Northumbria University
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Department of

Computer and Information

Sciences

LD7029- Computer Science and Digital Technologies Project

Project *Student Guide and Log Book*

Version 2021/2022

Contents

1 Introduction to the Project

The Individual Cyber Security Project constitutes the final part of the M.Sc., and represents a focus for earlier studies. It is a great opportunity for you to complete an in depth piece of research work on a topic of your own choosing. Successful completion of the project is an essential requirement for the award of the M.Sc. degree. Undertaking the project will allow you to develop and demonstrate two abilities:

1. academic ability to undertake research;
2. practical ability to apply skills and knowledge from the field of Cyber Security to the solution of a defined problem.

All projects must demonstrate both of these skills, although the balance between the two will depend on the nature of the project you choose to carry out.

Note the following key points about the project:

3. It is largely an individual activity. You will be working alone on a unique task. While you will receive guidance and assistance from your chosen supervisor, the responsibility for the work ultimately lies with you. You will not be told what to do all the time. Any problems you come across are your problems.
4. You must be able to apply the formal method of scientific enquiry and reporting. This means that you must select a task that involves some element of scientific research. In this context, research does not mean looking things up – you should discover new information for yourself.
5. You must be able to demonstrate a disciplined approach in the application of Computing skills and theory to a relevant problem. This means that you will need to select a project that involves research and implementation of technologies and techniques in the field of cyber security. The product should be developed using a professional, systematic method that uses skills taught on your course.
6. You are expected to demonstrate your professionalism. You should take responsibility for your own work, use professional development standards, stick to deadlines, respect the work of others and deal with your own problems in a responsible manner.
7. Most of the marks given for the project will be given for your dissertation. The software product itself is not marked, but your description of its construction and information gained from using/creating the product will be.
8. The project is a large undertaking, representing 600 hours of work. It is equivalent to three of the usual 20-point modules. Full-time students should expect to work from 9 to 5, five days a week for three months, in addition to time put into the project in the second term.
9. The project will be carried out under Northumbria University, London Campus supervision. Completing your studies abroad or in another part of the country is not advisable. Please see below if you think you need to do this.

The sections that follow this introduction are aimed to give guidance in a number of key areas that relate to the successful achievement of the project.

The syllabus and formal module descriptor (Module LD7029) for the project are available online via MyNorthumbria and the Blackboard (eLP) module site.

1.1 A Note about Module Codes

The module code for the Masters Dissertation is , however much of the preparation for it is done during the *LD7028 Research Methods and Project Management* module.

1.2 Project Resources

This handbook should give you answers to many questions about the MSc Cyber Security Individual project, but is just a starting point. Other sources of information include:

10. The lectures and seminars in the *LD7028 Research and Project Management* module
11. The project tutor
12. Your supervisor, once you find one
13. Blackboard. There is a module site on Blackboard for MSc projects, containing guidance, example material and project suggestions. You should automatically be enrolled on it once you start your project. You should also check it regularly (at least once a week) to see if there are any announcements relating to your project/dissertation. If you experience any difficulty accessing this module site, please contact the project tutor.

- Regular research seminars open to students from the department and university

14. There are also many good books on student projects, including:
    - Pickard, A.J., 2013. Research methods in information. Facet publishing.
    - Dawson, C., 2015. Projects in Computing and Information Systems 3rd Edn. Pearson Education Limited.
    - Evans, D., Gruba, P. and Zobel, J., 2011. How to write a better thesis. Melbourne Univ. Publishing.

The Project Tutor

Professor Hamid Jahankhani is the module leader with overall responsibility for the Masters Dissertation, and should be approached for questions about finding supervisors, submissions deadline and procedures etc.

Email:
hamid.jahankhani@northumbria.ac.uk
Room Location: London Campus

As part of LD7028 Research Methods and Project Management module:

1.3 Project Milestones

The project goes through a number of stages, with five key deliverables.

1. Find a project topic, and write a proposal document. Persuade a member of staff to supervise the project.
   Deliverable: Project Initiation Form.

2. Develop and plan your proposal in more detail, in consultation with your supervisor. Write a Research Proposal which describes in more detail what your project will involve.
   Deliverables: Research Proposal, Draft Ethics and Project Risk Assessment Forms.

3. Arrange and attend a Research Proposal Review meeting. This is a meeting between yourself, your supervisor and another member of staff to discuss your research proposal.
   Deliverable: Final versions of Ethics and Project Risk Assessment Forms.

The proposal is marked as part of the assessment of LD7028

As part of LD7029 Dissertation

4. Carry out the project. This is the bulk of the work. You will be creating your product, writing your dissertation, carrying out research. You should have several meetings with your supervisor.
   Deliverable: Dissertation.

5. Arrange and attend a viva to discuss your project with your supervisor and a second marker.

1.4 Project Timetable

The following dates are indicative. The exact deadlines will be given to you at the briefing sessions and will be available on the Blackboard site for the module.

Project Milestone	**Indicative Timescales**
Briefing by Project tutor	October 2021
Submission of Project Initiation Form	November 2021
Submission of Research Proposal	Jan 2022
Research Proposal Review Meeting Submission of MSc Project Ethical and Risk Assessment Form	Ethical and Risk Assessment submission date: Jan 2022 Research Proposal Review Meetings: Feb 2022
Submission of Dissertation & Seminar Presentation	17 May 2022 18 - 25 May 2022
Award Board	June 2022

Write your deadlines in the spaces provided in the 'Key Facts and Deadlines' Form provided as one of the Appendices to this handbook.

1.5 Learning Outcomes

These are the module learning outcomes:

Knowledge & Understanding:

1. Apply in depth specialist technical and academic knowledge and critical understanding of research methodologies and project management in the context of an independent academic research project related to your programme of study and at the forefront of the computer science and digital technology field.

Intellectual / Professional skills & abilities:

2. Identify, plan and execute a substantial independent research project demonstrating originality, critical and innovative thinking and problem solving

Personal Values Attributes (Global / Cultural awareness, Ethics, Curiosity) (PVA):

3. Critically evaluate and address professional, ethical, legal and social issues in an appropriate manner within an academic research environment

4. Effectively communicate the outcomes of a significant individual research project in both written and oral forms

2 Choosing a Topic

You are expected to conceive, structure and plan your own project, but not without some assistance from a project supervisor. The most that can be initially expected from tutors (and possibly industrial clients) is that they may produce an outline project idea which requires significant further enquiry and definition. (If you need to be set to work on a fully pre-defined project, this is likely to count against you in the project marking).

The MSc Cyber Security projects are concerned with equipping students with the specilalisations that are required to deal with the diverse business needs and the breadth of technologies and techniques to combat cyber threats as it is essential in the success of securing tomorrow's cyber space.

All MSc degrees required students to develop and demonstrate the ability to do research and this is primarily demonstrated through your dissertation. According to The QAA Framework for Higher Education Qualifications' Descriptor for Masters Level :

> *Masters degrees are awarded to students who have demonstrated:*
>
> - *a systematic understanding of knowledge and a critical awareness of knowledge, and a critical awareness of current problems and/or new insights, much of which is at, or informed by, the forefront of their academic discipline, field of study, or area of professional practice*
> - *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*

It is likely that your first degree included some project element. However, while it is adequate in an undergraduate project for a student to make use of recent scholarship (e.g. in the form of journal articles) and to re-apply knowledge, an MSc project should demonstrate originality in the application of scholarship.

This means that your project must produce some new information, rather than simply re-writing or applying existing information. For example, making a multimedia database would simply be applying existing knowledge. Attempting to construct the database using a novel approach (either suggested in a recent article, or devised by the student) would allow your dissertation to discuss something new. This does not mean that you have to come up with a totally new idea – you just have to solve a problem in a slightly different way or try a technique that has not been fully explored yet.

Your project should have either a “problem statement” or a “hypothesis”. A problem statement is a declaration of the problem you plan to solve by constructing your product. A hypothesis is a statement that you plan to prove or disprove by constructing your product.

Some examples are:

I intend to construct a compression algorithm that will store astronomical images more efficiently than existing techniques.

I intend to produce a program that will perform automatic data-cleansing on my company's database, using a new approach.

I intend to prove that the efficiency of a pathfinding algorithm can be increased for large search-spaces by remembering previous partial solutions.

I intend to determine which "lite methodology" is most suitable for games software development.

I intend to show that using a contextual interface will reduce errors in a command-and-control system.

Choosing a project idea is a very important part of the project process. It is surprisingly difficult and time-consuming. It is likely that your first ideas will turn out to be unsuitable. To help you find ideas, you should:

1. Read past dissertations. There are electronic versions of good examples of dissertations on the Blackboard module site.
2. Read journal and conference articles in the library. Take particular note of "suggestions for further study", which is often the last section of an academic article.
3. Consult the list of suggested ideas on the Blackboard module site.
1. Talk to staff who have interests similar to your own.
2. Consider the needs of your workplace. Is there a research project they need to be carrie d out?

If you are interested in a project idea put forward by an industrial client, you are expected to meet with the client to develop the idea eventually into a proposal and for both parties to decide if they wish to continue with the project. Remember that the MSc project requires a degree of originality. If your client simply wants you to build a standard system using standard techniques, your project will lack a research element.

There is often a temptation to select something that sounds good or is a trendy topic without the student having any real interest or commitment. This temptation should be resisted as experience tends to show that the best projects are undertaken by students who have a deep interest in what they are doing - which gives them the motivation to succeed when inevitable problems and setbacks occur. Remember that this project is possibly your last chance to pursue in some depth an interest

Once the initial idea has been generated, there are a number of questions that should be considered:

1. What published information is available to support further inquiry?
2. Is the project too narrow?
3. Is the project too broad?
4. Can the scope of the project be changed if it turns out to be unexpectedly easy or difficult?
5. Has the hypothesis already been fully answered or the problem already been fully solved?

6. How demanding are the project objectives compared to similar projects?
7. Does the project rely upon third parties (e.g. industrial sponsors, hardware/software, systems suppliers and University personnel)? Can they be relied on?
8. Does the project require specialist equipment or software? Can it be provided?
9. Does the project require you to master a new skill or devise a new technique? What will you do if you cannot achieve this?
10. What do you plan to test and how do you plan to test it? If you plan to do qualitative testing on a group of users, can you obtain enough subjects for a statistically relevant sample?

Defining the breadth, depth and support requirements of a project are critical determinants of its ultimate success and solid work done at this stage can often avoid many problems and heartaches later on.

If you take too long in coming up with an idea, you will have less time left to complete your project.

Many of these questions will be hard to answer – especially determining the scope of the project. It is likely that you will need guidance to refine your initial idea. To obtain this guidance, you will need to find a supervisor.

2.1 Finding a Supervisor

It is your responsibility to find a supervisor for your project. This task also takes time. Do not leave this until just before the deadline. You will need to find a member of staff who is interested in the area you have chosen. Certain staff are available for project supervision – consult Blackboard for a full list.

Note that there is a limit to how many students a single member of staff can supervise. It is in your interest to arrange a supervisor of your choice as quickly as possible. If you are interested in doing a project in a popular area, you will need to find a supervisor quickly before they all get booked up. Inevitably, in some specialist subject areas, staff arrange projects with students quite early in the year.

Once you have an idea, you should write a short proposal document. This is a single sheet of paper that describes what you plan to do. It should have the following sections:

1. Your name.
2. A proposed title. (This can change – it usually does).
3. The problem statement or hypothesis.
4. Background information.
5. The product – what you plan to make.
6. Reasons why you want to do this project.
7. Any articles or books that you have already read that are relevant.

You should then email this to a staff member and request a meeting to discuss your idea. You may find that the staff member is no longer available for any more project students, or that they recommend a more suitable person.

At the meeting, you should explain your idea. It is likely that the staff member will have a number of suggestions. You may be asked to make changes to the proposal. It is also possible that the proposal

will be rejected as completely unsuitable. If this happens, you will need to come up with a new idea. You will probably need to have several meetings with your intended supervisor before they accept the proposal.

2.2 The Project Initiation Form

Once a member of staff has agreed to supervise your project, complete the Project Initiation Form in accordance with the instructions given as part of the module LD7028.

IMPORTANT INFORMATION: If you have NOT managed to find a supervisor, then you should still submit a form with a proposed title but with the supervisor left blank. You will then be assigned a suitable supervisor.

If you fail to submit a form then you will be allocated a supervisor and may have a more limited choice over the type of project you can do. When you have been assigned a supervisor, you should meet him/her as soon as possible to decide on a project topic. Note that this means you will be limited in your choice of project. This may also cause a delay in starting your project. You will not be given more time to complete your project.

You are strongly advised to set yourself up with a supervisor quickly rather than be assigned a supervisor so that you can get started as soon as possible.

3 The Research Proposal

3.1 Writing your Research Proposal

Once you have a supervisor, your next task is to write your research proposal. Your research proposal should contain the following items.

1. **Aim:** which should summarise what the project will achieve in one or two sentences, often in the form of a research question.
2. **Background:** This is typically 500-1000 words that explain:
    - *Why* you intend to do it, i.e. why the project is worthwhile and relevant.
    - *What* you intend to do, i.e. a brief summary of what activities will be undertaken in the project
    - *How* you will proceed, i.e. what method you will use in order to achieve the aim.
3. **Objectives:** the steps you will have to complete in order to achieve the aims. Most projects involve 5-10 objectives, typically divided into stages of literature survey, practical work (design, implementation, results), analysis and evaluation. Objectives should be SMART, that is :
    - *Specific* – Objectives should specify what they want to achieve.
    - *Measurable* – You should be able to measure whether you are meeting the objectives or not.
    - *Achievable* - Are the objectives you set, achievable and attainable?
    - *Realistic* – Can you realistically achieve the objectives with the resources you have?
    - *Timely* – When do you want to achieve the set objectives.

    For example, one possible objective may be to 'investigate different approaches to solving a problem X' however this is not S,M,A,R or T: it may be that you could spend the rest of your professional life researching this area! A preferable way of defining the objective would be to 'identify alternative approaches to solving problem X, their advantages and disadvantages, and identify one suitable to be implemented in this project'.
4. **Resources / Constraints:** any resources you need to complete the project which are not provided as standard by Northumbria University, or any external limitations, such as availability of a client. Distance Learning students will also need to consider how they will present their viva.
5. **Schedule of Activities:** should include milestones, cross-referenced to objectives. This may be presented as a Gantt chart.
6. **Sources of Information:** you should identify high quality sources of information necessary for completing each of the objectives.

NOTE: Normally your research proposal forms part of the assessment for module LD7028 and thus you should follow the exact guidelines given in the assessment specification for this module. You should submit your research proposal in accordance with the assignment specification. Please note that no extensions to the project deadline will be awarded on the basis of a delayed research proposal

Support for your Research Proposal

You should write your research proposal in consultation with your supervisor. He/she will expect to see a draft version of the research proposal at least two weeks before the submission date and will suggest changes and improvements.

3.2 Research Proposal Review

Upon submission of your accepted proposals students would be prompted to complete ethical form which would be completed with the supervisor at this stage. The faculty will also allocate second marks based on the project subject/ field. Once the supervision team is allocated then, you should arrange a date and time for your research proposal review meeting with your supervisor and second marker.

Please note that it is your responsibility to arrange the research proposal review meeting before the deadline.

At the meeting, the supervisor and second marker will discuss your research proposal with you and make sure that the project is worthwhile, achievable, and has the potential to generate a dissertation capable of earning a MSc. This approval process is intended to protect you from attempting to carry out an unsuitable project. Ultimately, though, the responsibility for the project is yours.

At the end of the meeting, the second marker and supervisor will make a decision about your research proposal. They will decide one of the following:

- Accept the research proposal.
- Ask for changes to be made to the research proposal and ask for an updated version to be emailed to both members of staff.
- Ask for changes to be made to the research proposal and ask for another review meeting to be arranged.
- Reject the research proposal. If this happens, you will need to find a new project idea. This will seriously delay the project. You are not entitled to more time and will need to work quickly to catch up.

At the conclusion of the research proposal review meeting, your supervisor and the second marker should ensure that both the Faculty Research Ethics Registration and Approval Form and the Project Risk Assessment Form have been completed (see appendices). One copy of the Faculty Research Ethics Registration and Approval Form needs to be retained by your supervisor and a second copy should be submitted to the Faculty Office marked for the attention of the Computing Programme Support Team. The form will need to be referred to FRAC for approval if flagged as red and you may not submit your project until approval has been given by FRAC. You and your supervisor should keep copies of the Risk Assessment Form for ongoing review during the project period.

PLEASE NOTE: Your supervisor and second marker will give you a great deal of feedback and advice on how to improve your project during the meeting -- its a good idea to take pen and paper and take notes!

3.3 Risk Assessment (Health and Safety)

All research activity carried out by Northumbria University is subject to risk assessment and health and safety issues. As part of your research proposal you should complete the Project Risk Assessment Form (see Appendices) in discussion with your supervisor. Depending on the identified risks and associated health and safety issues, you may need to consult the relevant technical staff for further advice and guidance.

3.4 Ethical Approval

All research activity carried out by Northumbria University is subject to ethical approval, and this includes Masters projects. Ethical policies cover such matters as biological weapons and drugs trials. For the purposes of MSc Cyber Security projects, the most likely issues concern access to real data, commercially sensitive projects, and very occasionally health or animal related issues.

The Research Ethics Registration and Approval Form includes a section on ethical considerations of your proposed research and you should complete this in advance. If you have any questions about the form, discuss them with your project supervisor or the project tutor. For most students, there will be no issues that need further conditions or approval by FREC (Faculty Research Ethics Committee) but you must complete the form in all cases. Please make sure your supervisor has a copy of your final ethics form and a second copy is submitted to the Faculty Office.

More guidance on the ethical approval process is available on the Faculty Ethics Information web pages (https://www.northumbria.ac.uk/sd/academic/ee/about/studentsupport/ethics1/) and from the Northumbria University Research Ethics and Governance Handbook (https://www.northumbria.ac.uk/static/5007/research/reghandbook.pdf). This includes a good discussion of the principles of informed consent (ch3) and data confidentiality (ch6).

A good summary of ethical principles in engineering is available here www.theiet.org/about/governance/raestatementv2.cfm?type=pdf.

4 Working on the Project

You should normally start work on your project during your third semester and following your research proposal review and the acceptance of your project research proposal by the supervisor and second marker.

During the main part of the project, you will have regular meetings with the supervisor to discuss progress and to receive advice/guidance. It is your responsibility to make and keep appointments with the supervisor and to inform the supervisor of any problems that are preventing normal project work from taking place. Initially these meetings will take place weekly (or every two weeks for part-time students). Meetings may be less frequent once you are well established on the project. You should consider the supervisor to be a source of guidance and advice. The responsibility for the project is ultimately yours. Your supervisor should not have to tell you what to do – organise yourself and your time. This does not mean that you should never ask for advice, but that you should know what advice to ask for.

An initial key activity, both for initial project definition and for building up a full picture of applicable related research work, is the literature survey. The University library is well stocked with computing books and journals Sometimes you may need to make use of an inter-library loan. Since inter-library loans take several weeks, it is a good plan to make these requests early in the project. Sometimes the required information may be available in other nearby libraries where it may be consulted but not borrowed.

Progress will be monitored by both you and your supervisor against the detailed project plan agreed in the proposal. This will be done at your regular supervision meetings throughout the project. It is normal for the detailed schedule in the plan to be modified and updated to take account of unforeseen eventualities - both good and bad - but the project submission date is a deadline that needs to be met unless there is very good reason - for example if you have a sustained period of ill health.

The log book should be used to record significant variations in the project plan, and the meeting of milestones. Bring your log book to each meeting, with the relevant sections already filled it. At the end of the project the logbook will be submitted by the student.

Failing to attend meetings, or to make satisfactory progress, may mean that you will be asked to attend a meeting with the course leader and/or project tutor.

All projects produce a few surprises. You will need to deal with small changes. You may find that your project needs to change drastically, in which case you need to discuss this with your supervisor.

4.1 Responsibilities of the Student

- To agree on a schedule of weekly meetings with the supervisor and to attend those meetings.
- To keep the project Log Book up to date and to take it to every meeting with the supervisor.

- To submit at the agreed dates all project deliverables.
- To inform the supervisor of any problems arising out of the work.
- To arrange the Terms of Reference review meeting with the supervisor and second marker.

4.2 Responsibilities of the Supervisor

- To give guidance about the nature of the project and the standard expected, about the production of the proposal, about literature, about techniques and methods, and about any problems of plagiarism.
- To ensure that the proposed project exhibits the appropriate attributes expected of a Masters level computing project.
- To hold regular tutorials with the student and maintain an attendance record of these meetings.
- To ensure that the Log Book is kept up to date.
- To be accessible, within reason, at other times for giving advice to the student.
- To request evidence of progress and to ensure that the student is aware of any inadequacy of progress or of standards of work below those expected.
- To provide constructive criticism on any work presented; Please note the supervisor will not be marking your draft work , rather the supervisor will be advising you on how to improve the quality of your work.
- To encourage the student to produce early draft chapters, to comment on them critically and return them promptly; (If the student does not do so it is the student's responsibility).

4.3 Note on students using own hardware / software

You may use your own computer for part or all of the practical work involved in a project provided that it is suitable for the purpose, as agreed by the supervisor, and that any propriety software used is properly licensed. If a personal machine is used, the responsibility for back-ups etc. lies with you. If you lose programs and/or data and are unable to demonstrate deliverables, no allowance will be made. Postgraduate computing students are expected to be aware of sensible back up/security procedures on their own equipment. Ignorance or carelessness is not acceptable as an excuse

4.4 If your supervisor "goes missing"

...let the project tutor know. It may be that your supervisor is ill. If you let the project tutor know, he/she will be able to find you a replacement if your supervisor is likely to be away for more than a few weeks.

5 The Dissertation

Depending on the nature of the project, you will need to strike a careful balance between practical work such as programming/testing and the dissertation production work, literature reading/analysis and writing. Many students forget that it is the dissertation that will be marked, not the product. It is important to allow enough time for the writing-up stage; a typical MSc dissertation is around 12000 words will take at least a month of elapsed time to write, edit and assemble. It is worth consulting some of the books on academic writing style and composition before beginning the writing up work - see the resources at the end of this section. Some other notes on the form and format of the dissertation are provided in Section 5.1 below.

You are encouraged to write up draft chapters as the investigative and developmental work is done, and to ask your supervisor to read and comment on draft chapters. You should expect your supervisor to indicate particular areas of weakness - possibly in source material, analysis, reasoning, presentation or structure. The purpose of the criticism is to let you know what are the most important improvements you should consider making. It is important for you to understand that supervisors are not able to mark work in advance of it being formally submitted in the final dissertation. Do not expect your supervisor to say if you will pass, get a distinction etc - until the final dissertation has been assessed they cannot answer such questions.

You must also be realistic in the work you ask your supervisor to review, and allow adequate time for them to look at your work. Also bear in mind that good answers require good questions. For example, instead of asking your supervisor a vague question such as 'what do they think of this chapter', ask specific questions such as 'is the overall structure OK' or 'is it clear in section 4 how the program was written?'

There is a word limit, and you will lose marks for exceeding it. You should restrict yourself to a maximum of 12000 words, not including diagrams, appendices, bibliography, abstract and contents page. There is a set format that you should follow for your dissertations. A template for your project report is available on Blackboard.

The ability to express yourself efficiently is an important skill. You will probably find that you initially write lot more. The process of trimming your dissertation will improve it considerably by making it more focused. If you feel that you cannot discuss your work in the word limit set, consult your supervisor for guidance.

Appendices should be used to provide supporting information and evidence for the dissertation itself. Appendices should not be excessive - there is usually no need to include every diagram, chart and listing which has been used in the development of a piece of software. Your supervisor will be able to give advice on what is best included in the appendices for your particular project. Normally the appendices should be bound into the same volume as the dissertation itself.

The original proposal should be included in the appendices.

Diagrams, tables and charts should be included in the appendix. These are not part of your page limit.

Resources on Writing

- Andrews G. (2017), How to Write a Master's Dissertation: Outline and Examples (Essay and Thesis Writing Book 7), Kindle Edition.
- Harris D. (2015), Getting the Best of Your Dissertation: Practical Perspectives for Effective Research, Thought Clearing
- Bailey, S. (2011) Academic Writing for International Students of Business, Routledge, Abingdon
- Gillett, A, Hammond, A and Martala, M (2009) Inside Track to Successful Academic Writing, Pearson Longman, Harlow

5.1 Dissertation Contents

Your dissertation should include the following chapters:

1. **Abstract**
2. **Introduction**
3. *Literature Review*
4. *Practical Work*
5. *Results, Analysis and Evaluation*
6. *Project Evaluation*
7. **Conclusions and Recommendations**

The **chapters in bold** must be included.
The exact title and contents of the *chapters in italics* will depend on the nature of the project. See below for more details

Abstract

The Abstract should be a single paragraph summarising the project, including one or two sentences each on:

- Motivation for the Project
- Research Hypothesis/Question/Aim
- Work done
- Results
- Conclusions

The job of the abstract is to summarise the project in such a way to allow a reader to decide whether the report is relevant to them, and whether they should read it.

Introduction

The Introduction should summarise the entire project, including a paragraph each on:

- Motivation

- Research Hypothesis/Question/Aim
- Work done (including list of objectives achieved)
- Results
- Conclusions

The Introduction should also include an explanation of structure of the report. The job of the Introduction is to summarise the entire project in such a way that **the reader should not need to read the rest of the report**, since all the important points are summarised here. If the reader were interested in some particular detail of the project, then the introduction should direct them to the relevant chapter.

You should not write the introduction and abstract until you have completed the entire project

Literature Review

The literature review chapters should each concentrate on one particular aspect of the background. It is a review, not a survey, which means that it should not be a collection of all previous literature in the field, but instead should be a careful selection of relevant papers. For each paper selected, you should discuss its relevance to your project, discuss the work done, the results found and the strength of those findings. There should be some degree of critical evaluation: some research is stronger than others, and just because some research has been published does not mean that it will be convincing or definitive.

The hypothesis or research question and research aim should be the natural conclusion of the literature review. In other words it should follow clearly and logically from your review why your chosen question is worth asking (and answering). For example because it fills a hole in existing research, or corroborates previous work, or tries a variant of previous research

Practical Work

This should discuss any practical work done.

If your practical work has consisted of experimental work, then this should include a discussion of each stage of the experimental process including

- Definition of experimental variables and other requirements
- Design of experiments
- Implementation
- Collection of Results

Along with consideration of any tools and technologies used.

This discussion should outline the choices made, along with any alternatives considered and the reasons for those choices.

Results, Analysis and Evaluation

The content of these chapter(s) depend on the nature of the project but the overall idea is to determine how well you have met your original research aim/question. For development type products this should include an analysis of to what extent the product created – or the method used to create the product – meets some evaluation criteria. In this case then this chapter should discuss the choice of criteria, how they were measured, and the results. In the case of experimental projects, this chapter should include an analysis of the results of the experiments, including some consideration of their statistical significance and reliability.

In addition you should discuss how your findings contribute to the wider academic body of knowledge, and compare your results/findings/hypotheses with those of others, particularly those studies you included in your earlier literature review.

Project Evaluation

This should evaluate the quality of the project as a whole, including a consideration of how well each of the objectives were met. For example:

- How effective was the literature review? Is it possible that there were relevant techniques or issues that were ignored?
- Were there alternative hypotheses that could have been tested?
- For developmental projects, what other evaluation criteria could have been considered?
- How complete were the experimental results; how reliable are the conclusions

Conclusions and Recommendations

The conclusions should present the answer to the original research question, along with any other conclusions reached along the way (for example, about the best choice of tools or technologies). There should be no 'surprises' in this chapter: each conclusion should have been noted and evidenced elsewhere in the dissertation.

Recommendations should also be included for further research, for any possible practical applications, or any recommendations for future practice.

5.2 Dissertation Layout and Format

Dissertations are required to be written in a standard format, to ensure consistent lengths and to make marking easier. A dissertation template is included on Blackboard to make this process easier. **You should use this whenever possible**

Layout

Paper size: A4, Typed on one side of the paper only in a 12-point font.
The paper should be of good quality and not be transparent.

Margins: At least 20mm should be left all round and a left-hand margin of 40mm to allow binding.

Spacing: Double or one and a half spacing should be used throughout, except for indented quotations or footnotes, where single spacing is adequate.

Pagination: Pages should be numbered consecutively throughout the dissertation, including preliminaries and appendices; it may be advisable to number the pages only when all the typing has been completed.

Preliminary material

The title page should state:

- the full title and sub-title
- the full name of the author, including forenames
- the qualification for which the dissertation is submitted
- the name of the institution
- the department in which the work was conducted
- the year of submission

The title should describe the subject matter accurately and comprehensively as it may subsequently appear in bibliographies which will be consulted by other research workers.

The declaration provided in the dissertation template should immediately follow the title page. Please make sure you complete the word count.

An abstract of the dissertation, usually around 300 words and not exceeding 500 words, should then be included. The abstract should occupy one side of one sheet, be clearly typed or printed and headed with the author and title of the dissertation.

The table of contents should immediately follow the abstract and list, with page numbers, all the chapters and subdivisions that are included in the dissertation.

Main text of dissertation

This should be divided into numbered chapters each with a clear title.

Bibliography

This should be a list of sources that have been referenced in the text, along with any other relevant sources consulted, listed in alphabetical order. The bibliography should use a standard form of referencing such as the Harvard style of referencing. If you are uncertain what to use, please consult your supervisor.

Appendices

Appendices should be numbered and given a descriptive title. The research proposal should be included as an appendix. Experimental results, design documentation, coding, etc can also be included as appendices. There is usually no need to include all this information – only the parts that are relevant to the discussion.

Footnotes

Footnotes should be identified in the text by numbers and place the notes in numerical order at the foot of the page

References and Quotation

It should be clear from the text which of the material presented and opinions expressed are yours and which are other peoples. You do not need to worry about copyright in making direct quotations or copying figures provided you acknowledge the source. **However, any failure to acknowledge the source of material, however minor, will be treated as plagiarism according the University Assessment Regulations.**

You should list references in the bibliography, using a standard form of referencing such as the Harvard system.

References may be cited in the text in a number of ways. The Harvard system simply states the name(s) of the author, followed by the date of the publication.

> *... a popular Pascal text by Findlay and Watt (1985) is employed ...*

If there are more than two authors, you simply state the name of the first author on the publication followed by *et al* and the date of publication in brackets.

> *... according to findings by Benedict et al. (1993) ...*

All text in the dissertation should be your own. If you wish to quote some text from another source, it must be clearly indicated, or you will be considered to have plagiarised. To quote text from another source:

Small quotes: This applies if you wish to quote a single sentence, or less. Include the text inside your own words inside quotation marks. Italicise the text and put the reference in brackets afterwards. For example:

> *It is indisputable that "ACS is more effective if the ants start at different cities" (Rook 1999)*

Large quotes: This applies to any quote that is more than a single sentence. The text should be inserted as a separate paragraph to your own text. The paragraph should be indented, and possibly use an alternate font. The quote should be clearly referenced at the bottom. For example:

> *The following is a taken from a paper describing research on artificial intelligence.*
>
> > It is easy to modify the experiment above to the case in which the bridge's branches are of different length [60], and to extend the model of Equation 1 so that it can describe this new situation. In this case, because of the same pheromone laying mechanism as in the previous situation, the shortest branch is most often selected: The first ants to arrive at the food source are those that took the two shortest branches, so that, when these ants start their return trip, more pheromone is present on the short branch than on the long branch, stimulating successive ants to choose the short branch.

(Dorigo and Di Caro 1999)

It can be seen from this that…

(In the bibliography, this should be referenced as:

> Dorigo, M. and Di Caro, G. Ant algorithms for discrete optimisation. Artificial Life. Vol 5 No 3 pp 137-192 1999.)

Very large quotes: Quotes of more than six sentences should not be used, unless your supervisor has indicated that it is safe to do so.

5.3 Project Completion and Submission

The project is only deemed to be completed when all of the aims/objectives set out in the project proposal have been achieved. You should seek the advice of your supervisor on the issue of whether the project is in fact complete and has apparently achieved its aims and objectives. An incomplete project, even if the dissertation is well produced and written, may count against you.

Make sure you know the deadline for the dissertation submission. If you are not sure, ask the project tutor and make a note on the back page of this document.

You are required to submit your dissertation online through the BlackBoard portal. Details of the form and format of the dissertation are provided above. The project log book should be submitted as an appendix in your dissertation. You should also submit any additional materials in a form of appendices.

We will also ask you to place your project onto the TurnItIn database, in order to guard against plagiarism. We will give you more guidance on how to do this later.

If you think you may not be able to complete your dissertations by the published deadline, you should ensure that the Project Tutor and your Supervisor are both aware of the situation as early as possible and you will need to follow the process for a late submission or personal extenuating circumstances (PEC) claim.

Online Submission

You are required to submit your dissertation online through the BlackBoard.

Submission Procedure

Since the project is a major component of your MSc, and also represents genuine research that may be of benefit to other professionals, the submission procedure is more complicated than other modules. Make sure you allow time for this. In this instance. To submit, you need to do the following:

- Make any last checks for spelling. Check the bibliography adheres to the referencing system you are using. Make sure that there are no sections that have been accidentally copied from other sources. (See below on how to use TurnItIn to do this.)
- Include your original research proposal in the appendix.
- Sign and date the page near the front that reads "I certify that ....."
- Load your dissertation onto the Blackboard (eLP).

    1. This system will check your dissertation for originality. If you have copied any material from another source, the system will note this. You can view an "Originality report" which will show any sections of your report that seem to be similar to other reports or internet resources. It is normal for any report to contain several phrases that are similar to other sources, so don't worry about small sections. You also don't need to worry about sources that are clearly marked as quotes and properly referenced. Note that a clear originality report does not mean that your dissertation includes no plagiarism, only that the TurnItIn system could not find it. We might still be able to. You are welcome to upload one draft copy of your dissertation to this system, in case you want to try out a draft of your dissertation before submitting the final one. If you have any problems with this system, just contact the project tutor.

- After you have submitted your project, you should arrange the viva. This should normally be held about a week after submission. This gives the markers time to read your report. Your supervisor and second marker will attend the viva. See the section below for advice on the viva.

5.4 Extensions

Requests for extensions to the project need to be approved by the Faculty Office initially. They may then refer you to your programme leader. No-one else can grant an extension. Extensions will only be granted for genuine reasons, backed up my documentary evidence. The normal extension request form available from the Faculty office should be completed by you, normally after discussion with your supervisor.

Suitable reasons for extensions include:

- Serious illness that prevents you from working for a week or more.
- A personal tragedy, such as bereavement or personal problems that required counselling.
- A natural disaster – earthquake or flood.

You can only get an extension if you have documents as proof – such as a doctor's note or a note from the counselling service. The following are not reasons for extension.

- "I need more time." You should have worked harder.
- "It took me a long time to come up with an idea." That is part of the project. If it took you a long time, you should have worked faster on other parts.
- "I went on holiday for two weeks." You knew the time scale of the course. You should not have taken holiday during term-time if you could not afford to. If you have to take your family on holiday, take your work with you.
- "My computer crashed and I lost all my work." Have you never heard of backups?
- "It took me a long time to learn XYZ." It was part of the project. You should have allowed for it.
- "I'm a full-time student, but I had to work over the summer." We sympathise with students who need to work to pay their fees and will continue to press the government for more student funding. However, this is a full-time course and you should be working full-time on it.
- "I'm a part-time student and I had a hard time at work." We have already given part-time students extra time to allow for this. We cannot allow more. We may be more sympathetic if you have been sent abroad for a month or more.
- "The printer ran out of ink and I only have 10 minutes until the deadline." You should have allowed time. Have a busy 10 minutes.
- "I had a cold for a few days." Serious illness only, please.

Our policy may seem harsh, but we have to be fair to students who manage their time well. We also need to justify our policies to external moderators and other organisations that inspect our institutional standards.

Extensions will normally be for no more than two weeks. This is very important: if you are granted an extension of more than two weeks, we cannot guarantee to mark your project before the award board. We might, but we might not. This could mean that you will wait several months before receiving your MSc award.

6 Assessment Criteria and Mark Scheme

The assessment criteria and mark scheme used to assess your project dissertation and viva are provided below. Please ensure you look at these before you start your project so you know what we are going to assess you on.

6.1 A: Top-Down Measures of Quality

In reaching a final mark for the project, dissertation and viva, a top down and bottom up approach will be adopted. The top down measures of quality are as follows:

0 - 39% Clear Fail: Attainment is consistently and clearly below Masters level. The reason(s) for this may include some or all of the following:

- An inadequate survey of the available literature in the area of the study.
- Failure to meet one or more of the objectives of the project.
- Inadequate rigour in the application of techniques/tools.
- Lack of a disciplined, ethical and professional approach to tackling the research project.
- Failure to address a central computer science and digital technology issue in necessary depth.
- The absence of a required section in the dissertation.
- A partial or no demonstration/presentation was given, or the demonstration/presentation gave no useful information.
- The student could not answer some questions during the viva in any meaningful way.

40 - 49% Marginal failure: Attainment generally below acceptable level, although there is potential for it to reach a pass standard. The dissertation and viva and their response to questions in the viva should show that higher achievement could be reached is more time was devoted to it or another approach had been taken.

50 - 59% Basic Pass: Close to the minimum acceptable standard for a pass. Work in this mark range may fail to fulfil one of the major objectives of the project yet must exhibit a reasonable understanding of the fundamentals of computer science and digital technologies relevant to their chosen project and adequate use of technical communication skills, problem solving, independent study, knowledge of the literature and a disciplined, ethical and professional approach to tackling a substantial research project. The viva demonstrated an acceptable level of understanding.

60 - 69% Good Pass: Attainment which is overall better than acceptable but is not outstanding. There is evidence from the dissertation and viva of a sound understanding of the major computer science and digital technologies relevant to their chosen project together with a reasonable attempt to tackle more advanced topics and issues. There should be a convincing demonstration of technical communication skills, problem solving, independent study, knowledge and application of the literature and a disciplined, ethical and professional approach to tackling a substantial project.

70 - 85% Distinctive: The dissertation and viva clearly demonstrate a high degree of quality and originality in the application of standard techniques, and indicate an excellent professional endeavour. The work includes novelty and invention that goes beyond the accurate, appropriate and validated use of standard methods and tools, demonstrating strong technical communication skills, problem solving, independent study, knowledge and application of the literature and a disciplined, ethical and professional approach to tackling a substantial project. The dissertation is fluent, coherent and of an excellent academic standard. The viva clearly outlined the research approach, its implementation and the key findings and outcomes and demonstrated a deep understanding.

86-100% Distinctive and Outstanding: In addition to the distinction category, here the research work exhibits a high level of complexity and professional quality, evidence of an excellent understanding of the academic context of the work, a capacity for analytic thought, an ability to penetrate a complex application domain and a high quality of self appraisal. The standards of proof and the quality of writing shown in the dissertation should be equivalent to that of publication in a good quality journal. The viva provided valuable and thoughtful insight into innovative research and its outcomes.

6.2 B: Bottom Up Marks Breakdown

The following provides a breakdown by the four different elements that are assessed and should be used in conjunction with the top down measures of quality outlined above.

Abstract, Introduction and Literature Review (25 marks): The abstract should make clear the main question/aim addressed, the broad methodology used and the main findings. The introduction should include a discussion of the context and potential benefits of the work, an explanation of the main aims, a list of the objectives and a breakdown of the structure of the report. If you have changed or added any objectives since the research proposal review, these changes should be made clear. You will be expected to consider and outline here the main professional, ethical, legal and social issues related to this academic research project. The literature review should assess your presentation of a suitable range of literature relevant to the research. This section is a review, not a survey. This means that you should discuss the literature, explaining the range of validity, relevance to the project, strength of the findings, etc. rather than simply paraphrasing. You can be given credit for a clear explanation of difficult concepts. You should discuss the relevance and applicability of the literature to your own work. You should demonstrate the ability to critically evaluate the research of others and to assess the strength of the evidence/discussion presented.

Description of Practical Research Work Undertaken (25 marks): This section should assess the discussion of the practical work you have done, such as requirements analysis, design, construction, installation, experimental work. Your testing and/or data collection approach should be included in this section although the results from this form part of the next section. You should make it clear what you have done, and should also include rationales for the approaches and techniques used, including how you have addressed any ethical, social and legal issues in your approach. You should also include a discussion of any ideas that have been rejected.

Results and Analysis (25 marks): This section should assess your results/findings and your analyses of these. Examples of techniques you may use include reasoned evaluation, thorough product testing, scientific testing, data analysis, internal and external validation and statistical survey. You would normally make use of more than one technique, and your use of the techniques should reflect the postgraduate nature of the research. You should also justify your choice of techniques and ensure that they are applied in an ethical and professional manner, including any data protection issues.

Critical Evaluation, Conclusions and Recommendations (25 marks): Your critical evaluation should assess your own research outcomes and how your findings contribute to the wider academic body of knowledge, including any comparison of your results/findings/ hypotheses with those of others. You should assess the strength of the key findings, the limits of their applicability and their probable usefulness. You should discuss the extent to which the main aim has been achieved and which objectives have been satisfactorily met. There should also be a critical assessment and evaluation of your own work and your professional approach to this research project, including an appraisal of how you have addressed any ethical, legal and social issues. In the conclusions and recommendations, you should assess the strength and presentation of the findings and the recommendations. You should present your answer to the original research aim/question and should discuss how well the original problem has been solved. This should include reference to the results obtained by you. You should also discuss any interesting additional discoveries that have been made. Recommendations may include suggestions for further research, suggestions for improved practice based on your findings and suggestions for practical application of any new concepts that have been investigated.

6.3 Referencing Style

The set referencing style for the dissertation is Harvard, you should consult with your supervisor and follow this standard system.

6.4 Expected size of the submission

The length of the written dissertation should be typically in the range 10,000 – 12,000 words including the abstract but excluding the references and appendices. Further guidance on the format and layout of the dissertation is provided in the project handbook. The project viva will usually last no more than 30 minutes with 10-15 minutes of presentation and 10-15 minutes of questions. The viva can also be used to demonstrate any practical products/applications/ experiments that have formed part of the project.

6.5 Assignment weighting

An overall mark will be agreed for the dissertation and viva and is worth 100% of the overall mark for this module.

6.6 Additional Important Information:

Academic Integrity Statement: You must adhere to the university regulations on academic conduct. Formal inquiry proceedings will be instigated if there is any suspicion of plagiarism or any other form of misconduct in your work. Refer to the University's Assessment Regulations for Taught Awards if you are unclear as to the meaning of these terms. The latest copy is available on the University website.
https://www.northumbria.ac.uk/sd/central/ar/qualitysupport/asspolicies/
Failure to submit: The University requires all students to submit assessed coursework by the deadline stated in the assessment brief. Where coursework is submitted without approval after the published hand-in deadline, penalties will be applied as defined in the University Policy on the Late Submission of Work. https://www.northumbria.ac.uk/static/5007/arpdf/lateappr

6.7 Plagiarism

All phases of the project are covered by Northumbria University Assessment Regulations, available at http://northumbria.unn.ac.uk *> current student > assessment regulations.*

If you haven't read the assessment regulations, read them now. Ignorance of the assessment regulations is not a defence in the case of accusations of academic misconduct.

And finally, we hope you find your MSc research project an enjoyable, stimulating and rewarding experience.

Appendix A. Project Log

The purpose of this log is to provide a record of the supervision process and to ensure that any issues and agreed tasks are recorded. This form must be presented and signed at each meeting with your supervisor. You should record time spent and a summary of work done before the meeting. The other parts of the form must be completed at the meeting. After completing the form it must be signed by both parties.

Meetings with your supervisor should be on a regular basis. Generally such meetings will be a maximum of one hour in duration. Depending on progress they may be shorter. They must take place so that your supervisor can assess your progress.

Date and time of meeting	
Brief description of work done since last meeting	
Hours spent on project since last meeting	
Issues identified during supervision	
Agreed tasks for next meeting	
Date and time of next meeting	
Student signature	
Supervisor signature	

Appendix B. Project Risk Assessment Form

This form is to be completed by you and discussed with your supervisor and second marker during your Research Proposal Review. You and your supervisor should each retain a copy and review it on an ongoing basis during the project period.

ARE YOU AWARE THAT NO ONE IS ALLOWED TO WORK ALONE IN THE LABORATORY? YES/NO
(delete as applicable)

Student Name	
Student ID	
Student Email	
Programme Title	
Project Title	
Project Location	
List the Significant Hazards associated with your project *(continue on a separate sheet if necessary)*	
List the other people at risk *(continue on a separate sheet if necessary)*	
Describe the working procedures to be used to minimise risk *(continue on a separate sheet if necessary)*	
Are there any other Risk Control Measures needed? *(continue on a separate sheet if necessary)*	
When will you and your supervisor review the risk assessment? And how will the risk be monitored on an ongoing basis?	
Student Signature	
Supervisor	
Supervisor Signature	
Second Marker	
Second Marker Signature	
Date of Agreement	

Guidelines for Completing the Risk Assessment Form

Significant hazards might include one or more of the following. The list is not exhaustive, and you must include any other items, which might be interpreted as comparable or more serious than these. If you feel there are no significant risks, write "None".

- Live electrical supplies in excess of 50 Vac or 120 Vdc.
- Soldering.
- Lasers, RF or microwave sources.
- Hazardous chemicals or substances, such as PCB etching fluid ($FeCl_3$), hot liquids, dry ice etc.
- Mechanical hazards, such as traps, rotating shafts, robots, reciprocating and rotating machinery. Systems subjected to pressure such as pneumatics or hydraulics.
- Manual handling, such as lifting heavy or bulky objects.

Avoid mentioning the trivial, such as tripping over chairs, accidentally pulling equipment of benches or banging into doors. These generally fall into a category against which we must all be alert, but which do not require special cautionary knowledge or preparation, not have special safety regulations, or need any protective equipment.

Others at risk might be your fellow students nearby, or technicians or lecturers (don't mention them by names). The aims are for you to be aware that you have some responsibility for your neighbours, and to inform them of, or protect them against, any of your activities that might be hazardous.

The answer to the question of awareness of not working alone in the laboratory must be yes.

Procedures might include the following

- High voltage: use our special isolating boxes and shrouded cable terminals. Connect up circuits only when they are ""dead" and if, required by your supervisor, energise only after they have been checked.
- Soldering: use a metal guarded stand for the soldering iron to prevent burning. Avoid working with your eyes very close to the workpiece, or, if you must, wear glasses or goggles.
- Lasers: be familiar with the CVCP code.
- RF or microwave signals: be familiar with the power density of your source(s), the dangers of excessive levels, and the necessary precautions.
- Hazardous chemicals or substances: provide a COSHH assessment and follow these guidelines.
- Mechanical hazards: be aware of the dangers to yourself and others, and use suitable guards.
- Heavy or bulky objects: be trained in the correct ways to handle such items, or ask someone who has.
- Computers: follow the guidelines (HSE's "working with VDUs") on adopting comfortable seating, typing and reading positions, with suitable display clarity, and avoid sitting in the same position for long periods.

A mid session date should be specified, e.g. week 6 of the semester, to reassess the position in the light of your progress. New hazards will require you to complete a new form, or adding to this one. No change of hazard should be stated as such on this form, and additionally dated and initialled by you and your supervisor.

Two copies of this risk assessment are needed:

- One for our department files (to be retained by your supervisor for the duration of your project).
- The other for you to bring to project laboratory sessions.

This form has been devised to comply with the Management of Health at Work Regulations 1992.

Appendix C. MSc Project Ethical and Risk Assessment Form

This should be completed at your research proposal review meeting and one signed completed copy should be retained by your supervisor, and a second copy submitted to the Faculty Office for the attention of the Computing Programme Support Team. If approval results in a 'red' flag, this form should be referred to FREC (Faculty Research Ethics Committee) and approval must be given before any research can commence.

Appendix D. Key Facts & Dates/Deadlines

PLEASE COMPLETE THIS TABLE WITH THE KEY INFORMATION & DATES/DEADLINES

Deadline for submitting Project Initiation Form	
Deadline for submitting Research Proposal	
Date of Research Proposal Review Meeting	
Deadline for submitting MSc Project Ethical and Risk Assessment Form	
Deadline for submitting Dissertation	
Date of Viva	
Name of Supervisor	
Name of Second Marker	
Name of Project Tutor	
Name of Programme Leader	