Alternatively, candidates who have their own idea for a topic may discuss their idea with potential supervisors to ascertain whether the idea is viable. Sometimes a candidates idea may be close to a project in the booklet, in which case the specification may be negotiated with the relevant supervisor.

Especially, but not exclusively, this is an appropriate approach for MSc Information Systems students. Non-technical IS projects typically involve research work which is more dependent on co-operation of third parties, including one or more with whom the student already has some sort of contact, and/ or some with whom the student has had no contact whatsoever hitherto. An experienced supervisor, in exploring the students idea for an IS project, is usually well placed to make a better initial assessment of the feasibility of such a project and the likelihood of the necessary third party co-operation. IS projects are also more likely to include perspectives associated

with academic disciplines other than computing, and, again, an experienced supervisor can give valuable advice about this consideration.

If you are a part-time candidate you should also consider whether you are in a position to undertake a project which would be substantially dependent on the facilities and equipment within the School. If you are a part-time student already working in IT, you and your manager at your place of work may have some initial ideas about a work-based project. If so, you should see the Projects Co-coordinator as soon as possible to check that the initial idea is acceptable to the School, the main criteria being whether the work will be yours alone, and whether it will lead to an MSc-level dissertation. Further discussion will be necessary between the allocated supervisor, the industrial supervisor, and the student.

Full-time candidates who undertook an industrial placement may wish to negotiate a topic in consultation with their industrial supervisor and the academic supervisor allocated by the School. Almost certainly, there will already have been some discussion between the potential industrial supervisor and the Projects Manager about the nature of the placement and the type of project to be associated with it.

Academics who specify topics know that these will be sufficiently original and challenging to meet the needs of a Master's degree. If you wish to specify your own topics you will need ensure that it is original before proposing it (this may well involve lots of Google searching) and be able to convince one of the supervisors to take it on, which is a substantial challenge for you. As illustrated in the project workshops, you can find a list of academic staff on the school website and use Google Scholar or Researchgate to see if their most recent work makes them suitable potential supervisors. The Projects Manager may also be able to advise which, if any, members of staff might be interested in a project in a particular area.

Chapter 4

The Terms of Reference

When you have met with your supervisor and the precise requirements for the project have been agreed, you will be required to write a final project ToR. This must be clearly presented and checked for English errors. Submission to Moodle and acceptance mark on Moodle count as signatures from the student and supervisor respectively, demonstrating commitment to the project by the student and acceptance of the plan by the supervisor.

For industrially placed candidates, the signature of the industrial supervisor is required as well. This may be added to a printout of the ToR, scanned and uploaded to Moodle by the student. The Industrial supervisor must be provided with a copy of the ToR if you have one.

Terms of reference may take a number of different forms but they should all include at least the following sections.

4.1 ToR components

4.1.1 Cover sheet

The cover sheet is used to record details of the project and will show the names of all the people involved, the project title, the award and an agreed date for submission. The cover sheet is shown in Appendix B and can be downloaded from Moodle.

4.1.2 Project aims

This general term may refer to

- A. Aims and Objectives for an industrial / practical / development project

- B. Research Questions and Hypotheses for a research-oriented project

- C. Some combination of A and B.

These will help you to design and plan your project appropriately and will provide the overall direction of the project. Aims are the high level achievements your project should produce, Objectives are concrete deliverables (e.g. Lit review, design document) which can be measured as having been achieved as your project progresses. Research questions are things you are trying to find out by doing your project, hypotheses are mutually exclusive, contradictory statement pairs that you test to answer your research questions. These are covered in the Project workshops.

4.1.3   Learning Outcomes

It is necessary to record the learning outcomes associated with the project:

- Award Learning Outcomes developed by your project

- Specific Learning Outcomes for a project for your MSc Degree title .

4.1.4   Project description

Describe the work that will be undertaken to achieve the aims given above. You may divide the work into specific objectives and you may indicate outcomes and any deliverables. You may also include some background information and it is likely that the objectives will include investigation of suitable tools and methods. There should also be an assessment of legal, social, ethical and professional issues (if any) pertaining to the project. (At this point the actions to answer research questions and test hypotheses can be formulated as objectives.)

4.1.5   References

This should be a bibliography, listing books, journals and other sources that you will use to begin the literature survey. It should also include the sources for any material to which you have referred in the project description.

4.1.6   Evaluation Plan

When the project is complete you will need to evaluate your achievement. This should be done both in terms of the project objectives and in terms of the project process. How will these evaluations be carried out? Will you use qualitative methods? Will you use statistical tests?

4.1.7   Activity schedule

The project is broken down into tasks and activities which need to be scheduled. You should give dates and milestones, usually relating to any objectives you have defined above. The work plan must be realistic enough for

you to follow, so that you will be able to meet the deadline for the submission of the dissertation. In addition, it is always a good idea to represent your project plan graphically in such a way that the sequence of the activities is clearly shown. For instance, the use of a Gantt chart is appropriate.

4.1.8   Signing and dating

The following signatures should be included:

- the candidate submission to Moodle by the candidate counts as a signature

- the supervisor acceptance mark on Moodle counts as a signature (0 = unsatisfactory, 1 = satisfactory)

- the industrial supervisor if applicable physical signature on the proposal, scanned and submitted to Moodle by the student.

4.2   MMU Research Ethics

The place of research ethics within a university is best thought of in terms of the avoidance of reputational damage. There are broadly four types of danger:

- Danger of the University (this, of course, includes you as a student) being found to being undertaking research of a nature which might attract negative publicity (for example, we are obliged to maintain records of research involving genetically modified organisms or which is security sensitive, and this is managed through the ethics system),

- Danger of physical injury to experimenters or participants (like any other activity, this is a matter for the Health and Safety system; all applications must have a Risk Assessment attached to them);

- Danger of psychological injury or exploitation of participants (we have, for example a responsibility not to make use of inappropriate power relationships or unnecessary deception of participants),

- Danger of inappropriate use or release of data (we are bound by both the Data Protection and Human Tissue Acts and must ensure that our procedures follow best practice in these areas).

Following on from these concerns, we have a responsibility not to collect more data than is necessary. It is therefore appropriate both to undertake a review of the proposed protocol and to see accepted applications as licenses to collect a stated amount of data, not to carry out protocols.More details on the subject can be found by reading the MMU ethics introduction at: `https://www2.mmu.ac.uk/research/staff/ethics-and-governance/`

4.2.1 Procedures Relating to Research Ethics

The following procedure should be carried out in consultation with your supervisor. It should be considered in parallel with drawing up your Feasibility Study, and submitted as part of it.

The necessary ethics forms can be found at the following URL: `https://ethos-apply.mmu.ac.uk/`

1. After login (use your standard University details), click `Create Project`. Enter the project title as agreed with your supervisor, and, from the menu choose `Undergraduate and PGT Application`. press `Create`.

2. Click `Student Application Form` and confirm that you will abide by the University's Academic Ethical Framework in relation to this project.

3. Now answer the questions. Obviously, the precise answers will depend on what you are doing, but the following points will apply to everyone:

   - The application is **not** being submitted as a "learning experience";
   - The Faculty is **Science and Engineering**;
   - The "course title" is **7G6Z1015 Masters Project** (or similar if you are on a different course);
   - The start date is the deadline for the ToR submission - three weeks after prject allocation.
   - The end date is Friday 29/09/19 (project submission day);
   - Discuss with your supervisor if there are Health and Safety issues, if there are, list them and include a Risk Assessment form, signed by me, Nicholas Costen;
   - It is unlikely that the project is part of a larger study, but your supervisor will tell you.

4. If your risks or ethical issues are special and not covered by the documents available, discuss things with your supervisor and me and we will sort the issue out.

5. Once you have completed the questions, **confirm** that you have answered the questions correctly, **request a signature** from your supervisor and **sign** the document (it won't let you finish signing until you have answered all the questions).

6. When you have received ethical approval from your supervisor, create a PDF of the application (do this via the `Print` button) and include it as part of your Terms of Reference.

- *Do not collect or manipulate data for your project before you have obtained the signed document.* You may however undertake your literature survey and / or Product design.

7. When you write and submit your Report you **MUST** include the signed form as an appendix to your document, as part of you ToR. Supervisors will be prompted to ask for evidence of a plan to do this when you submit the Report Outline. Examiners will be instructed to treat Reports which do not include a signed ethics form as non-compliant and as evidence that the University Research Ethics and Governance regulations have been subverted.

Chapter 5

The Dissertation

5.1 Introduction

This chapter is intended to help you to write your project report. The material presented here is not part of the degree regulations. Any disputes or appeals arising from the consideration of your project will be judged solely in accordance with the Regulations as published in the Student Handbook.

As well as understanding the background of the project itself, it is necessary to build up an understanding of the project area in which the project is taking place. That involves quite a lot of reading, especially of academic journals' articles about the project area. In some cases, however, there may not be sufficient time to make a major study of the background area, involving much reading of the standard work, at the beginning of the project. It may be easier to search for reviews or meta-studies in your field, which summarise the work of many research papers in your field. Reviews, for example, are usually publications of the results of literature surveys in the field by PhD students. However, you must always reference these pieces of other people's work that you are using as part of your project. Your project workshops have an excellent Library Induction to help you find your way through the literature beyond Google Scholar.

This document aims for generality. There is a wide variety of projects in the school, so the particular form of your project report will be unique to your project. Therefore, this document concentrates on those aspects of a project report that are always required, e.g.: structure, presentation, etc. Discuss with your supervisor the form that your particular project report should take.

The final section of this document gives some of the characteristics of the ideal project. Once again, bear in mind that these give generally applicable advice. Therefore, nothing is said about documentation, but if you have designed a piece of software, it should really be documented appropriately. Equally, if you have conducted a survey, you should ensure that you have

clearly explained what information it is supposed to elicit, how you selected the methods you used, how you chose your subjects, etc.

Remember to leave sufficient time for writing up your project. You should discuss with your supervisor whether you are ready to start writing your report. In order to get full credit for the work you have put in, you must write a good project report. This takes time, so do not leave it until the last minute.

Many people find it difficult to begin. You should draft out a set of chapter headings and then refine each chapter into sections. Discuss this outline with your supervisor at an early stage. You may then begin writing anywhere. You may find that, when writing, you cannot find exactly the right phrase that you need. It may help to write something (anything) and continue. After several drafts, the dissertation will begin to take shape.

Keep the writing simple. You are trying to communicate ideas with clarity rather than to demonstrate how many words you know. Keep sentences short. Avoid jargon, slang and figures of speech. The best way to learn how to write in a suitable academic style is to read plenty of academic literature. Also, the project unit specifications contain texts which may help you to develop your writing abilities. Both dictionaries and books on English grammar have a role to play. So do spell checkers and grammar checkers, although their functionality can be limited.

Do not generalise without justification. You should usually try to present evidence, perhaps from the literature, to show there is some basis for your assertion.

5.2 Critical Evaluation

Part of your dissertation should include a critical evaluation of the work you have carried out. Such an evaluation will refer to your initial aim(s) and objectives. It may also include a test and/or an experiment, although in IS projects, where the work is quite likely to be of an exploratory, qualitative nature, this is less probable. Evaluation can also be carried out by comparing your project achievements with those of others working in the same area. Critical evaluation is an important part of your dissertation, since it demonstrates that you understand the subject area, the justification behind the piece of work that you did as part of your project and you can evaluate it objectively and compare it with other existing approaches mentioned in your literature review. Where evaluation is performed by a user group, this must have been fully approved through the ethics process at the start of your project.

5.2.1   Report Formatting

The project report is probably the largest and most comprehensive document that you will have produced to date in your programme of study. Its purpose is to communicate the work done throughout the course of the project to a non-specialist (but one who has a good understanding of postgraduate level computing) so that the reader fully understands what is being presented. This carries the overwhelming weight of the project marks and is expected to take the vast majority of the time allocated for the project unit to produce.

The project documents should comply by the following university standards for academic project reports:

- The report must be a typeset PDF document.

- The report must have a title page that includes: the university logo; the name of the faculty; the name of the student; the degree title of the programme; the title of the project; the month and year that the project was completed; the name of the school to which the student belongs.

- The report must have a preamble consisting of (on separate pages): a full-page abstract; an acknowledgements page; a signed university plagiarism disclaimer; a table of contents; a list of figures.

- The report should use a 12pt Times New Roman (or the LaTeX equivalent) font with 1.5 times the standard spacing for the main text with suitable larger bold type fonts for the chapter, section and sub-section headings. Chapters, sections and sub-sections should be numbered appropriately, and appendices identified by letters (sub-parts have numbers). All chapters should start on a new page.

- All pages with the exception of the title page should be numbered at the bottom aligned to the centre of the page. Roman numerals should be used for pages in the preamble and Arabic numerals used for all other pages starting at 1 for the first page of the first chapter.

- All mathematical expressions should be typeset using an equation editor. All display equations should be centred on the page. Where a display equation is numbered, the number should be aligned to the right-hand margin alongside the equation and enclosed in parentheses.

- All figures and tables should be centred on the page and should not have elements placed alongside. Numbered figure captions should appear below figures and tables.

- All sources should be cited using the Harvard method with a list of references containing the citation information in alphabetical order by the first author's surname a placed after the conclusions chapter. See the University's referencing guide for more information using this link: `http://libguides.mmu.ac.uk/refguide/mmuharvard`.

The project supervisor will advise on the detailed aspects of the report and will provide formative feedback on interim drafts. Students should however note that project supervisors will not proofread the whole report prior to submission. Students are advised to use either LaTeX or Microsoft Word software available on the university machines on which to prepare their project report. Skeletal templates that give an indication of the basic formatting in both LaTeX and Microsoft Word formats are provided on the Moodle area for this unit.

5.3 Report style and presentation

The report should be as short as possible, consistent with a good description of the work carried out. For the vast majority of projects, the word count is to be somewhere between 10,000 and 15,000 words. There is a limit of 20,000 words. This would generally result in a report with about 55 to 75 pages containing not only written text, but also figures and fragments of code, for example. While word or page counts are useful for measures of the workload involved, it far more important that your report forms a coherent description that is concise but, at the same, contains all the relevant sections given your project aim and objectives.

A high standard of organisation and presentation is required. The report must be written in competent English, in in a clear and unambiguous style. This means that your work will be grammatically correct and your use of English will strike an appropriate balance between formality and readability. You must check your work for spelling. Modern word-processors have spell-checkers so there is no excuse for spelling mistakes. Obviously, a spell-checker cannot distinguish between "their", "they're" and "there", or other similar homonyms, so you must read your work carefully. As postgraduate students you are expected to be able to write properly in English.

You must use punctuation properly. You should be particularly careful with commas and apostrophes. If you have a sentence with several commas in it, try reading it aloud. You will probably find that it is too long to make any real sense. Split such sentences up into more manageable units. Apostrophes are used only to indicate possession or elision. The use of brackets to indicate sub-clauses, comments or asides should also be avoided (although sometimes they can appropriate).

As a general piece of advice, ask another student to comment on a draft of your project report. Another person will often spot grammatical and ty-

pographical errors that you miss. Also, you will get some idea of how clearly you have expressed your ideas and how convincing are your arguments.

5.3.1   Figures and Tables

A figure caption should appear below each figure, and a table caption should appear below each table. Insert figures and tables after they are cited in the text; make sure that you cite them all. The figure or table, together with the caption (which should give the number of the figure or table), should be centred and referred to within the text as "Figure 5.1 shows..." or "...as shown in Table 5.1". There should be a blank line above and below each figure or table.
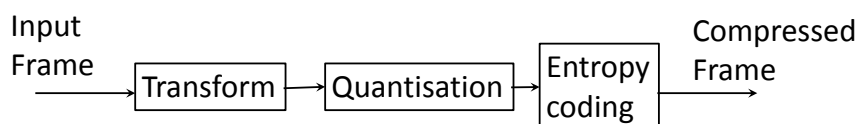

Figure 5.1: Transform coding.

Number	Measurement
M0	Difference in Y values
M1	Maximum of TI
M2	RMS of TI
M3	Range of TI values
M4	RMS of SI

Table 5.1: Quality measurements used by CQA

If preparing your report on Word, use its caption handling facility to enter figure and table headings. This will allow you to auto-number the headings and also to generate a List of Figures and a List of Tables at the beginning of your report.

5.3.2   Equations

Number equations consecutively within each chapter (e.g. the first equation in Chapter 1 should be numbered (1.1), the first equation in Chapter 2 should be numbered (2.1) etc.). Equation numbers, within parentheses, should be positioned flush right as in (5.1). The equation should be centred and included in the sentence within your text which brackets it. There should be a blank line above and below each equation.

The following is an example of the correct use and formatting of an equation:

Using the root mean square error,

$$RMSE = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - m_i)^2}, \quad\quad (5.1)$$

as a measure of accuracy, where x_i and m_i are respectively the i-th elements of the observation and reference,....

Be sure that symbols in your equation have been defined before or immediately following the equation.

5.3.3   Bullet Points and Ordered Lists

Ordered (numbered) lists and bullet point lists should be indented on both the left and right margins (see Section 5.6.1 "Common mistakes").

5.3.4   Footnotes and Endnotes

Do not use footnotes[1] or endnotes.

5.3.5   Referencing

Whenever you refer to another's ideas or findings you should include a reference. This will allow the reader to locate and refer to the original source in the event of wishing to find out more information about a particular topic. Please note that references do not allow you to copy sections of work that are not your own.

There are a number of conventions for citing references. You should follow the one referred to as "Harvard", described in great detail in the University's guide `http://libguides.mmu.ac.uk/refguide/mmuharvard`.

The citation should be given name and a year, as in the case this case: (Britch, 2003a). This name form is easier to work with than others and gives some visual clue to the reference. When naming authors, use their surname only; do not use their personal names, titles or initials unless it is necessary to distinguish two people with the same surname. If there are two authors of a paper, use both their surnames to identify it (Britch and Costen, 2005). For three or more, give the name of the first author and the words "et al" (Britch et al, 2007). It is not normal to state where the authors work; this is an attempt by journalists to give credibility their statements and is not appropriate in scientific writing where we are concentrating on the content of the work.

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[1]This is a footnote. Endnotes are similar but placed at the end of the document. They are annoying and deprecated in scientific writing. Other, non-scientific subjects, typically including humanities such as history or music have different standards and make use of them.

A citation is placed in the text and the corresponding work is included in the list of references. All citations in the text should be represented in the list of references and conversely, all works in the list of references must be cited in the text. Works that are not explicitly cited, for example material on computer languages, design methodologies etc., that have been used in the process of carrying out the project and so should be acknowledged, should be placed in a separate bibliography.

One of the useful features of the Harvard system is that the citation can take several forms, depending upon which part it plays in the sentence. The citation should be entered into the text wherever you wish to refer the reader to the original source e.g.:

> A detailed explanation of the stages of the waterfall model can be found in Sommerville (2004).
>
> Recommendation BT.500 (CCIR, 1982) defines experimental conditions such as the minimum number of participants, lighting conditions, timing etc.
>
> For example, it has been found experimentally that perceptually proper division of bits between luminance and chrominance in the compressed bit stream is obtained by application of the Euclidean distance in YUV space (Westerink et al., 1992).

At the end of the document you should include a list of references, ordered by name then year. Such a list is shown below, as an example. The title of the work should be italicised. Also note that when referencing a book, exact page numbers should be included.

> Britch, D., *Wavelet-based digital image watermarking for copyright protection*, 10th IEEE International Workshop on Systems, Signals and Image Processing, Prague, Czech Republic, 10–11 September 2003.
>
> Britch, D. (`D.Britch@mmu.ac.uk`), *Project allocation*, Email to John Smith (`J.Smith@mmu.ac.uk`), 5th October 2003.
>
> CCIR, *Recommendation 500-2, Method for the subjective assessment of the quality of television pictures*, Recommendations and reports of the CCIR, Geneva, 1982.
>
> Shoemaker, C. *A survey of techniques for digital watermarking*, `http://www.vu.union.edu/~shoemakc/watermarking/`, 27th October 2002.
>
> Sommerville, I., *Software Engineering*, 7th edition, Pearson Education, Harlow, UK, pp. 65 - 68, 2004.
>
> Westerink, P. H., Biemond, J. and Boekee, D. E., *Scalar quantisation error analysis for image coding using QMFs*, IEEE Transactions on Signal Processing, 40**2**, pp. 421–428, 1992.

In the event of an author having published multiple documents in the same year you can append a letter to the end of the year, in order to uniquely identify the reference e.g. [Britch 2005b]. When referencing a web page, you should list it as "viewed on dd-mm-yyyy". This only applies to blogs and other self-published source of information. Journal articles and books or their sections are cited via the publisher's name and the issue etc, even if they are available via a website. The name of the journal, conference or book gives weight to the publication you are citing; it is important that you take the time to find the full citation of the papers you use. As mentioned in other documents, writing your report in LaTeX will allow you to solve all of these problems with ease.

5.3.6 Quotations

In general, quotations should be avoided. They are generally only appropriate when you want to introduce some text as data into the report to be considered and criticised; it is rare for this to be done in computing. However, if necessary, short quotations can be embedded into the text. They should be italicised and placed in quotation marks with a reference being given, as follows:

> Unfortunately, watermarks are not always robust to standard image filtering techniques. *"While the watermarks are still visible after sharpening and blurring, too much information from the original image is also present and obscuring the watermark."* [Britch, 2003a]

Longer quotations should be in-set as follows:

> *"Furthermore, the watermarks are not very robust to the addition of random noise. Even at an addition of 10%, the noise overwhelms the watermark. However, the watermark is more robust to the addition of uniform noise."* [Britch, 2003a]

5.4 The Structure of your report

Before beginning the write-up you should agree the general structure and contents of your project report with your supervisor. However, the precise structure will depend on the nature of the subject matter and on how you approached your topic. Nevertheless, in any project report one would expect at least an introduction at the beginning and a conclusion at the end. The most important thing is that the report should be structured logically. You should try to establish a structure before you start writing. A suggested report structure is shown below.

Title Page	Give: project title, University logo, author, formal title of degree, supervisor.
Contents	A list of chapter and section headings, with their respective page numbers.
List of Figures	A list of figure headings and page numbers.
List of Tables	A list of table headings and page numbers.
Abstract	A summary of the work undertaken, stating the problem, how the problem has been solved, and the result.
Declaration	A signed plagiarism disclaimer, as follows:

> No part of this project has been submitted in support of an application for any other degree or qualification at this or any other institute of learning. Apart from those parts of the project containing citations to the work of others, this project is my own unaided work.
>
> Signed
>
> --------------------------------

Acknowledgements	Optional (acknowledge anyone who helped you with your project).
Abbreviations	A table showing each abbreviation used within the report, and its full meaning.
Chapter 1 Introduction	A statement of the aims of the work and a brief overview of the remainder of the report.
Chapter 2 Literature Review	Relate your work to previous work (literature). Give the context of the Analysis work and any technical details necessary for understanding the work. Establish motivation for the present work and relate it to the wider social, ethical, legal and professional context.
Chapter 3 Design	State the identified requirements and show design diagrams with full explanations for your product.

Chapter 4 Implementation	Describe the work undertaken and the results obtained. Small sections of code can be used to aid the understanding of a particular point. Discuss testing strategy and show testing details.
Chapter 5 Evaluation	Examine critically the completed work and the results achieved. Relative achievements (or lack of them) to the original objectives. Depending on the type of project, this may involve significant user-evaluation, statistical or application-completeness testing.
Chapter 6 Conclusion	Briefly restate the work undertaken, summarise any findings or recommendations, acknowledge limitations and make suggestions for further work.
References	Use a recognised referencing system and be consistent.
Bibliography	List any material consulted but not specifically referenced.
Glossary	Optional.
Appendices	
	Appendix A : Feasibility Study Appendix B : Materials used in Showcase Appendix C : Link to OneDrive directory containing Product Appendix D, E, etc : Other materials - User manual, test runs, questionnaires etc. You do not need to include your entire source code. Note that each appendix should be referred to within the report text.

Initially, try to put yourself in the position of someone who knows nothing about what you have been doing during your project. (NB the second reader will know something about the general area of your project but not about the detail of what you have been doing in that area). You have to convince this person of: (a) the justification for your project (i.e. that what you have done is worthwhile/sensible/useful etc); and (b) the quality of your work (i.e. that you have made a good job of whatever it is that you have done). It is guaranteed that if your report is not logically structured, you will fail to achieve either (a) or (b).

Obviously, your report should be organised into chapters and each chapter should be organized into sections. Each chapter between the Introduction

and the Conclusions should deal with a substantive area of your work. Although chapters should normally be relatively independent of each other, there is nothing wrong with establishing a link with the next chapter at the end of the current one.

When writing the sections of a chapter, there are a number of points that you should bear in mind. First, make sure that section headings reflect the content of the sections. Second, if you are numbering sections 1.1, 1.2, 1.2.1, 1.2.2 etc (and there are very good reasons to do so), make sure that you do not go beyond three levels of subsection. Remember that you are trying to convince someone of something. You cannot expect the reader to remember where they are in a maze of sections and subsections, much less follow the arguments you are trying to put. If you find yourself writing section 6.4.1.3.1.1, ask yourself what you are trying to say and whether or not you might find a better way of saying it.

It is not acceptable to ask your Supervisor to read your project report through in full before he/she has to mark it, but it is entirely reasonable to ask them to comment on the structure you propose for your report. Start with a list of chapter titles and then refine this by adding the titles of the major sections within each chapter.

5.5 Chapters and sections in your report

This section describes some of the chapters and Sections your report should contain. This is not an exhaustive list.

5.5.1 The abstract

Your report should be prefaced by an abstract. This is a single-paragraph summary describing the problem you were trying to solve, how you solved the problem, and the result.

5.5.2 The introduction

Your report must have a coherent introduction. A useful basis for your introduction might be:

- Background to the project (i.e. an expanded version of the section in your terms of reference).

- Detailed assessment of the problem. Your account of the problem your project is addressing.

- Realistic aims and objectives for the project.

- Brief overview of the chapters in the report. You should aim in this section to give some sort of idea of how the report is structured.

5.5.3   The literature survey

All project reports are expected to include a literature survey, and this will normally be detailed enough to warrant a chapter of its own. You should present your literature survey in narrative form. It is not enough to produce a long list in the form of "Smith (1990) said this. Jones et al (1992) said that". You should aim to critically evaluate the work you have read and to show how your understanding of this work has contributed to your project.

5.5.4   What you have done

Somewhere in your report you will need to explain what you have done during the year. You may feel that this discussion is best distributed over several chapters. For example, you may want to describe the functionality of a system in one chapter and the user interface to the system in another. Wherever this discussion is situated, you must be careful to justify what you have done instead of merely describing it.

Describe the work actually done and any results obtained; this may be split into design and implementation or some other natural division. Avoid low-level detail (e.g. long sections of code or, for IS projects, paragraph after paragraph of verbatim interview notes) unless absolutely necessary for the understanding of a particular point. The more voluminous material is more appropriately placed in an appendix, and even then almost certainly needs to be summarized and/or presented via samples. Quite clearly, you would not, for instance, have an appendix containing all the separate responses (whether originally electronic or paper-based) from hundreds of people who replied to a questionnaire.

5.5.5   The body of your report

As has been said, it is not possible to state generally what should go in the body of your report; this depends entirely on the nature of your project. However, there are some remarks that are appropriate for all chapters.

First, you should introduce each chapter with its own mini-introduction. This should summarise how the chapter fits into the whole report. If appropriate, it should summarise what the previous chapter says and indicate how this chapter follows on.

At the end of each chapter, you should summarise the contents of the chapter and what you expect the user to have understood from it. Again, where appropriate, you should indicate how the next chapter follows on from the present one.

Problem Analysis

Here you will need to state in more detail the precise work that you are carrying out. This may require elaboration of the aim(s) and objectives, and more specific consideration of requirements and how they were identified. Alternatively, the primary research question may be decomposed into subsidiary research questions before formulating the hypotheses. For IS projects in particular, there may be a need to give considerable relevant information about any organization(s) that are participating in the study. This part/ chapter will probably be the most appropriate place for discussion of any legal, social, ethical and professional issues, although such issues may be discussed in further detail, as appropriate, in subsequent parts/ chapters.

Design

Explain and justify every stage and aspect of the design process, relating, where appropriate, your design to the literature. For IS projects, design will often be restricted to design of the investigation approach adopted. For non-IS projects, design incorporates both logical and physical design. Remember that design is about the choices you make in undertaking your project.

Implementation

Describe the work actually done and any results obtained; this may be split into design/implementation or other natural division. Avoid low-level detail (e.g. sections of code or, for IS projects, paragraph after paragraph of verbatim interview notes) unless absolutely necessary for the understanding of a particular point. The more voluminous material is more appropriately placed in an appendix, and even then almost certainly needs to be summarized and/ or presented via samples. Quite clearly, you would not, for instance, have an appendix containing all the separate responses (whether originally electronic or paper-based) from hundreds of people who replied to a questionnaire.

5.5.6 Evaluation

It is not enough in a project to do something and then report how you did it. In most cases you will be expected to evaluate what you have done against some criteria that you have designed. Depending on the nature of your project, this evaluation may warrant a chapter on its own.

You will be expected to have considered the evaluation criteria before embarking on any development work, and it may be that you have alluded to them in several chapters in your report. Nevertheless, it is worth restating and justifying all your evaluation criteria together in a separate section or chapter. Your evaluation should normally cover all aspects of your project.

If there are some aspects of your project that you do not evaluate, you should explain this and explain why.

5.5.7 Conclusions

Your report must have a conclusions chapter. In the final chapter, you will attempt to draw together the themes and arguments presented in the body of your report. As with the other chapters, you should introduce the conclusions with a very general overview of what is to follow.

In your conclusions, you should attempt to reiterate what you have achieved during your project. You should emphasise the positive aspects of your work and show how you dealt with the problems that arose during the course of the year. Where problems have proved insurmountable, you should describe potential solutions to the problems and show how you worked around them. If you feel that more work could profitably be done in the area of your project, you should indicate this and describe the form this work might take.

Finally, you should attempt to comment on how you feel you tackled your project and how you might have approached it differently. In this section you might like to comment on how the other modules you have taken during your degree have contributed to your project and how you feel your project may help you in your future career.

5.5.8 References and Bibliography

At this point, you should include a list of sources for your work. There are a range of reference style, Manchester Metropolitan uses *Harvard* references. Items (books, papers, websites for example), which you have made explicit use of in the text, at a particular location, should be included in the Reference list. items which you have used as general sources, but not made particular reference to, should be included in the Bibliography list. The latter are relatively rare in scientific writing, but might, for example, be used where you have needed to consult and extract from a number of textbooks on mathematics or programming. Quite apart from the ungainliness of repeated reference to a single publication, such a source is unlikely to be the origin of the facts or techniques, and so is not appropriate as a reference. However, it is necessary to credit the texts, so a mention in the Bibliography is required.

5.5.9 Appendices

These are additional sections which are not part of the Dissertation proper, and so are not counted towards the word limit. You must include the Terms of Reference at this point, but any other Appendices are at your discretion. Examples might include any items of code used in the project, raw data

which you have generated, screen shots of an application in operation or comprehensive pseudo-code describing the algorithms developed. Regardless of the content, each Appendix should be referred to by the text of the Dissertation at least once (not doing so suggests that there is no need to look at the Appendix).

You must include a copy of the Terms of Reference you submitted at the beginning of your project as an appendix to your report. This should include the Ethics Form, and is required to ensure that the examiners can see you have stuck to what you intended to do.

5.6 Positives and negatives

This is a miscellaneous collection of pieces of advice on the Report.

5.6.1 Common errors to avoid

- It is generally not appropriate to use the first person ("I" or "we") to describe activities undertaken in the project. The readers know that the work (is meant) to be your work, so you don't need to say it. Using the first person plural ("we did (something)...") encourages the readers to ask if someone else undertook the research. Use the indefinite, passive form ("it can be seen", "it was undertaken") by preference. The `Word` grammar checker may object, but this is appropriate academic form.

- The word *data* is plural, not singular.

- Do not use the word *essentially* to mean approximately or effectively.

- Be aware of the different meanings of the homophones *affect* and *effect*, *complement* and *compliment*, *discreet* and *discrete*, *principal* and *principle*.

- Do not confuse *imply* and *infer*.

- The prefix *non* is not a word; it should be joined to the word it modifies, usually without a hyphen.

- There is no period after the *et* in the Latin abbreviation *et al.*.

- The abbreviation *i.e.* means "that is", and the abbreviation *e.g.* means "for example". Generally, they should be avoided, in any case.

- A graph within a graph is an *inset*, not an *insert*.

- The word *alternatively* is preferred to the word *alternately* (unless you really mean something that alternates).

- Commas, semi-colons, periods, question and exclamation marks are located within quotation marks only when a complete thought or name is cited, such as a title or full quotation. When quotation marks are used, instead of a bold or italic typeface, to highlight a word or phrase, punctuation should appear outside of the quotation marks. A parenthetical phrase or statement at the end of a sentence is punctuated outside of the closing parenthesis (like this). (A parenthetical sentence is punctuated within the parentheses.)

- British form is to use a decimal point between the integer and fractional components of a real number (as in 1.25), and commas between units of 1000 (as in 1,200,000.25). Some other languages reverse this arrangement. Use a zero before decimal points: 0.25, not .25.

5.6.2   The ideal project report will...

- Contain arguments that are expressed clearly and persuasively. Reasoned justifications to support these arguments will be presented. Appropriate reference to the literature will be made to support the arguments. Dissenting views from the literature will be discussed.

- Contain a detailed and critical assessment of previous work conducted in this area. The main contributors to the debate will be highlighted and their work will be discussed in more detail. The student will attempt to demonstrate where his or her work fits in with the literature presented.

- Identify the major problems addressed by the project. The report will set these problems in the context of the aims and objectives identified for the project. These problems will be explained in detail as a prelude to the student's account of how they were solved. The report will also indicate other possible solutions to these problems. Where particular problems have proved too difficult in the time available for the project, they should be discussed and the student should identify potential solutions.

- Include an element of self-critical reflection. The report should review openly whether certain decisions were justified and whether certain activities could have been done better. The report should demonstrate how the student has learned from any mistakes that have been made. The report should also show what the student has learned from the positive achievements of the project. The report should demonstrate the student's ability to discuss alternative approaches to the work undertaken in the project. The report should also reflect how the student's other courses (including the placement, if any) have contributed to the project.

- Contain a section that indicates what further work might be fruitful. This other work might be a continuation of the project or in a different but related area. In either case, the report will explain what the contribution the student thinks his/her work can make to this future work.

- Demonstrate that the student has managed his/her time appropriately in completing the project. Will clearly show where changes to the project plan have had to be made and will indicate how the student adapted his/her project to accommodate these changes.

- Only contain material that is relevant to the aims and objectives for the project, as expressed in the report.

- Be written in good English and the ideas will be expressed clearly, unambiguously and persuasively. The work will consist of coherent sentences that are punctuated correctly. There will be very few spelling mistakes.

Appendix A

Terms of Reference Cover Sheet

The following information should be presented on the cover sheet:

- the candidate's name;
- the academic (MMU) supervisor's name;
- the industrial supervisor's name (if applicable);
- the project title;
- the award, MSc;
- the credit rating,
    - MSc by Research, 120,
    - MSc Advanced Computing, 120;
    - all other MScs, 60;
- the project start date, normally
    - May for full-time candidates,
    - September for part-time candidates;
- the proposal date, normally
    - the end of May for full-time candidates,
    - the end of September for part-time candidates;
- the intended submission date, normally the end of September for all candidates.

Appendix B

Features required by the British Computer Society

Postgraduate projects must give students the opportunity to demonstrate:

- a systematic understanding of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of the specialist academic discipline;

- a comprehensive understanding of techniques applicable to their own research or advanced scholarship;

- originality in the application of knowledge, together with a practical understanding of how established techniques of research and enquiry are used to create and interpret knowledge in the discipline;

- ability to deal with complex issues both systematically and creatively, make sound judgements in the absence of complete data, and communicate their conclusions clearly to specialist and non-specialist audiences ;

- self-direction and originality in tackling and solving problems, and acting autonomously in planning and implementing tasks at a professional or equivalent level;

- critical self-evaluation of the process.

Appendix C

University Standard Descriptors for Masters Level

MMU has a set of Standard Descriptors for marking. There is a set for each level, and they have been split into seven bands for each level, to facilitate the use of a full range of marks. The Descriptors are intended to help with writing marking criteria. They will need to be interpreted for the disciplinary context and to reflect the nature of the assignment task.

The descriptors are not, in themselves, a marking scheme in your Masters project they are intended to help supervisors and second readers interpret the marking grid In one sense, the marking grid defines what you get the marks for and the descriptors help supervisors determine how much of the mark you should get for the component You should read these descriptors before and during writing your dissertation. Use them to judge the quality of your own work and decide how to write your dissertation.

University Standard Descriptors: Level 7

Graduate outcome / Grade range	1. Apply skills of critical analysis to real world situations within a defined range of contexts	2. Demonstrate a high degree of professionalism* eg initiative, creativity, motivation, professional practice and self management.	3. Express ideas effectively and communicate information appropriately and accurately using a range of media including ICT	4. Develop working relationships using teamwork and leadership skills, recognising and respecting different perspectives	5. Manage their professional development reflecting on progress and taking appropriate action	6. Find, evaluate, synthesise and use information from a variety of sources	7. Articulate an awareness of the social and community contexts within their disciplinary field
86%-100%	Novel and complex problems are evaluated thoroughly with reference to theory and practice, generating original solutions, expressed with clarity	There is evidence of the ability to work autonomously and creatively with reference to professional standards and values, reflecting critically on their own practice.	The outcomes of their work are presented creatively and persuasively to multiple audiences using a wide range of appropriately selected strategies and media	Clear and effective leadership skills are exercised in a team to manage complex multi-faceted projects. There is evidence of exemplary critical reflection on their own performance and that of others within the team	A creative and credible vision of themselves and their professional futures is meticulously presented.	A complex and innovative project is designed, planned and carried out meticulously to gather and synthesise useful information from a wide range of appropriate primary and secondary sources to produce original outcomes of publishable standards	The social and community contexts of the discipline are critically evaluated in developing action plans, articulating conclusions and making recommendations of relevance to theoretical development and/or practical application
70%-85%	Novel and complex problems are evaluated with reference to theory and practice, generating original solutions	There is evidence of the ability to work autonomously and imaginatively with reference to professional standards and values, reflecting critically on their own practice.	The outcomes of their work are presented convincingly and fluently to a defined audience using an interesting range of appropriately selected strategies and media	Clear and effective leadership skills are exercised as needed in a team to scope and complete complex multi-faceted projects. There is evidence of critical reflection on their own performance and that of others within the team	A novel and feasible vision of themselves and their professional futures is presented	A complex project is designed, planned and carried out thoroughly to gather useful information from a wide range of appropriate primary and secondary sources and synthesise the results to produce workable outcomes	The social and community contexts of the discipline are critically evaluated in developing action plans, articulating conclusions and making recommendations of relevance to theoretical development and/or practical application
60%-69%	Novel and complex problems are solved confidently with reference to theory and practice	There is evidence of the ability to work autonomously with reference to professional standards and values, reflecting critically on their own practice.	The outcomes of their work are presented confidently and coherently to a defined audience using a range of appropriately selected strategies and media	Works in a team as either leader or member as needed to scope and complete complex multi-faceted projects. Evidence of careful reflection on their own performance and that of others within the team.	Demonstrate a fully worked vision of themselves and their professional futures	A project is carefully planned and carried out to gather useful information from appropriate primary and secondary sources and synthesise the results	The social and community contexts of the discipline are analysed carefully in drawing conclusions and making recommendations

Figure C.1: University performance descriptors for higher mark-bands.

Graduate outcome	1	2	3	4	5	6	7
50%-59%	Novel and complex problems are solved with reference to theory and practice	There is evidence of the ability to work with reference to professional standards and to professional standards and values, reflecting critically on their own practice.	The outcomes of their work are presented clearly and appropriately to a defined audience using a range of strategies and media	There is evidence of contribution to a team as either leader or member as needed to scope and complete complex multi-faceted projects and of some reflection on their own performance and that of others within the team	Demonstrate a vision of themselves and their professional futures	A project is planned and carried out to gather information from appropriate primary and secondary sources and synthesise the results	The social and community contexts of the discipline are considered critically in drawing conclusions and making recommendations
45%-49%	Attempts to solve novel and complex problems are partial, with limited reference to theory and practice	There is evidence of a limited attempt to work as an autonomous professional who reflects on their own practice	Communication of the outcomes of their work is unclear and confused and does not consistently use appropriate strategies or media	There is limited evidence of contribution to a team as either leader or member as needed to scope and complete complex multi-faceted projects and little reflection critically on their own performance and that of others within the team	A limited vision of themselves and their professional futures is presented.	Partial attempt to plan and/or carry out projects which gather information from appropriate primary and secondary sources	There is partial or limited identification of the social and community contexts of the discipline in drawing conclusions and making recommendations
20%-44%	Attempts to solve novel and complex problems are inadequate, with little reference to theory and practice	There is limited evidence of any attempt to work as an autonomous professional who reflects on their own practice	Communication of work is unclear and inappropriate to a defined audience and does not consistently use appropriate strategies or media	Inadequate or little contribution to a team as either leader or member as needed to scope and complete complex multi-faceted projects and little or no reflection critically on their own performance and that of others within the team	There is insufficient development of a vision of themselves and their professional futures	Limited attempt to plan and/or carry out projects which gather information from appropriate primary and secondary sources	There is limited or incorrect identification of the social and community contexts of the discipline in drawing conclusions and making recommendations
0%-19%	There is little or no evidence of any attempt to solve novel and complex problems with little or no reference to theory and practice	There is little or no evidence of working as an autonomous professional who reflects on their own practice	Communication of work is unclear and inappropriate to a defined audience and does not use appropriate strategies or media	Inadequate or no contribution to a team as either leader or member as needed to scope and complete complex multi-faceted projects and little or no reflection critically on their own performance and that of others within the team	No clear vision of themselves and their professional futures is presented	Little or no attempt to plan and/or carry out projects which gather information from appropriate primary and secondary sources	There is little or no identification of the social and community contexts of the discipline in drawing conclusions and making recommendations

Figure C.2: University performance descriptors for lower mark-bands.

Appendix D

Assessment grids and criteria

This appendix contains assessment grids and assessment criteria for all of our approved MSc titles (named routes). Only ONE of these will apply to you! Make sure you read the correct section. Some of the guidance provided to markers is common to all titles. The common learning outcomes for the programme are:

- PLO1. Detailed knowledge of computing relevant to each students interests and specialisations.

- PLO 2. A critical awareness of some of the current problems and/or new insights in computing.

- PLO 6. Apply the methods and techniques that they have learned to review, consolidate, extend and apply their knowledge and understanding at the forefront of computing.

- PLO 7. Critically evaluate arguments, assumptions, and abstract concepts to make judgements and to frame appropriate questions to achieve solutions to a problem.

- PLO10. Employ the skill required to plan and execute a specific piece of independent research in an agreed specialist field.

- PLO13. Prepare presentations, reports and documentation appropriate to requirements.

- PLO18. Have the capability to further their own knowledge and develop new skills via independent Study.

The other common material is the BCS guidelines for project reports (appendix B) and the University descriptors for work at Masters level (appendix C)

Marking sheets follow for:

- MSc Computing: 630B/634B

- MSc Information Systems: 631K/631L

- MSc Data Science: 630T/631T

- MSc Data Analytics: 630U/631U

- MComp (Hons) Computer Science

D.1 MSc Computing

MSc COMPUTING

60 CREDIT PROJECT REPORT ASSESSMENT SHEET

Very exceptionally, the assessors may agree that the weighting of criteria stated here is inappropriate for a particular project. In such a case, they MUST produce an alternative scheme and MUST discuss it with, and have it approved by, the Projects Manager.

Postgraduate mark points: 50=pass, 60=merit, 70=distinction

Projects cannot be condoned. Only one referral is allowed.

Student name:	
Student number:	
Project name:	

Criterion	Column A prescribed project weighting	Column B percentage mark awarded	A*B
Report structure, quality of academic enlgish, quality of referencing	0.15		0
Understanding, clarity of research question	0.10		0
Literature survey	0.15		0
Discussion of research approach, including, if approrpaite, professional / legal / ethical issues.	0.15		0
Presenation of findings, including quality of software produced.	0.20		0
Discussion and evaluation of work and finding, and relationship to literature, conclusion	0.15		0
Degree to which objectives have been met	0.10		0
Dissertation total out of 100 (2CWK95):			0
Viva mark out of 100 (1CWK5):			

Final project mark (0.05 * 1CWK5 + 0.95 * 2 CWK95), note that pass is >= 50%.   **0**

The marking grid indicates common project components for which marks should be allocated. Deciding what mark should be given for a component is determined by taking account of the common learning outcomes across the Computing and Digital Technology MSc programme, the award (degree

title) learning outcomes, the University standard descriptors and the British Computer Society Postgraduate project requirements. These are given below.

The examiners will also supply comments on the submission, including, if the Final Project Mark awarded is less than 50, what the student needs to do in order to bring the mark up to a pass. If the student is deferred or referred, you will be supply this to the student as the basis for successful completion.

D.1.1   Award Learning Outcomes for MSc Computing

- PLO23. Be able to develop computer programs using object-oriented development techniques.

- PLO24. Be able to use object-oriented techniques for systems analysis and design.

- PLO25. Have an understanding of database technology and its exploitation.

- PLO26. Understand underlying technical concepts of network, internet and multimedia technology for the delivery of application systems.

- PLO27. Understand concepts and be able to apply appropriate techniques across a small number of specialist computing subjects.

- PLO28. Be able to carry out a research-informed practical project involving system construction or experimentation work.

D.1.2   Specific Learning Outcomes for MSc Computing Project

- CM.1. Plan and carry out a programme of research or design work using appropriate methods, involving experimentation/implementation.

- CM. 2. Apply practical and analytical data science skills demonstrated in the programme as a whole in order to present obtained results in an appropriate way.

- CM.3. Apply innovation and/or creativity to solve a typical data science task and synthesise information, ideas and practices to provide a quality solution together with an evaluation of that solution.

- CM.4. Use, evaluate and critically assess relevant literature.

- CM.5. Analyse relevant legal, ethical, professional and social issues, and associated risks.

- CM.6. Evaluate the work and the results in the context of other published works and appropriate industry benchmarks.

D.2   MSc Information Systems

MSc Information Systems

60 CREDIT PROJECT REPORT ASSESSMENT SHEET

There are two types of IS project: Type A involves research field work; Type B is a dissertation based wholly on secondary sources. Assessors should enter the approrpaite letter in the "Type A or B" box. Very exceptionally, the assessors may agree that the weighting of criteria stated here is inappropriate for a particular project. In such a case, they MUST produce an alternative scheme and MUST discuss it with, and have it approved by, the Projects Manager.

Postgraduate mark points: 50=pass, 60=merit, 70=distinction

Projects cannot be condoned. Only one referral is allowed.

Student name:	
Student number:	
Project name:	

Type A or B?	

Criterion	Type A prescribed project weighting	Type B prescribed project weighting	Percentage mark awarded	Weighted mark
Report structure, quality of academic enlgish, quality of referencing	0.2	0.30		Enter A or B
Understanding, clarity of research question	0.1	0.10		Enter A or B
Critical appraisal and systhesis of iterature	0.25	0.50		Enter A or B
Discussion of research approach, including, if approrpaite, professional / legal / ethical issues.	0.1	-		Enter A or B
Presenation of findings, including quality of software produced.	0.25	-		Enter A or B
Degree to which objectives have been met	0.05	0.05		Enter A or B
Conclusion	0.05	0.05		Enter A or B
Dissertation total out of 100 (2CWK95):				0
Viva mark out of 100 (1CWK5):				

Final project mark (0.05 * 1CWK5 + 0.95 * 2 CWK95), note that pass is >= 50%.	0

The marking grid indicates common project components for which marks should be allocated. Deciding what mark should be given for a component is determined by taking account of the common learning outcomes across the Computing and Digital Technology MSc programme, the award (degree

title) learning outcomes, the University standard descriptors and the British Computer Society Postgraduate project requirements. These are given below.

The examiners will provide comments, including, if the Final Project Mark awarded is less than 50, what the student needs to do in order to bring the mark up to a pass. If the student is deferred or referred, this will be supplied to the student as the basis for successful completion.

D.2.1 Award Learning Outcomes for MSc Information Systems

- PLO29. Be able to develop computer programs using object-oriented development techniques.

- PLO30. Be able to use object-oriented techniques for systems analysis and design.

- PLO31. Have an understanding of database technology and its exploitation.

- PLO32. Understand underlying technical concepts of network, internet and multimedia technology for the delivery of application systems.

- PLO33. Have detailed knowledge of issues involved in the management of the information systems function and projects, and the strategic planning of IS within a business context.

- PLO34. Understand concepts and be able to apply appropriate techniques across a small number of specialist computing subjects.

- PLO35. Be able to deploy research skills in order to carry out a non-technical information systems project.

D.2.2 Specific Learning Outcomes for MSc Information Systems Project

- IS.1. Plan and carry out a programme of research or design work using appropriate methods, involving experimentation/implementation.

- IS. 2. Apply practical and analytical data science skills demonstrated in the programme as a whole in order to present obtained results in an appropriate way.

- IS.3. Apply innovation and/or creativity to solve a typical data science task and synthesise information, ideas and practices to provide a quality solution together with an evaluation of that solution.

- IS.4. Use, evaluate and critically assess relevant literature.

- IS.5. Analyse relevant legal, ethical, professional and social issues, and associated risks.

- IS.6. Evaluate the work and the results in the context of other published works and appropriate industry benchmarks.

D.3 MComp (Hons) Computer Science

MCOMP (HONS) COMPUTER SCIENCE

60 CREDIT PROJECT REPORT ASSESSMENT SHEET

Very exceptionally, the assessors may agree that the weighting of criteria stated here is inappropriate for a particular project. In such a case, they MUST produce an alternative scheme and MUST discuss it with, and have it approved by, the Projects Manager.
Postgraduate mark points: 50=pass, 60=merit, 70=distinction
Projects cannot be condoned. Only one referral is allowed.

Student name:	
Student number:	
Project name:	

Criterion	Column A prescribed project weighting	Column B percentage mark awarded	A*B
Report structure, quality of academic enlgish, quality of referencing	0.15		0
Understanding, clarity of research question	0.10		0
Literature survey	0.15		0
Discussion of research approach, including, if approrpaite, professional / legal / ethical issues.	0.15		0
Presenation of findings, including quality of software produced.	0.20		0
Discussion and evaluation of work and finding, and relationship to literature, conclusion	0.15		0
Degree to which objectives have been met	0.10		0
Dissertation total out of 100 (2CWK95):			0
Viva mark out of 100 (1CWK5):			

Final project mark (0.05 * 1CWK5 + 0.95 * 2 CWK95), note that pass is >= 50%.	0

The marking grid indicates common project components for which marks should be allocated. Deciding what mark should be given for a component is determined by taking account of the common learning outcomes across the Computing and Digital Technology MSc programme, the award (degree

title) learning outcomes, the University standard descriptors and the British Computer Society Postgraduate project requirements. These are given in the appendices to this document.

The examiners will supply comments, including, if the Final Project Mark awarded is less than 50, what the student needs to do in order to bring the mark up to a pass. If the student is deferred or referred, they will supply this to the student as the basis for successful completion.

D.3.1   Award Learning Outcomes for MComp (Hons) Computer Science

- PLO23. Be able to develop computer programs using object-oriented development techniques.

- PLO24. Be able to use object-oriented techniques for systems analysis and design.

- PLO25. Have an understanding of database technology and its exploitation.

- PLO26. Understand underlying technical concepts of network, internet and multimedia technology for the delivery of application systems.

- PLO27. Understand concepts and be able to apply appropriate techniques across a small number of specialist computing subjects.

- PLO28. Be able to carry out a research-informed practical project involving system construction or experimentation work.

D.3.2   Specific Learning Outcomes for MComp (Hons) Computer Science Project

- CM.1. Plan and carry out a programme of research or design work using appropriate methods, involving experimentation/implementation.

- CM. 2. Apply practical and analytical data science skills demonstrated in the programme as a whole in order to present obtained results in an appropriate way.

- CM.3. Apply innovation and/or creativity to solve a typical data science task and synthesise information, ideas and practices to provide a quality solution together with an evaluation of that solution.

- CM.4. Use, evaluate and critically assess relevant literature.

- CM.5. Analyse relevant legal, ethical, professional and social issues, and associated risks.

- CM.6. Evaluate the work and the results in the context of other published works and appropriate industry benchmarks.

D.4 MSc Data Analytics

MSC DATA ANALYTICS

60 CREDIT PROJECT REPORT ASSESSMENT SHEET

Very exceptionally, the assessors may agree that the weighting of criteria stated here is inappropriate for a particular project. In such a case, they MUST produce an alternative scheme and MUST discuss it with, and have it approved by, the Projects Manager.

Postgraduate mark points: 50=pass, 60=merit, 70=distinction

Projects cannot be condoned. Only one referral is allowed.

Student name:	
Student number:	
Project name:	

Criterion	Column A prescribed project weighting	Column B percentage mark awarded	A*B
Report structure, quality of academic enlgish, quality of referencing	0.15		0
Understanding, clarity of research question	0.10		0
Literature survey	0.15		0
Discussion of research approach, including, if approrpaite, professional / legal / ethical issues.	0.15		0
Presenation of findings, including quality of software produced.	0.20		0
Discussion and evaluation of work and finding, and relationship to literature, conclusion	0.15		0
Degree to which objectives have been met	0.10		0
Dissertation total out of 100 (2CWK95):			0
Viva mark out of 100 (1CWK5):			

Final project mark (0.05 * 1CWK5 + 0.95 * 2 CWK95), note that pass is >= 50%.

0

The marking grid indicates common project components for which marks

should be allocated. Deciding what mark should be given for a component is determined by taking account of the common learning outcomes across the Computing and Digital Technology MSc programme, the award (degree title) learning outcomes, the University standard descriptors and the British Computer Society Postgraduate project requirements. These are given in the appendices to this document.

The examiners will supply comments, including, if the Final Project Mark awarded is less than 50, what the student needs to do in order to bring the mark up to a pass. If the student is deferred or referred, they will supply this to the student as the basis for successful completion.

D.4.1   Award Learning Outcomes for MSc Data Analytics

- PLO 70. Articulate knowledge and understanding of relevant facts, concepts, theories and principles of data analytics.

- PLO 71. Critically evaluate, select and apply techniques and methods used in data analytics.

- PLO 72. Analyse, interpret and visualisation of complex, high-volume, high-dimensional and structured/unstructured data from varying sources to provide actionable insight in a business environment.

- PLO 73. Ability to program in at least one statistical language to obtain results and insight from data.

- PLO 74. Communicate effectively and clearly and interpret the results of the analytics to a business audience to inform decision-making.

D.4.2   Specific Learning Outcomes for MSc Data Analytics Project

- DA.1. Plan and carry out a data centric project informed through a critical review and evaluation of literature, and using appropriate data analytics methods by applying practical data analytics skills demonstrated in the programme as a whole;

- DA.2. Define specific business objectives and levers for the data analytics task to be performed;

- DA.3. Perform data collection, pre-processing and cleaning, data modelling and visualization;

- DA.4. Analyse relevant legal, ethical, professional and social issues, and associated risks;

- DA.5. Evaluate the work and assess whether produced data models are meaningful and relevant to the business.

D.5 MSc Data Science

MSC DATA SCIENCE

60 CREDIT PROJECT REPORT ASSESSMENT SHEET

Very exceptionally, the assessors may agree that the weighting of criteria stated here is inappropriate for a particular project. In such a case, they MUST produce an alternative scheme and MUST discuss it with, and have it approved by, the Projects Manager.
Postgraduate mark points: 50=pass, 60=merit, 70=distinction
Projects cannot be condoned. Only one referral is allowed.

Student name:	
Student number:	
Project name:	

Criterion	Column A prescribed project weighting	Column B percentage mark awarded	A*B
Report structure, quality of academic enlgish, quality of referencing	0.15		0
Understanding, clarity of research question	0.10		0
Literature survey	0.15		0
Discussion of research approach, including, if approrpaite, professional / legal / ethical issues.	0.15		0
Presenation of findings, including quality of software produced.	0.20		0
Discussion and evaluation of work and finding, and relationship to literature, conclusion	0.15		0
Degree to which objectives have been met	0.10		0
Dissertation total out of 100 (2CWK95):			0
Viva mark out of 100 (1CWK5):			

Final project mark (0.05 * 1CWK5 + 0.95 * 2 CWK95), note that pass is >= 50%.	0

The marking grid indicates common project components for which marks should be allocated. Deciding what mark should be given for a component is determined by taking account of the common learning outcomes across the Computing and Digital Technology MSc programme, the award (degree

title) learning outcomes, the University standard descriptors and the British Computer Society Postgraduate project requirements. These are given in the appendices to this document.

The examiners will supply comments, including, if the Final Project Mark awarded is less than 50, what the student needs to do in order to bring the mark up to a pass. If the student is deferred or referred, they will supply this to the student as the basis for successful completion.

D.5.1   Award Learning Outcomes for MSc Data Science

- PLO 60. Demonstrate a critical understanding of the challenges and issues arising from taking complex data, and applying data science techniques to gain insight for business, scientific or social innovation.

- PLO 61. Develop the skills and expertise required for the analysis, interpretation and visualisation of complex, high-volume, high-dimensional and structured/unstructured data from varying sources.

- PLO 62. Identify, apply, experiment with and evaluate appropriate machine learning algorithms to mine data and evaluate using statistical methods.

- PLO 63. Effectively communicate the results of the data science process to a variety of stakeholders in order to tell a story.

- PLO 64. Articulate their role, including ethical and legal responsibility as data scientists in society.

D.5.2   Specific Learning Outcomes for MSc Data Science Project

- DS.1. Plan and carry out a programme of research or design work using appropriate methods, involving experimentation/implementation.

- DS.2. Apply practical and analytical data science skills demonstrated in the programme as a whole in order to present obtained results in an appropriate way.

- DS.3. Apply innovation and/or creativity to solve a typical data science task and synthesise information, ideas and practices to provide a quality solution together with an evaluation of that solution.

- DS.4. Use, evaluate and critically assess relevant literature.

- DS.5. Analyse relevant legal, ethical, professional and social issues, and associated risks.