

# COMSC TAUGHT MSc PROGRAMMES

## PROJECT HANDBOOK 2019-2020

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# 1 INTRODUCTION

According to the Quality Assurance Agency for Higher Education (QAA), University awards at Masters level have the characteristics that:

*“Much of the study undertaken at Masters level will have been at, or informed by, the forefront of an academic or professional discipline. Students will have shown originality in the application of knowledge, and they will understand how the boundaries of knowledge are advanced through research. They will be able to deal with complex issues both systematically and creatively, and they will show originality in tackling and solving problems.*

*They will have the qualities needed for employment in circumstances requiring sound judgement, personal responsibility and initiative, in complex and unpredictable professional environments.”*

Part-time students study for three years, of which two years involves the study of formal course material within the taught phase of the programme. Full-time students complete the same course of study over the period of one calendar year, starting in September.

At the end of the taught phase, students who have accrued the requisite number of credits, may enter the project phase of the programme. This phase comprises the completion of a suitable project, MSc dissertation and project presentation. During the project phase, students will produce certain required deliverables and will be expected to attend project-related formal activities at the University. COMSC staff will provide guidance on choice, research activities, content and presentation, throughout the conduct of the project.

The MSc dissertation is worth 60 credits, and will qualify successful candidates for the award of the MSc degree. It is expected to involve the equivalent of some twelve weeks of full-time study. This will normally be completed by full-time students on the one-year Masters programmes in the weeks immediately following the taught phase, by students on the Masters programmes with placement after they complete the placement stage, and by part-time students in the 6-12 month period following completion of the taught portion of the programme. It is expected that students who have not secured a placement by the end of the Spring Semester examination period will transfer to the one-year programme and begin their dissertations immediately following the completion of the taught phase.

The aim of the project is to demonstrate achievement of the QAA requirements noted above, and to demonstrate the student's integration of the material encountered during the taught phase of their particular programme. Students are also required to reflect on their learning.

The purpose of this handbook is to describe the project phase, the outline timetable and deliverables, the arrangements for supervision and assessment.

## 2 OUTLINE TIMETABLE

### 2.1 Part-time Students

The project is normally completed in the 6 – 12 months following successful completion of the taught phase of the programme. It should be borne in mind that the graduation celebration event (graduation ceremony) for MSc programme graduates takes place once annually, in July of each year. The implication is that part-time students wishing to attend a graduation ceremony in the academic year in which they complete their project must submit their project in December of that year, in order to allow time for assessment and consideration of their result at an Examining Board held in the spring. Please note that regulations allow you to submit up to and including the September deadline, however submission later in the academic year implies attendance at graduation in July of the following year,

Early thought should be given to the dissertation; you do not have to wait until you have substantially completed the programme before commencing the project. It can be started at any convenient time towards the latter part of the programme, particularly if an internal project arises within your normal line duties that lends itself to an MSc Dissertation. Seize the opportunity. In general, it would be normal to be developing your ideas, and making contact with industrial sponsors (for support; see paragraph 3.2 below) and potential supervisors from about week 4 of the Spring semester prior to commencing the project in September.

The key events in the project phase are shown below.

Activity	Time	Notes
Selection of project and academic/industrial approval	Weeks 4 to 11 of the Spring semester prior to qualification to advance to project phase.	Students should be considering suitable areas of research for some time prior to embarking on the project. This activity should include initial approaches to potential academic and industrial supervisors, to assess the viability of potential topics.
Start of dissertation phase	One year before the submission deadline.	
Academic progress meetings	Monthly with academic supervisor.	Meetings may be more frequent in the early stages of the project, and again as it is nearing completion.
Draft dissertation to academic supervisor	As agreed.	Students will find it advantageous to present written material in stages throughout the study.
Submission of dissertation	Dissertation started Sep 2019: 18 September 2020 Dissertation started Sep 2020: 17 September 2021	
Project demonstration	Within two weeks of submission	To be arranged between student and supervisor
Notification of award	December 2020 (September submission)	Notification will be on the basis of Examining Board recommendations only, and will be subject to confirmation by the University.
Graduation Celebration Event	Normally the July following the notification of the award.	

## 2.2 Full-time Students on One-Year Masters Programmes

Full-time students on one-year Masters programmes who pass all taught modules in the June exam board will submit their dissertation in September. If they do not pass all taught modules in the June exam board but do so in the resit exam board in summer, then they will submit their dissertation in November. Each student will have 12 weeks to work on the dissertation.

The key events in the project phase are shown below:

Activity	Time	Notes
Selection of project and academic/industrial (as appropriate) approval	Weeks 4 to 11 of the Spring semester	Students should be considering suitable areas of research for some time prior to embarking on the project. This activity should include initial approaches to potential academic and/or industrial supervisors, to assess the viability of potential topics.
Start of dissertation phase	12 weeks before the submission deadline	A student who pass all autumn semester modules can start 12 weeks before the September deadline. If they fail a spring semester module later, they should stop the project and resume it 12 weeks before the November deadline. If they fail the resit again, then they will not be able to progress to dissertation.
Academic progress meetings	As frequently as appropriate with academic supervisor. Normally fortnightly or thereabouts.	Meetings may be more frequent in the early stages of the project, and again as it is nearing completion.
Draft dissertation to academic supervisor	As agreed.	Students will find it advantageous to present written material in stages throughout the study.
Submission of dissertation	Completed taught phase in June Exam Board: 18 September 2020 Completed taught phase in September Exam Board: 27 November 2020	
Project demonstration	Within two weeks of submission	Students are required to demonstrate their project to their supervisor. See Section 6.

<b>Activity</b>	<b>Time</b>	<b>Notes</b>
Notification of award	December 2020 (September Submission)	Notification will be on the basis of Examining Board recommendations only, and will be subject to confirmation by the University.
Graduation Celebration Event	Normally the July following the notification of the award.	

### **2.3 Full-time Students on Masters Programmes with Placement**

Full-time students on Masters programmes with a placement will normally progress to the project phase (subject to satisfactory progress in the taught phase) after the placement phase, in the June following their placement. The dissertation will be submitted in September. If students have a late start to their placement then they can start the dissertation in September and submit their dissertation in November.

Students should ensure they have an initial project selected and approved BEFORE starting their placement. You may later propose an alternative project to build on knowledge and skills learnt during the placement, but this project should not be based on work done during the placement. You need to inform the module leader for CMT400 Dissertation if you want to propose an alternative project.

The key events in the project phase are shown below:

<b>Activity</b>	<b>Time</b>	<b>Notes</b>
Selection of project and academic/industrial (as appropriate) approval	Placement starts in 2020: Initial project selection - weeks 4 to 11 of the Spring semester 2020. An alternative project would need to be approved no later than week 11 of the Spring semester 2020.	Students should be considering suitable areas of research for some time prior to embarking on the project. This activity should include initial approaches to potential academic and/or industrial supervisors, to assess the viability of potential topics.
Start of the project	12 weeks before the submission deadline	
Academic progress meetings	As frequently as appropriate with academic supervisor. Normally fortnightly or thereabouts.	Meetings may be more frequent in the early stages of the project, and again as it is nearing completion.
Draft dissertation to academic supervisor	As agreed.	Students will find it advantageous to present written material in stages throughout the study.
Submission of dissertation	Project Phase starts Jun 2020: 18 September 2020 Project Phase starts Sep 2020: 27 November 2020 Project Phase starts Jun 2021: 17 September 2021 Project Phase starts Sep 2020: 26 November 2021	
Project demonstration	Within two weeks of submission	Students are required to demonstrate their project to their supervisor. See Section 6.

<b>Activity</b>	<b>Time</b>	<b>Notes</b>
Notification of award	Project Phase starts Jun 2020: December 2020 Project Phase starts Jun 2021: December 2021	Notification will be on the basis of Examining Board recommendations only, and will be subject to confirmation by the University.
Graduation Celebration Event	Normally the July following the notification of the award.	

### 3 CHOOSING THE PROJECT

#### 3.1 General

Key to a successful project is choosing a topic that is relevant, appropriate and sufficiently demanding to allow you to demonstrate that you have achieved the standard required for the award of a Master of Science Degree by Cardiff University. This section aims to identify those characteristics of a potential project topic, that will allow you to do all this.

The first stage of the dissertation process is to find a suitable project which is of interest to you. Most part-time students conduct a project within their own organisations. Full-time students sponsored by their employer may also wish to consider an employment based project. Students on programmes with a placement may undertake a project for their previous employer as long as the project is not based on work done during the placement. These projects will need to address Academic Guidelines (Section 3.2) and Industrial Guidelines (Section 3.3)

Most full-time students undertake either a client based project within the University or a suitable *academic* project. Students are at liberty (and, indeed, are encouraged) to make their own arrangements with any part of the University or with any local organisation, for them to sponsor a project. In such cases, it is useful to have an “Industrial Sponsor” to carry out the support tasks noted in this Handbook. Further guidance can be found in (section 3.3).

Where an “academic” project is selected, it will be normal for this to be sponsored by a member of staff whose idea forms the basis of the project.

#### 3.2 Academic Guidelines

The University examiners will want to be assured that you have been rigorously tested. The guidelines below are intended to help you choose a project:

- *All projects should have a critical, evaluative or analytical element. They should not consist of mere data collection unless the collection itself calls for enterprise, ingenuity, interviewing or questionnaire design skills or an otherwise demanding methodology. The project should, therefore, not consist only of the collection of secondary data (i.e. data that already exists) without significant subsequent analysis by you. It is essential that you place your project in the context of existing knowledge relevant to your chosen topic.*
- *Primary data collection may be sufficient if the required method itself is sufficiently challenging, the subject requires it, and you can demonstrate the lack of existing data as well as the need; but even in this case, proper analysis of the data will normally be required.*
- *A literature-based project is unlikely to be acceptable for COMSC MSc degrees. Should your supervisor confirm that a literature-based project may be appropriate, it should not require only identification of sources, summarising, classification etc., but should call for critical evaluation, synthesis, identification of gaps, etc. If case studies or in-depth interviews are used, these should be evaluated for their general significance and implications rather than merely reported. A literature-based project will not meet the requirements of the relevant professional body (BCS – the Chartered Institute for IT)*
- *Your project is an opportunity to apply what you have learned during the taught phase and to demonstrate that you have learned it thoroughly, and in particular that you know what is and what is not useful in a particular context or problem. You should make appropriate use of concepts, models, and principles that you have learned, but do not, of course, distort the project to make it fit a preconceived mode – you will be required to justify in your report the selection of the approaches you have adopted.*

Notwithstanding the above, the nature of COMSC taught Masters degrees, and the requirements of the relevant professional body (BCS – the Chartered Institute for IT), require that your project be practical and problem solving. This does not necessarily imply the development of some application, though this would

invariably be a satisfactory project area. Your supervisor will guide you on what deliverables are required for your project to be capable of meeting the academic requirements. In general, how far you have to go will depend on the nature of the *problem*. The more straightforward the problem (e.g. a relatively simple database for few users) the more you will be required to do (including in this case a full product, properly documented and tested). The more complex the problem (e.g. an unspecified business requirement in a complex organisation, involving many stakeholders) the more acceptable will be production of a formal specification based on analysis and the accommodation of different viewpoints, and (possibly) a working prototype or (as a minimum) a description of what you would do to validate and implement your derived specification or design.

The academic staff will be pleased to assist in defining your project, and will also meet your proposed industry sponsor (if any) during the selection process to ensure that the different aims of the academic and industrial aspects of the project are accommodated. You are strongly encouraged to speak to all members of staff in the School when considering your choice of project; this will enable you to assess whether there is appropriate expertise to assist you in the conduct of your project, and may serve to introduce you to other areas where there are particular skills or research interests that would suggest a project in an area you had not previously considered. Academic staff are also invited to propose projects for both the final year undergraduate schemes and the MSc schemes; these are publicised through the PATS system and you will be notified when this list of proposals is available.

In summary, from the academic viewpoint, the MSc project should be of a practical, problem solving nature. It should provide you the opportunity to gather information about a problem area, assess the problem and either develop an appropriate solution or define the problem in such a way that either a solution could be engineered as a result of your work, or make it clear that no possible solution exists. You would be expected to select and apply appropriate methodologies to the problem area, tailoring them as necessary to meet your needs, and justifying your selection. You would be expected to examine the environment, culture, organisation and politics of the problem area, in conducting your project. It may be appropriate to develop some application in response to the problem; if so this would be expected to be of a professional standard, documented and tested, even if only of the nature of a prototype. The conduct of the project will be fully documented in your dissertation, as described in the guidance in Section 5 of this guide. Finally, you will be expected to provide a critical reflection on your conduct of the project.

### **3.3 Industrial Guidelines (where applicable)**

If you are a part-time student it is generally preferable to conduct a project within your own organisation, both in terms of obtaining as much support as possible and to prove the value of the investment of time and money! Full-time students sponsored by their employer may also wish to consider an employment based project. Students on programmes with a placement may undertake a project for their previous employer as long as the project is not based on work done during the placement.

Where possible the School would recommend that you find a suitable Industry Sponsor for an employment-based project. The essential characteristics of the industrial sponsor include patience, experience and determination. Your industrial sponsor may be able to help you get access to necessary parts of the organisation, when your own efforts fail. He or she can offer support, in terms of providing influence and guidance to help your awareness of the broader business environment, as it relates to your study.

The Industry Sponsor and the University will each be viewing your choice from a different perspective; the Industry Sponsor is interested in the value of the outcome of your project to the organisation, and the academic staff are concerned with demonstrating that you have fulfilled the academic requirements. Hence, you must satisfy two masters. In some cases, your choice may be restricted by your employer who may recommend a topic concerned with your work. This may be a continuation of an ongoing project, but if it meets the both industrial and academic criteria it will be acceptable.

The project dissertation is an essential element of the Master's Programme learning process of applying theory to practice, and is also a mandatory requirement for the award of the Master of Science degree. It is important to recognise the distinction between industrial and academic requirements for your project.

It can obviously be helpful to choose a topic for an employment based MSc project which overlaps significantly with part of your normal work programme for the Industry Sponsor. If your work environment is



dynamic you may prefer to choose a project that builds on your experience in the workplace but does not relate to your normal work duties. This can reduce the risk of needing to restart a project if your duties change. Alternatively, you may wish to select a topic in a different area in order to broaden your experience or prepare for a change of job. There are a number of factors about your organisation that may be relevant to your choice of project.

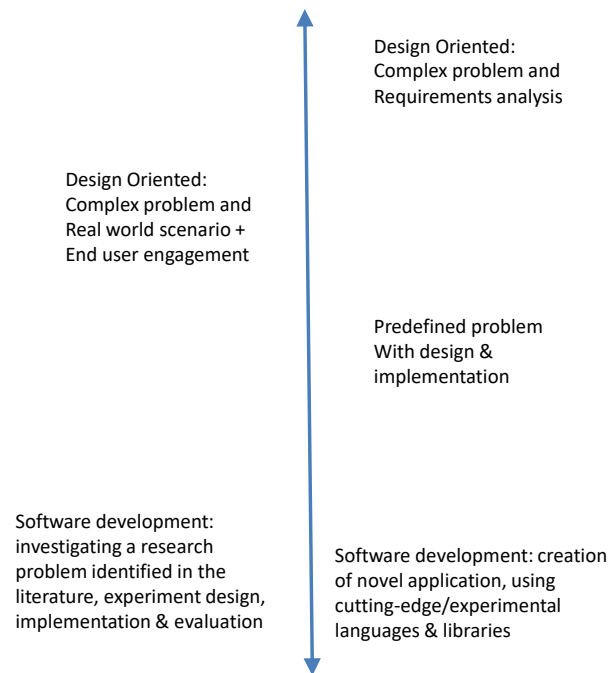
You will need to take into account any mandated methodologies used; while being required to use a company standard approach will not prevent you from carrying out a good project, you will need to document a consideration of whether the approach was relevant to your project, and assess its strengths and limitations. This part of your report may warrant a fairly detailed analysis of the mandated methodology.

You will also need to overcome the fact that, in all probability, the people from whom you are seeking information will already know you. This will pose particular problems in discovering objective evidence to support your analysis of the problem.

It will be important to be aware of any security or commercial constraints on your project, and your dissertation. University regulations lay down that research work accepted for a higher degree shall be openly available, and subject to no security classification or restriction of access. In cases where there is an overriding need for a restriction of copying or access, for example where the dissertation contains commercially sensitive information, the University *may* place a bar on access to or photocopying of a dissertation for a specified period, normally three years in the first instance.

### 3.4 Learning Outcomes

The module description for CMT400 Dissertation provides learning outcomes for the module. In addition, BCS – The Chartered Institute for IT requires that all projects should reflect the aims and learning outcomes of the programme to which they contribute. Learning outcomes that are particularly relevant to the project are given for each programme. The project does not need to cover all learning outcomes given below for the programme but students will need to discuss which ones are relevant to their project with their supervisor. The diagram below gives an indication of the range of possible projects. Note that while a project may involve a data collection or literature survey component, this is not sufficient in itself for an acceptable project.



### MSc Computing

*The following Programme Outcomes are relevant to the project:*

- critically analyse and evaluate current issues in computing;
- clearly communicate ideas, principles and theories by oral, written, diagrammatic and practical means;
- demonstrate self-direction, initiative, professionalism, critical judgement and planning skills in tackling and solving computing problems using appropriate technologies;
- demonstrate software design and programming skills;
- design, using appropriate tools, a simple information system or selected part of a larger system;
- creatively apply computing knowledge and techniques to the solution of computing problems;
- develop research skills through completion of the dissertation;
- a systematic understanding of general computing concepts, both theoretical and practical;
- an understanding of the methods, techniques, and tools available to specify, design, implement and manage computer based systems;
- an understanding of the principles and characteristics of computer and communications hardware and software and of how these support the development of computer systems;
- a critical awareness of current trends in selected research areas of computing, and discuss their contribution to developing computer based systems.

### MSc Information Security & Privacy

*The following Programme Outcomes are relevant to the project:*

- identify security risks and / or privacy issues in organisations and recommend / implement as appropriate relevant policies and counter measures;
- understand emerging themes in security and privacy related technologies and systems;

- demonstrate an ability to analyse a problem and identify privacy issues / security incidents, including breaches of trust or legislation, and recommend appropriate reactions to these;
- demonstrate a critical awareness of the theories, principles, and concepts concerning information security and privacy and describe how these influence the specification and /or development of information systems that reflect the organisations security & privacy needs;
- demonstrate professionalism in framing and resolving problems involving security & privacy.

### **MSc Computing with IT Management**

*The following Programme Outcomes are relevant to the project:*

- critically analyse and evaluate current issues in the application of computing;
- clearly communicate ideas, principles and theories by oral, written, diagrammatic and practical means;
- demonstrate self-direction, initiative, professionalism, critical judgement and planning skills in tackling and solving computing problems using appropriate technologies;
- design, using appropriate tools, a simple information system or selected part of a larger system;
- apply technical and management concepts and techniques to the solution of computing problems;
- develop valuable research skills through completion of the dissertation;
- a systematic understanding of general computing concepts, both theoretical and practical;
- understanding of the nature of organisations and their use of information for business purposes;
- understanding of the methods, techniques, and tools available to specify, design, implement and manage computer based systems for organisations;
- understanding of the principles and characteristics of computer and communications hardware and software and of how these support the development of computer systems;
- critical awareness of current trends in selected research areas of computing, and discuss their contribution to developing computer based systems.

### **MSc Advanced Computer Science**

Projects will normally relate to one of the the research strengths of the School including Informatics, Visual Computing and Distributed and Scientific Computing. *The following Programme Outcomes are relevant to the project:*

- an understanding of the broad range of concepts, principles and theories underpinning advanced computer science;
- an understanding of the methods, techniques, and tools available to specify, design, implement and manage computer-based systems;
- an understanding of the representation of data in structured forms and its interplay with the implementation of algorithms;
- a critical awareness of current trends in selected research areas of computer science, and an ability to discuss their contribution to developing computer based systems;
- a mastery of the practical methodologies in key areas of computing; their application to well-established areas of software development and their use in selected specialised application areas;
- an ability to objectively analyse computational problems and develop appropriate, creative solutions;
- an ability to model complex scenarios to design computer systems that meet stated requirements;
- an awareness of professional, legal, social, cultural and ethical issues that arise in the implementation of existing and future computer systems and an awareness of societal and environmental impact;
- an ability to pursue opportunities for career development and lifelong learning and appreciate the importance of commercial awareness;
- an ability to critically review the literature, and to effectively communicate ideas, principles and theories by oral, written and electronic means;
- an ability to make effective use of a range of IT systems.

### **MSc Artificial Intelligence**

*The following Programme Outcomes are relevant to the project:*

- understanding of the importance of how data is represented for the success of artificial intelligence methods;
- knowledge of the key concepts and algorithms underlying artificial intelligence methods;
- understanding of the theoretical properties of different artificial intelligence methods;
- Insight and foresight of how artificial intelligence methods influence the success of a given task;
- capacity to formalize real-world problems in relation to chosen artificial intelligence methods;
- ability to choose an appropriate artificial intelligence method (and data pre-processing strategy if needed) to address the needs of a given application setting;
- competence in implementing artificial intelligence methods, taking advantage of existing libraries where appropriate;
- critical appraisal of your own and other's work through written and verbal means;
- clear and efficient communication of complex ideas, principles and theories by oral, written and practical means, to a range of audiences;
- appreciation of opportunities for career development;
- an ability to undertake independent study and critical reflection.

## **MSc Cybersecurity**

*The following Programme Outcomes are relevant to the project:*

- knowledge of risk assessment, secure application development, network security, malware analysis, vulnerability assessment, cybersecurity operations, digital forensics and business continuity;
- understanding of carrying out risk assessments and developing security policies – including technical security configurations, human factors affecting security policy, forensic responses and security monitoring;
- understanding of the cybersecurity landscape and professional roles within cybersecurity;
- critical assessment of an unseen environment for security vulnerabilities, evaluate the security landscape and select appropriate solutions and methods to present the case for a suitable cybersecurity solution;
- initiative and personal responsibility in decision-making in complex and unpredictable situations;
- analytical and systematic methods for dealing with complex issues; sound judgement making in the absence of complete data;
- hands-on experience of applying security methods (e.g. risk assessment standards) and the fundamental concepts behind security tools (e.g. forensic toolkits and security operations centres);
- ability to communicate ideas, principles and theories effectively by oral, written and practical means to both specialist and non-specialist audiences;
- ability to apply logical and analytic thinking to problems.

### **3.5 Summary of Factors Influencing Choice of Project**

To summarise the above discussion on choosing your project, you should bear in mind the following:

- Choose a topic that interests you and has the full support of your Academic/Industry Sponsor; scope it so that it can be concluded in the agreed timeframe; make your aims achievable.
- If you are choosing your own project or undertaking an employment-based project then you need to ensure the suitability of the project proposal. You are welcome to seek advice on your proposal from potential Academic Supervisors and get guidance on whether it meets the academic requirements.
- Ensure that the outcome will be of value to, the Academic Supervisor, the Industry Sponsor (where appropriate) and yourself (in terms of personal goals).
- Choose your topic so that the work includes an original element, or if the work has been done previously by others, look for elements that can be significantly improved; reviews of other work may be acceptable

as long as they are critical and add to the overall understanding in the area (but be warned, it is harder to win high marks with just a review). A project that is insufficiently practical with little computing content runs the risk of not meeting BCS criteria for exemption from professional examinations.

- It may be worthwhile to identify a topic which includes generation of data/information which can be quantitatively assessed/measured and conclusions drawn. This includes topics where data is generated via models, simulations etc. as well as more traditionally via measurements of reality.
- Scope the project so that it can be completed, with a quality result, in the time available, at least to the stage where solid recommendations can be made for decision and some action. In some cases the recommendations will be for further work; but provided the dissertation has intellectual substance and is original, it will be acceptable.
- Expect to research a variety of internal and external sources (library material, interviews, internal reports and statistics etc.) for information/ideas on your topic. The University will insist on this and experience shows that some students focus too exclusively on Internet or internal reports. You will be expected to demonstrate the methodology of your research.
- If you choose a topic which has security or commercial implications for an Industry Sponsor, ensure that you discuss the implications with someone in authority within the organisation.
- Remember that, in most cases, your dissertation will conclude with a series of recommendations. Your choice of topic should be made with this in mind. However, the range of potential recommendations is enormous, and it will be as valid to recommend what course of action *not* to take, as to make some “positive” recommendation. In this respect, your dissertation will be in the nature of a business report. The dissertation should be a logical progression of evidence, argument and deduction, which leads to conclusions on which your recommendations will be based.

## **4 CONDUCT OF THE PROJECT**

### **4.1 Introduction**

There are a number of stages in the conduct of the project which will require you to produce material for consideration and acceptance by your Academic Supervisor. This section will describe these in some detail, and indicate some of the activities you can expect to undertake during the conduct of your study.

### **4.2 Project Proposal**

During the Spring semester you may propose the topic of your MSc project up until the project selection deadline (typically Week 11). Your project proposal should contain the following detail as appropriate:

- Your Name
- Degree Scheme
- Project Title
- Project Aims & Objectives
- Brief description of the project
- Resource Requirement (hardware/software requirement)

The project proposal will be submitted electronically via PATS (further details will be provided in Spring semester), and can then be seen and considered by members of staff to see if whether it is likely to meet the academic requirements for an MSc project, and whether they would be interested in supervising the project.

If you did not submit your project proposal, or did not manage to get a member of staff to agree to supervise your proposed project, then before the project selection deadline you can select one (via PATS) from the projects that are proposed by staff. You may approach any member of staff about their projects within that week. If a member of staff accepts you, then your project is set -- that staff proposed project is your MSc project. If you are not accepted by the project selection deadline, a supervisor will be assigned to you.

### **4.3 Working with Your Supervisor**

The extent to which you see your academic supervisor will depend on many factors, including his or her expertise in the project topic, the amount of help you need, the availability of the supervisor, and the extent to which you get along and interest each other.

However, it is in your interest to make sure you see your supervisor as often as you need to. Students are expected to have fortnightly meetings to discuss progress with their project supervisor or moderator. These should preferably be face to face, but they may be virtual (e.g. Skype) if necessary. Some supervisors may wish to see an example of your written work early, in order to assess the level and style; it may be appropriate, whether it is asked for or not, to show them the “Background” section early on in your project.

Being supervised is a two-way process: you cannot expect help and time from your supervisor if you are not making substantial effort on your own and spending an adequate amount of time on the project. If you have difficulty arranging meetings with your supervisor in spite of your working hard on your project, and cannot discuss access with them, you should seek advice from your Personal Tutor or the Project Co-ordinator.

It is possible that a student may find that he or she wishes to change their academic supervisor, during the course of the project. In such a case, the student should contact the Project Co-ordinator, their personal tutor, or the Senior Personal Tutor at the earliest opportunity to discuss the nature of the difficulty, and consider possible courses of action. Similarly, should a problem arise involving the availability or suitability of the industrial supervisor, this should be brought to the notice of the academic supervisor.

#### **4.4 Ethics**

If your project involves human participation such as interviews, observations, questionnaires, personal data, etc., then you must seek ethical approval from the School. Please follow the procedure explained in <https://www.cs.cf.ac.uk/ethics/>.

If you use the laptop provided by the University, please also note that the laptop is not encrypted and therefore should not be used for storing sensitive information or company private data. Please check out the University's [Information Security Framework](#) for guidance on data storage.

## 5 THE DISSERTATION

Your dissertation is the major product resulting from your study, and records what you did, how and why you did it, what the outcome was and what you learned from the study. The dissertation will be read and assessed by at least two members of staff, and marks are awarded to it rather than to any other products, such as software, which are produced as a result of your study. It is strongly recommended that you keep a note-book or diary throughout the duration of the project. This should be used to note decisions you have taken (and their reasons), results, ideas, difficulties, conclusions you reached, etc. This will be very useful when you come to write the dissertation.

### 5.1 Structure

The structure of the dissertation varies according to the problem you have chosen to address and the features you choose to emphasise. In consultation with your supervisor, you should decide how much emphasis to give to requirements elicitation, problem investigation and understanding, your approach (methodologies and tools), business issues, algorithms and data structures, etc. Different projects concentrate on these to different extents, and it is your responsibility to make sure that you are clear about where your contribution lies. It will be important within your chosen structure to ensure that you critically assess your approach to the problem and the products of your study.

The following dissertation structure should therefore be seen as a guideline only; it is your responsibility to adapt it to suit your particular project. You should also comply with the general University regulations for the submission of dissertation (<https://intranet.cardiff.ac.uk/students/your-study/exams-and-assessment/masters-dissertation-submission>).

- **Title page**, including title, author, degree (MSc Computing, MSc Strategic Information Systems, etc.), name of supervisor, name of institution (School of Computer Science and Informatics, Cardiff University), date, privacy marking (if appropriate).
- **Preamble**, including (a) Table of Contents; (b) Abstract/synopsis (suggested length: half a page); (c) Acknowledgements; (d) Privacy or commercial limitations on the use of the information contained in the dissertation.
- **Introduction**. In this first section, you should describe the motivation for the project. Explain whatever background the reader will need in order to understand the business need, and/or the nature of the problem. The introduction is an important section of the dissertation; every reader will read it, and many will read only that section. It should be as inviting and compelling as possible. However, the introduction is also often the most difficult section to write, as it requires a balance between giving adequate explanation and going into too much detail. For these reasons, you should consider writing the introduction last - it is only when you've written the rest of the dissertation that you will know what you have to introduce. By convention, the last part of the introduction outlines the remainder of the dissertation, explaining what comes in each section.
- **Aim and Objectives**. Include a clear and detailed statement of the project aim and provide appropriate objectives to meet this aim. Concentrate on what your study seeks to achieve; the question of how it does it will be dealt with in later sections. Although your aim may need to change as you understand more about the scope of your project (a balance between what you set out to achieve, and what you can achieve in the time available) a clear statement of the aim should be used to help you make sure that what you are doing is relevant.

The next three or four sections form the main part of the dissertation, and cover the following topics. How much space you give to these topics is something you should judge carefully.

- **Background material**. It is necessary to put your work in the context of related existing work, commercial products, and research papers (if relevant). You are required to show that you have reviewed the relevant literature, and in doing so you are trying to demonstrate why there is a problem to be



addressed, and to show what your project will add to the body of knowledge relevant to your chosen topic. Even if you are developing a software product, you need to show what is unique about your solution or the methods you have adopted in arriving at it. You must remember that this chapter is not just a catalogue of relevant published material; you **must** critically assess your evidence, and show clearly how you have arrived at the identification of the problem your project seeks to solve.

- **Problem.** A description of the problem to be addressed in your study. This should give sufficient information on the background to the problem, in the context of the business, organisational or academic environment. You should, of course, give the reader sufficient detail to make them understand not only what your study is about, but also what characteristics of this problem make it difficult! This section should also state what benefits are expected to arise as a result of your study. (If there is a detailed benefits document, you may want to put that in an appendix.) This should be followed by a review of the problem context, which may involve a survey of what has already been done in this field, and what are the main existing ideas, methods, techniques, products, guidelines, principles, theories, etc. relevant to the project. In almost all cases this will involve a critical review of published literature (books, journals and conference papers, technical reports, software documentation, etc.).
- **Approach.** You should explain your intended approach to addressing the problem, and also how you decided upon this approach. This section should not go into detailed discussion of the *mechanics* of any chosen methodology (except as far as is necessary to allow the reader unfamiliar with the approach to understand stages, activities and products), but it will be appropriate to contrast different candidate approaches to explain why others were discarded.
- **Application of the chosen approach.** This section should give the detail of what you actually did. It will include a discussion of your research activities related to “finding out”, and the activities involved in identifying stakeholders and obtaining information (if appropriate). It is not necessary to include all products (such as interview notes) but there should be sufficient detail to allow the reader to assess the value of the evidence you have used, and place the study in an academic and business or organisational context.
- **Products.** This section will vary considerably, depending on the type of study you have undertaken. Relevant content may include the following:
  - Requirement – the definition of the requirement, developed as a result of your investigations into the problem.
  - Design - the main design decisions (these may relate to applications, organisational structures or business processes), the factors considered, assumptions made and quality criteria.
  - Implementation - detailed account of the implementation. This may include data structures, code, working prototypes, business products, simulations etc. It is important that this section permits the reader to relate your products to the requirement and analysis.
  - Project management - you may describe tools and techniques used to manage your project, and include any user acceptance or responses to the products you have developed.
  - Results - you may have produced experimental results or other kinds of results during the course of your study: if so, these should be reported. Your dissertation should indicate how well your project achieved the expected benefits, or what benefits management plans expect to be the results if these will take a long time to become evident.
- **Analysis.** You should assess the success of own study and seek to validate the products or your outcomes. This will include a comparison with the original specification, and reasons for changes of direction during the study. You should describe the reliability of your products, including indicating the results of any system testing or other quality processes. An assessment should also be made of the robustness of your solution to the “problem”, and indicate any performance metrics you have been able to define and/or gather. If it is appropriate to do so, you should assess user acceptance to any products of your study.
- **Conclusions.** This section should summarise your achievements, and also critically evaluate your study for deficiencies. You should consider what you would or could have done, if you had had more time or if things had worked out differently. It is important to be completely honest about the deficiencies and

inadequacies of your work, such as they are – part of the aim is to demonstrate your ability to recognise problems that remain. You should be equally candid about what you regard as the successes, as well as identifying shortfalls in existing knowledge or theory. You should fully identify your contribution to academic, practical or business knowledge, and make recommendations. If appropriate, and for the benefit of your industrial sponsor, you should include recommendations relating to the business problem. All recommendations should be derived logically from the evidence, assessment and argument.

- **Reflection/Learning.** One of the principal aims of the Project phase of the MSc Programme is to provide you with research skills. One way in which you demonstrate this is to critically assess what you have learned through completing the project. The range of “lessons” will be great, and will vary between individuals and areas of research. You should include lessons learned about the process of research (time; availability and authority of sources in the field; skills needed and acquired; project management; how good your decisions were (e.g. on the selection of the methodology) and what information might have improved these decisions; etc.), lessons learned about yourself (what areas you have identified for continued personal development; what skills you needed; your strengths and weaknesses; etc.) and lessons about the topics addressed in the project where not already covered by the substance of your dissertation (underpinning theory or philosophy; value of approaches; understanding gained; problems not solved; effectiveness; etc.). On the basis of reports from External Examiners to date, the importance of this section cannot be overstated.
- **References.** List any books, articles, lecture notes, conference proceedings, manuals or other documents that you refer to in the dissertation and/or that were important in your work. Guidance on how to do this and on how to cite references within your dissertation can be found at <https://intranet.cardiff.ac.uk/students/your-study/study-skills/manage-cite-and-reference-information>
- **Bibliography** (optional). It is sometimes useful to include an annotated bibliography, i.e. a list of key books, articles, reports, etc., with your own comments on how they contributed to the work, what background information they provided and their significance in the field in general. Bibliography entries may or may not be in the reference list (but usually will be) and should normally be in alphabetic order of author, although they may also be subdivided into subject headings. A bibliography is a useful place to give your views and reactions to works you have read, and can be of great assistance to others new to the field. However, it is not an essential component and your dissertation can safely omit it.
- **Appendices.** You may include other documents here. You should consider including copies of any Web documents you have cited as a reference (because of the transitory nature of many such documents), and may also consider incorporating: the original project specification; a selection of experimental data; schedules; testing strategy; risk management plans; glossary; manual; source code; project plan; etc.

## 5.2 Style

The dissertation should contain a full and coherent account of your work. Although there will be an opportunity to demonstrate products such as software, the major part of the assessment will be based on the written material in your dissertation. Although you can expect help and feedback from your supervisor, the final form is ultimately your own responsibility. You should assume the reader is computer-literate, but not necessarily an expert in the specific area of your dissertation. Even where readers are expert, they will be looking for evidence that you can explain the concepts and context clearly to a non-expert.

It is important that your written style is of appropriate gravity (although there is scope to lighten the reader’s load with appropriate humour or illustrations), and that the narrative develops a logical argument describing what you did, why you did it and what the results were. Written style is a very personal matter, but you might consider consulting a pithy and highly entertaining little book called “The Elements of Style” by Strunk & White (3rd edn, Macmillan 1979). A virtue much emphasised by Strunk and White is brevity - never use three words when one will do. The book itself is a shining example of the benefits of applying this philosophy.

Until recently the convention in scientific reporting has been to use the passive voice universally (e.g. “The results show that ...” or “It is considered that ...”), thus avoiding the use of the first person. It is now however quite common to find authors writing in the first person in appropriate circumstances, e.g. “I believe that the results show ...”. This form of usage is perfectly acceptable in a dissertation where an opinion is being expressed, and can help to avoid your prose appearing stilted. You should, however, avoid telling stories, for example, “Then I spoke to my supervisor who told me that the problem was.....”

In your writing, you should avoid gender or racial bias: don’t assume or imply, for example by choice of personal or possessive pronouns, that the user is male.

Finally, you should make sensible use of appendices; for example, user instructions for software generated, sample questionnaires, and detailed code listings, can be relegated to appendices. This will avoid distracting the reader from the presentation of your arguments.

### **5.3 Length**

The body of the dissertation should not exceed 20,000 words. Use a 12 point font with one-and-a-half or double line spacing (see the academic regulations handbook at <https://www.cardiff.ac.uk/public-information/policies-and-procedures/academic-regulations>).

### **5.4 Electronic Submission**

Electronic submission of the dissertation will be performed via PATS (Project Allocation & Tracking System). A PDF version of the dissertation should be uploaded by the submission deadline, and also any additional relevant files, e.g. source code, images, video, audio, other data. Some projects may produce physical artefacts without any digital versions of them. A copy of these artefacts must be handed in by the submission deadline to the COMSC office in an envelope to accompany the electronic version of the dissertation. On the envelope clearly write your name, the title of your project and the names of your supervisor and moderator.

### **5.5 Note on plagiarism**

Plagiarism is the use of other people’s work so that it appears to be your own. “Other people” includes COMSC staff and other students, as well as authors of books, papers, documents or programs on the internet, etc. Deliberate plagiarism is a very serious offence that is treated in the same way as cheating in an examination; this could result in expulsion from the University, and as a minimum it results in disqualification from the project module. The University has issued guidelines on plagiarism, which you should consult. These are reproduced in your Programme Handbook and the Academic Regulations Handbook.

You should take care to ensure that plagiarism does not occur inadvertently. It is normal in academic reports to quote other people’s work, but you must clearly indicate that this is what you are doing, and identify the source. Direct citation from another source of material should always be indicated by quotation marks or by indenting the quoted text and the source of the material referenced as indicated above. If material is paraphrased the source should still be clearly stated. Tables, diagrams, etc. copied from elsewhere must also be clearly identified, with reference to the source.

Information on the avoidance of plagiarism is provided by the University at the following URL:  
<https://intranet.cardiff.ac.uk/students/your-study/exams-and-assessment/sitting-your-exam/cheating-and-unfair-practice/plagiarism>

## 6 DEMONSTRATION

As part of your study, you are required to demonstrate your project to your supervisor, explaining your findings.

The purpose of the demonstration is to allow you to describe your project to your supervisor (and other internal examiners, if available), and to demonstrate any products you may have developed. This is to enable your supervisor to satisfy him or herself that the project is your own work, that you understand the work you have completed, and to confirm that the products (if any) function as described in your dissertation.

The demonstration is not assessed separately, but it will be used by your supervisor (and moderator if present) in considering the overall mark awarded for the project. It is your opportunity to demonstrate, in an oral presentation, that you have approached your study in a professional manner, using tools, techniques and methodologies appropriate to the problem situation, and that this has been done in such a way as to demonstrate the level of research skills and thinking appropriate to the award of a Master of Science degree.

During your demonstration you may wish to:

- Describe the problem situation, including the characteristics that made it difficult.
- Describe your approach, including the reasons for its adoption.
- Describe, and illustrate with examples, the collection of information and evidence relating to your analysis of the problem situation.
- Indicate your findings.
- Describe, and if appropriate demonstrate, the products of your study.
- Describe what you learned through the conduct of the study, identifying deficiencies you have found in both your work and in the relevant body of knowledge.

The demonstration should take place no more than two weeks later than the submission deadline. You can also do it before the deadline if you want. You are responsible for arranging a mutually convenient time and place with your supervisor and moderator if available. The demonstration can be done online via video conferencing if necessary.

## **7 ASSESSMENT**

Your project dissertation will be marked independently by your Academic Supervisor and a second examiner (moderator) selected by the School on the basis of understanding of the subject area. They each give a mark out of 100. The supervisor and moderator will then consult together to agree a single final mark. If the difference between the two marks is larger than 15%, a third marker will be appointed. You require a mark of at least 50% to pass.

## 8 DISSERTATION MARKING GUIDELINES

The dissertation should demonstrate that the student has the ability to gather information, assess a problem situation, adopt and exercise an appropriate approach to dealing with the problem situation, and clearly and persuasively communicate his or her activities, proposals and achievements in writing. The successful candidate is expected to demonstrate the ability to think, act and communicate as a mature computing/IS professional. In particular, the dissertation should show that the candidate has:

1. Selected an appropriate approach to understanding and investigating the problem situation;
2. Critically reviewed academic literature, and other relevant material, in the project area to identify the problem to be addressed and its context, conducted a systematic analysis of the problem and developed coherent and logically derived products and/or conclusions;
3. Applied the selected approach, adapted as appropriate, in an effective, professional manner, to develop coherent and logically derived products and or conclusions relevant to the stated issues and appropriate to the complexity of the issues in the context of both the time available and the standards required of MSc students, and validated the products as appropriate;
4. Critically assessed the activities undertaken in completion of the project and reflected on the achievements, the methods, decisions made and concepts and methods used, in the context of a spirit of lifelong learning, and identified transferable learning arising from the project.

### Selecting the approach

Material reviewed in undertaking the project will normally include a review of the published literature in the area of the dissertation, and perhaps material from standard texts that cover the background theory. The purpose of the review is to assist the reader in understanding the rest of the document, and to indicate to the examiner that the student has mastered the material relevant to the project. It also allows the student to justify the selection of the topics and issues to be addressed by the project, by identifying the gaps in the body of knowledge relevant to the issues or topics to be addressed. There should be a clear statement of the problem the project addresses. The student will be expected to identify candidate approaches, and assess them before embarking on action to improve the problem situation. This assessment and selection should be fully reported and justified, along with any decision to develop an original approach or tailor an established methodology to suit the circumstances of the project.

### Applying the Selected Approach - Products

The examiner will be seeking evidence that the student has progressed through a set of logical steps towards the desired outcome, and has fully explained and justified decisions taken. The structure and volume of material may also provide an indication of the amount of effort expended on the corresponding areas of the study as well as providing an audit trail to any conclusions or products. This requires reporting of the activities actually carried out by the student, and this forms the basis of the dissertation. It is impossible to set out guidelines for what the student should attempt to achieve in the course of the project, as each student will be operating in a real problem situation with pressures of time and resources, and often with real customers, political and cultural constraints. Due regard will therefore be paid to the difficulty of the situation and the originality and persuasiveness of any conclusions, recommendations or product development. This section should show how the bulk of the student's full-time study (amounting to the equivalent of 12 weeks) was spent.

The products resulting from a student project may embrace a wide range of documents and artefacts. Whatever is presented should be appropriate to the problem addressed, should be of good quality and should be clearly placed in the context of the systems lifecycle (in other words, the purpose of the products should be clear). It is not essential that MSc students produce a working software application – the initial problem situation may have been so complex that the expression of the situation in such a way that a “solution” *could* be engineered is all that could be expected in the time available. However, whatever the products are they should be validated or tested appropriately, and fully documented.

## **Reflection**

It is important for the student to provide critical appraisal of the work conducted. Reflection should identify shortcomings in the approach, conduct of the project or body of theory and knowledge appropriate to the area. It should equally highlight success, record what went well in conducting the project and what skills or knowledge proved valuable. It should indicate where the student's work could be further developed and identify the contribution to knowledge in the field. Good students will assess the value of the concepts and theories underpinning their approach and activities, and show evidence of having developed some insight which will allow them to transfer knowledge gained from undertaking the project to other problem areas.

## 9 PROJECT SPECIFICATION

The project proposal is fairly vague and rough, and students are encouraged to produce a detailed specification of what you will do. You may need two or three meetings with your supervisor between the Proposal stage and the Specification stage. The specification must be as detailed as possible. It should demonstrate that you know what the project is about, and that you know how you are going to approach it. It should include a timetable showing different phases of the development and when they will be completed, and should give details of the hardware and software you will use. It is recommended that the timetable be presented as a project plan (Gantt chart), and that you allow some slack, particularly towards the end of the project.

Your specification should be ambitious and imaginative, but it should also provide several fall-back positions in case you cannot realise all of it in the available time. Make sure you have specified a substantial and self-contained core, together with several extras which you will do if time permits. It is accepted that, as you discover more about the topic, you may find it necessary to reduce the scope of your project; this will be done, if necessary, in consultation with your supervisors. The reasons for amending the scope of the project will, of course, no doubt form part of your dissertation!

Your project specification should contain the following detail:

- Introduction and aim. Your specification should give some background to the project (this may be taken from the proposal) and the aim of your study. The aim should be in the form of a sentence describing what you intend to do, e.g.:

*“The aim of this study is to identify the causes of project failure in complex IT application development projects, and to make recommendations relevant to improving the chances of success.”*

- A statement of the requirement. This should include an outline of the project, which includes what needs to be achieved. You should include details of any work done in the study area so far, which may refer to previous studies and any strategy within which your study will be placed.
- Constraints. Define any circumstances which will constrain your project in any way.
- Main deliverables. Describe products to be produced.
- Project plan. This should contain a detailed and realistic analysis of the tasks you will undertake in the course of your project. You should include each of the products described previously, and the activities related to them, as well as specific information gathering activities, review meetings and research. Any training related to your study (for example, product related courses) should be included (although you should note that the University will not fund any such training).

You may, of course, have to deviate from your detailed specification as your project progresses, because things do not turn out exactly as you planned. This is perfectly acceptable, provided you are quite clear about the reasons for the change. Discuss these reasons and the possible reactions to them with your supervisor. If they entail a substantial change to your specification, you may wish to rewrite it, depending on how far advanced you are with your study. It will be normal to include the Project Specification as an annex/appendix to your dissertation.



## 10 PROGRESS

Most students will find that problems will arise that cause them to review their plans, and possibly re-evaluate their aim and goals. This is normal. However, a number of events or situations can arise that seriously interfere with progress. This section explains what to do in such cases.

The full regulations governing progress and activities or actions to be followed if normal progress is interrupted are contained in the (current) Academic Regulations Handbook. This is the definitive guide to dealing with all aspects of examination and progress, and takes precedence over this Project Handbook.

If any factor, such as illness, work commitments or the need for time off for compassionate reasons, should arise, you must obtain such evidence as is possible (e.g. a medical certificate) and hand it in at the School Office. This will be necessary should it be decided that an application for extension to the submission deadline is appropriate.

If such an event occurs, but you decide to work on, you should still acquire appropriate evidence and hand it in at the School Office. It will be of value to the Examining Board and may favourably affect your result should your marks be borderline. Examining Boards are inclined to take into account adverse circumstances or hardship, if it is apparent that a student's performance has suffered through circumstances not of his or her making.

Should it transpire that you are unlikely to be in a position to meet the due submission date, you should discuss the matter as early as possible with your supervisor. The Head of School has the authority to grant an extension of up to 28 days in appropriate cases. ***Such an extension is not a right, and a strong case will have to be made for its award.*** Again, evidence will help you and your supervisor to present your case.

If you do not submit by the due date, and no extension is granted, ***you will be deemed to have failed at first submission.*** In such cases, you have a right to resubmit within 6 months of the original submission deadline, as is also true in the case of submitted dissertations that fail to meet the required standard (though in this case the due date is 6 months from notification of failure). A fee may be charged for the resubmission, as determined by the University. The maximum mark which can be gained for a resubmitted dissertation is 50% (the pass mark).

All students should note that the BCS – the Chartered Institute for IT requires projects to be passed without compensation, in order to qualify for exemption from professional examinations.