Guided Technology Project Handbook

Higher Diploma in Science in Computing (Award)

October 2018

Contents

Appendices

1. Introduction

1.1 Handbook Purpose

The purpose of this handbook is to provide the learner with the aims, objectives and assessment procedures for the 15 ECTS Guided Technology Project. The Guided Technology Project module is an elective module that features in the 3rd semester (full-time route) or 4th semester (part-time route) of the QQI awarded Higher Diploma in Science in Computing programme, at the College of Computing Technology (CCT).

This handbook covers the following:

- Intended Project Learning Outcomes
- Learner and Supervisor Roles and Responsibilities
- Assessment procedures and requirements, and expected schedule of project activity
- Guidelines on report style and structure, referencing style and plagiarism

1.2 Introduction to the Guided Technology Project Project

As a requirement for completion of the Level 8 Higher Diploma in Science in Computing, learners are either required, or obliged, to take either a Work Placement **or** a Guided Technology project module, both modules are 15 ECTS and feature in Semester 3, full-time route, or Semester 4 on the part-time route.

Intended Module Learning Outcomes

On completion of this module the learner will be able to:

1. Demonstrate an advanced ability to research an assigned problem area and propose an innovative solution while applying ethical and legal considerations
2. Construct a detailed project report using appropriate scheduling techniques and perform a resource and risk analysis using various best practice approaches
3. Apply knowledge and understanding within specific areas in modern computing such as programming, databases, networking, web development and mobile technologies
4. Design and build a working prototype using various systems analysis approaches and Systems Development Lifecycle methodologies
5. Act under supervision to reflect on the project progression through the iterative design process and through the various supervised feedback mechanisms
6. Exhibit competence, accountability and autonomy by making informed critical decisions at key project milestones and perform relevant research required for in-depth understanding and awareness of project attributes to manage learning tasks independently
7. Express an awareness of ethical and legal issues and diversity and multiculturalism through the commercialization analysis of the project build
8. Confidently present a working product in a succinct, efficient manner and show how the product was developed with specific reference to sectorial relevance, demonstrate areas of improvement and further development

Module Objectives

It is the aim of this module to provide the learner with knowledge of:

1. Advanced research methodologies, methods and data collection and analysis tools
2. Concepts and methodologies in project planning and milestone analysis, resource management and risk assessment.
3. Selecting and applying appropriate programming languages, tools and technologies within a systems development project.
4. Ethical and legal obligations and considerations with regard to solution mapping processes
5. The process of effective communication through supervisor led sessions and the ability to critically appraise feedback and use autonomy to direct a project
6. Self-reflection and feedback analysis by placing tacit feedback into written objectives
7. Diversity and multiculturalism with respect to design, development and implementation

1.3 Supervisor's Role

The project is a set of activities that an individual takes full responsibility and accountability for. While it is important that the Individual co-ordinate their own meetings it's also a project requirement that the Individual meets with an assigned Project Supervisor on a scheduled basis.

The role of the Project Supervisor is as follows:

- Facilitate on-site progress meetings on a weekly basis.
- Provide general feedback about quality of work to date and overall progress.
- Provide advice about project activities, methods and evaluation/monitoring issues.
- Make suggestions about useful sources of information, literature, and the technical resources such as international standards and organisations relevant to the project.
- Facilitate additional meetings with other faculty members with regard to subject matter expertise.
- Participate in the assessment and marking of the project attributes.

Each learner will be assigned an individual supervisor but other supervisors will be available for consultation depending on the specific technical requirement. Project supervisors will be selected from the available pool of full and part-time IT faculty at CCT. Guidance can be sought from other sources and this process can be discussed with the principle project supervisor.

In addition to the project supervisor, learners will have additional support through the ICT Faculty Coordinator. The ICT Faculty Coordinator will provide useful guidance on completing the various documentation requirements, as well as providing general feedback on progress through the project attributes. The ICT Faculty Coordinator can also assist in the procurement of additional resources the learner may require, can assist with regard to ethical permission requests, as well as liaise with third parties where meetings are required.

1.4 Learner's Role

The learner will be provided guidance (through a series of lectures) on the format of the project, the expected deliverables and various attributes of the project. The learner will also receive

guidance on reflection, logging and writing, research, methods and plagiarism.

The learner is expected to show autonomy throughout the project lifecycle, while sufficient support and support resources are available to the learner, autonomy, criticality, accountability and responsibility are key requirements of the learner. These form the evaluation process further discussed in section 2.

The learner is expected to liaise with the supervisor with regard to the arrangement of weekly project update and progress meetings, and to lead these one-to-one sessions by providing progress updates and outlining the schedule of activities.

The role of the learner is as follows:

- Communicate with the principal supervisor with regard to weekly meetings
- To take responsibility and accountability for the management of the project plan
- Ensure guidelines on ethics and academic integrity are adhered to
- To liaise with the ICT Faculty Coordinator for general project attribute queries, and to request additional resources if required

2. Assessment Breakdown and Timeline

2.1 Overview of project assessment

Assessment will be based on the set of project attributes outlined below. These attributes are expected deliverables upon the completion of the project cycle. The Individual work will constitute 100% of the overall marks which can be set as milestones throughout the semester. This distribution of marks ensures that individuals can assess their progress and receive ongoing feedback and evaluation on their performance.

Assessment Components

Attributes	**Mark Weighting**
Attribute 1: Project Report	25%
Attribute 2: Ability to plan, scope and manage a project	10%
Attribute 3: Quality and functionality of the final working prototype*	30%
Attribute 4: Prototype Presentation and Demonstration*	10%
Attribute 5: Attendance and engagement at scheduled supervision sessions	10%
Attribute 6: Reflective Learning Journal	15%
TOTAL	**100%**

**To ensure fairness and consistency blind marking will take place for these components*

2.2 Project context

It is recommended that learners apply their existing knowledge and skills to projects and apply caution for attempting to acquire new critical skill areas for the project to be successful. The learner will create a short project proposal which will be presented to the supervisors, and upon agreement of the proposal, the learner can commence the project based on mutually agreed milestones and deliverables.

2.3 Plagiarism

Plagiarism, as already covered in previous modules, is academic dishonesty. Plagiarism is the presentation by a student as his/her own work of a body of which is wholly or partly the work of another. Therefore learners should never submit as your own, complete or partial essays/reports/computer programs/images etc. Learners will be severely penalised if found guilty of plagiarism.

Where reference is made/quotations used from others' work, those parts of the work produced by others must be clearly marked and cited where they appear in the main text, and properly referenced at the end of the document. The learner must make sure that he/she acknowledges materials from others through the use of quotation marks, and citations to entries in your list of references. The default referencing style to be used is Harvard, if you have a preference for

alternate methods please discuss this with your supervisor. Your project supervisor can provide further advice on issues with citation and referencing.

All project submissions (documentation and code) may be subjected to checks using plagiarism detection software.

2.4 Important Dates and Deadlines

GUIDED TECHNOLOGY PROJECT PROPOSED SHCEUDLE OF ACTIVITES	
Week No. (approx.)	Project Activities / Deadlines
1	Issue of Project Handbook & Project Context
2	Lecture: (Advanced Research Skills / SDLC)
3	Lecture: (Managing a Project / Reflective Practice)
4	Lecture: (Advanced Research Skills / SDLC)
5	Lecture: (Managing a Project / Reflective Practice)
6	Lecture: (Advanced Research Skills / SDLC)
7	Lecture: (Managing a Project / Reflective Practice)
8	Lecture: (Advanced Research Skills / SDLC)
9	Lecture: (Managing a Project / Reflective Practice)
10	Lecture: (Managing a Project / Reflective Practice)
11	Lecture: (Managing a Project / Reflective Practice)
12	**DEADLINE: FINAL SUBMISSION** - Submission of **Attribute 1**: **Project Report** - Submission of **Attribute 3**: **Working Prototype** - Submission of **Attribute 4: Prototype Presentation & Demonstration** - Submission of **Attribute 6: Reflective Learning Journal**
13	Project conclusion and feedback meeting with supervisor

3. Guided Technology Project – Overview

The Guided Technology Project should closely follow the Software Development Life Cycle (SDLC), where learners are expected to fully plan, design, implement, test and document a software system, or similar. This will enable Individuals to develop software systems using a structured process methodology, similar to that of a real-world project.

Learners are provided a project context to act as the principal guide for the planning and development of a working prototype. The project context is devised by the faculty involved in the delivery of the Higher Diploma programme, to ensure key aspects of their learning are integrated and explored in their individual projects. The project context can be expanded on by the learner if additional experience held by the learner is justified in the proposed project plan. Please refer to **Section 8** for sample project contexts.

The skills and knowledge gained from subjects in previous semesters, such as Software Development Fundamentals and Databases, will aid the learners in structuring the project according to a SDLC methodology. The SDLC, and other key knowledge areas such as project management, will be covered as part of series of lectures within this module.

Typically learners will begin by focusing on the assigned project context, in terms of analysis and design of the proposed system, where individuals will identify how the system should work and what problems need to be addressed in the development of the system. Learners will then work towards building and implementing a working prototype of the system with a detailed project report that outlines the design, building, testing and coding phases. Documentation and the prototype will be presented to supervisors in the form of a demonstration where learners will be expected to walk through their system, their approach with justification for choices made, and conclusion.

4. Guided Technology Project – Assessed Attributes

4.1 Attribute 1 – Project Report

Each project is different, and the precise form of evidence of progress and development will vary from project to project, and be negotiated with your project supervisor. However, the Individual will need to document a detailed project report to including planning, design, build and development steps and issues and should represent closely the final artefact build. Please see **Section 5** for further details.

Learners are expected to perform detailed academic research and include this research within their project documentation. Correct citing is required with an accompanying reference list.

4.2 Attribute 2 – Ability to plan, scope and manage a project

As the learner is responsibility for the planning and management of the project, evidence is required to support a coherent plan was devised and followed. This is evidenced on a weekly basis through a meeting with the supervisor. As with the nature with real world projects, changes and deviation from initial plans are permitted, so long as these are discussed with the supervisor and documented accordingly.

4.3 Attribute 3 – Quality and functionality of the final working prototype

The quality and functionality of the final working prototype should mirror what is presented in the project report. Learners will have the opportunity to present their working prototypes to their supervisor and other programme faculty members. Learners are expected to provide a full and detailed demonstration of their prototypes, and this will follow a question and answer session. Specific databases or code sections may be called upon for viewing and discussion.

4.4 Attribute 4 – Prototype Presentation and Demonstration

Each learner will have an opportunity to present their finished artefact to their supervisor, and programme faculty member, in the form of a conference style demonstration. The learner will answer questions raised by the programme team and will be required to defend aspects of the final artefact design, build and functionality and choices made.

4.5 Attribute 5 – Attendance and engagement at scheduled supervision sessions

The learner is required to meet the supervisor once per week at an agreed time. The supervision session provides the learner an opportunity to go through progress made and to address some key ideas during the development of the project. The supervisor will provide advice, and suggestions, as the project progresses and learners are expected to either build in feedback or justify a change of direction. Supervision sessions take place throughout the semester.

4.6 Attribute 6 – Reflective Learning Journal

Each learner will be responsible for documenting their key learnings each week through a process of reflection. The process of reflection and logging is covered in the scheduled Guided Technology Project module lecture series.

Supervision feedback and action taken should be incorporated into the journal. This action will determine future decisions and considerations while facilitating and strengthening knowledge. Learners are required to complete a reflective learning journal (weekly submissions) and submit this at the end of the semester.

5. The Project Report

5.1 Project report overview

The project report will provide evidence that the learners have gone about their project in a reasonable way to solve the problem outlined in the project context. The Individual documents their literature review, so a reader can see the previous works that have influenced their point of view, and the Individual documents their system analysis, design, implementation and testing, so that there is evidence about how the individual has followed a systems life cycle process in an attempt to solve a problem.

The Individual may need to refer to the results of their testing and any user evaluations as evidence to support their project report conclusions about the success of their system as a means of solving the problem they have set out to solve.

Issues to keep in mind when writing the project report is that it is an argument and a story about how the individual has chosen to solve a particular problem, including:

- Academic story with a document / resource trail:
    - Citations to entries in list of references
    - Must present alternatives for important decisions, evaluate each and then argue choices they make
    - The important thing is that even if someone reading the dissertation doesn't agree with the Individual choices, they can describe them, and understand their arguments

5.2 Project report style

The project report should be written to conform to the CCT Project Report document style. A copy is available in the Academic Office. This is the default structure for the project report – exceptions can be made to the report style if the learner as a justification for using an alternative style.

The project report should be typewritten and conform to the following guidelines:

- Normal text should be in Times New Roman font (or similar) and be sized 12 point
- Paragraphs should be fully justified and unless immediately after a heading paragraphs should be separated by a blank line
- Headings should be numbered to level 3 but no further
- The footer of each page should have at the left the student name and at the right the page number

5.3 Project report structure

The structure of the project report should conform to the following (although the number of additional chapters and appendices will vary from project to project):

- Title page

- Abstract
- Acknowledgements
- Contents
- Chapters
    - Chapter 1: Introduction
    - Chapter 2: Literature Review
    - Chapter 2: System Analysis & Design
    - Chapter 4: Implementation of system
    - Chapter 5: Testing and evaluation
    - Chapter 6: Conclusions and Further Work
- Appendices
    - Appendix A: Project Planning
    - Appendix B: Reflective Learning Journal
    - Appendix C: Code listings
    - Appendix D: (other technical or data appendices as required)
- List of References

Chapter 1: Introduction

The first chapter sets the background and motivation for the project. The problem to be solved is stated, with the project aims and a list of specific objectives.

The chapter could include:

- A brief synopsis of the project context (supplied by CCT)
- General areas of computing that project context covers / requires knowledge of
- Brief summary of your initial proposed plan for addressing the project context
- Short section arguing 'why' this is a good project – outline Individual's skills, interests, strengths – they Individual can describe how the project brings together many of the modules they've listed
- Novel aspects – a real world business or organisation or taking advantage of new technology

Chapter 2: Literature Review

The aim of this chapter is to present all academic research carried out throughout the project cycle. It is important that learners produce research that defends their justifications for choosing one from of technology or software over another, and other sources of information that have helped inform the individuals thinking, planning and delivery of the project.

Chapter 3: System Analysis and Design

The overall aim of this chapter is to answer the questions – exactly what is the application supposed to do? It can include the following, where relevant:

- Functional Requirements
    - Detailed description of the functionality of the proposed system. This should be comprehensive and exact, break up the application into subsystems.

    - Diagrams – use Case diagrams, Wire frames, with text descriptions
- Data Requirements
    - An overview of the entities and data in the system, and what data needs to be stored
    - Diagrams – an Entity-Relationship Diagram
- User Interface Design
    - This should contain an argument as to how this suggested interface supports each of the use cases specified in the analysis
    - Diagrams – Screen designs, either pen-and-paper or computer drawn of how the user interface will appear
- Functional Design
    - Functional design should model both the structure of each software component in the systems, and also how they interact with each other.
    - Diagrams – detailed class diagram and an Interaction Diagram to show the interaction between objects in the system
- Data Design
    - Whether to be implemented as a database or some other central data repository, a detailed design of the data storage components should be presented
    - Diagrams – Normalised database tables

Chapter 4: Implementation of the system

This chapter should detail how the learner implemented a working system based on their design. This should include the technologies used (languages, APIs, frameworks etc.) and how the system was implemented, based on the user and functional requirements identified during the analysis and design phase. This chapter should address any potential problems that could arise in the system and suggested or implemented solutions.

Possible areas for discussion in this chapter are:

- Architecture considerations - e.g. are there specific functional requirements that will influence the software architecture implementation.
- Technologies used - operating systems, databases, computer languages, frameworks, API's etc.
- Implementation of the system - main body of work for the chapter. This will discuss precisely how the system was developed, based on the analysis and design considerations.
- Problems encountered - any issues that may have arisen during the implementation phase, e.g. the project's cross-platform compatibility between different operating systems.

Chapter 5: Testing and Evaluation

Details of the learner's test plans, test results, user evaluations and discussion of these results in detail and in summary.

Possible entries in this chapter might include:

- Functional correctness
    - Set of tasks system should be able to perform – part of requirements specification of system and include a focus on efficiency
    - Set of inputs and correct outputs
    - Set of 'test scripts'
        - Objective of test / statement of which part of systems is being tested
        - Input data/situation
        - Correct output data / state / behaviour
        - Need to show actual results of test – screen shots
        - Evaluation - if actual matches correct then working
- Usability
    - List of usability requirements
        - set of tasks user should be able to perform
        - Have a set of tasks for each type of user
        - System Response times
        - Time for user to complete a task
        - Aesthetic
        - Acceptable navigation of site and layout
    - Set of 'test scripts'
        - Instructions for user
        - Observation / measure time / evaluate success of task
        - Analyse results to come up with usability result
    - Can also measure qualitative usability aspects with questionnaires / structured interviews etc.
- Commercialisation / marketing
    - Requirements – registration on web search engines, direct marketing – discuss real commercialisation aspects of project
    - Evaluation – have set of key words / phrases for targeted websites

Chapter 6: Conclusions

The Individual needs to review the entire project against their problem context, aims and objectives, and evaluate project success and results. This may also include a section for suggestions for further work.

Appendix A: Project Planning

The project planning should be described, and critically evaluated with suggestions for how the project planning could have been improved upon (or not, if the project went well). Indicate how the project monitoring raised any issues and if the Individual needed to re-plan their project at any point(s).

Appendix B: Reflective Learning Journal

Present evidence of the Individual's reflective processes over semester as an appendix.

Appendix C: Code Listings

This and later appendices provide the technical detail of the Individual's project. They should have only included selected code fragments or algorithm summaries in the main chapters,

otherwise the project report can become a monotonous technical manual rather than a story of what they did and why they did it.

Appendix D: (other technical or data appendices as required)

If you have additional technical data to showcase it should be included in this appendix, you can also use this appendix to present the raw data of empirical research carried out (questionnaires, interviews etc.)

- Appendix A: Project Planning
- Appendix B: Reflective Learning Journal
- Appendix C: Code listings
- Appendix D: (other technical or data appendices as required)

List of References

All citations used within the report should include their full reference using the Harvard referencing style. A reference list should be included in this section of the report.

6. Required reading

Required Reading Material Listed in Bold

Title	Author	Edition	Year	Publisher
Projects in Computing and Information Systems: A Student's Guide	**Dawson, C.**	**3rd**	**2015**	**Pearson Education**
Learning Journals	**Jennifer A. Moon**	**2nd**	**2006**	**Routledge**
Project Management for IT-related Projects	Hughes, B., Ireland, I., West, B., Smith, N., Shepherd, D.	2nd	2012	British Informatics Society Ltd
Agile Project Management with Scrum	Ken Schwaber	1st	2004	Microsoft Press

Other learning materials

- International Journal of Project Management: http://www.elsevier.com/wps/find/journaldescription.cws_home/30435/description#description
- Project Management Journal: http://www.pmi.org/Knowledge-Center/Publications-Project-Management-Journal.aspx
- Study Guides and Strategies: http://www.studygs.net/groupprojects.htm

7. Project Assessment Policy

The guidelines for assessing the Guided Technology Project are detailed in Appendix A. The guidelines are followed by the supervisors to determine if learners have successfully planned, followed, tested, implemented and documented the project process. The table below outlines the guideline criteria for marking the entire project.

Guided Technology Project –*Guideline Marking Criteria*	
• **Evidence of research**	• **Completeness of project**
• **Ability to explain project goals**	• **Originality**
• **Ability to explain technologies involved**	• **Technical challenge**
• **Quality of prototype software (or equivalent)**	• **Universal and/or Applicable Design**
• **Quality of Project Report**	• **Reflective Activity**
• **Overall ability to demonstrate artefact**	• **Attendance and engagement at supervisions sessions**

8. Sample Projects

These sample projects are designed to reflect each of the different skills which the learner has been exposed to allowing them to further refine their abilities for a specific application during the semester.

Title: Staff Collaboration Platform
Technologies: PHP / MYSQL / JavaScript / HTML

Description: The larger a company becomes; the more issues can be seen in the process of collaborating and commenting on documents which have been created. In this project, the learner will build an online staff collaboration platform. On this platform, a staff member will be able to log in and upload and download different files which have been added to the system. As the staff member is working, in the background a list of all the changes and edits which have been made by the person will be logged.
With this approach, each staff member will then be able to identify the changes which have been made by other staff members and also the changes which they have made themselves. In addition to this, each staff member will have the ability to comment on different changes which have been made to the documents. A tracking utility should be implemented allowing the documents that have been uploaded to be rolled back to a previous version if needed.

Title: Restaurant Deal Locator
Technologies: jQuery Mobile / JavaScript / HTML / PHP / PhoneGap

Description: Many people who enter a busy town often have not made a decision where they would like to eat. In this project, the learner will be tasked with generating a mobile application with which utilise the GPS on a phone to find different deals which restaurants have as a person is walking down a street.
The learner will be working with different elements of maps and GPS location coordinates to devise a useful method of finding the deals which are current close to the user's current location. This project is designed to be a cross platform application, utilising a cross platform application development solution such as PhoneGap. An interface should be developed for both the customer looking to eat and also a business who would like to offer a deal for their restaurant.

Title: Real-time News Aggregator
Technologies: Python / HTML

Description: Some of the most successful website which offer news are those that aggregate the news from a number of different locations, such a Google News. In this project, the learner will be tasked with devising a method to aggregate content from a number of different news sources which have been specified by the user. The application should then connect to the news source, download the news content and present it to the user as a single news source which has been aggregated together for the user.

Title: Cross Platform Operating System Management Utility
Technologies: Python / Bash Scripting / PowerShell Scripting
Description: One issue many system administrators often face is gathering various different statistics from the machines which they are currently maintaining. Other issues also arise when the administrator is working on different operating systems, and forgets the commands needed to perform a task.
In this project the learner will be tasked with creating a single cross platform operating system

management utility. This utility will provide all of the basic statistics about the machine which the administrator is currently working on such as RAM / CPU usage and also information about the different storage mediums which exist and how much space is currently being used. In addition to this basic tasks such as network configuration and user account configuration are also possible from inside of the management utility.
The learner will cross platform programming language such as python which will provide the administrator with an interface which these commands can be run from. In the background of this application, Bash or PowerShell commands will then be used to convert the command to the scripting language native to the current operating system.

Title: Floor Space Mapping Using Robots
Technologies: Python / Raspberry PI
Description: As the cost of simple robot hardware has become cheap, this has opened an opportunity for this hardware to be utilised for a specific task. In this project the learner will be tasked with utilising a common off the shelf and additional movement sensors and hardware to create a simple robot.
Once the robot has been started, it will then be tasked with the process of automatically mapping out the surface area of a building and generating relevant diagrams which can easily be accessed. This process if very useful for the initial process of mapping out a structure of a building which currently does not have any blueprints. The robot will be responsible for navigating automatically around a building without regard for the size and without any knowledge of the layout of the building. As the robot encounters different obstacles, it should make real-time decisions to overcome these issues. After the robot has finished, a simple floor plan layout should be generated and returned back to the user.

Appendix A - Guideline Criteria for Marking of Guided Technology Project

Marking Criteria	(F) FAIL / VERY WEAK (D)	(C) PASS / GOOD (B)	(A) EXCELLENT
Completeness of Artefact Build	• Not an integrated system – disjoint, un-integrated components • One or more components not working	• system composed of features / integrated components • One or two system features may not be working fully BUT project implementation still forms a coherent system that does a job	• all features of system work well • no apparent missing features – the presented system appears coherent and whole
Originality	• the minimum implemented • little or no evidence of originality	• evidence of some attempts at original ideas	• novel or elegant solution attempted
Technical challenge	• at or below skills/problems attempted in previous year of study • no evidence of technical challenge attempted / not very technically challenging	• technical challenge at a level appropriate for project year • some evidence of technical challenge one or more interesting features implemented	• ambitious problem attempted • successful implementation of technically challenging feature
Universal Design	• difficult to use / understand • GUI / keyboard actions result in unexpected results	• System works – use cases achievable • System response / interactions are predictable / intuitive	• sleek look and feel • easy to use / navigate • feels like a professional application
Project Report	• Project components are not integrated. • Functionality is inconsistent across software components. • Data is not coherent across software components. • Look and feel is not consistent across software components.	• Software components are integrated into one system to some degree. • Data is consistent across software components to some degree but could be better. • Look and feel is consistent across software components. • Functionality is useful and consistent across software components.	• Seamlessly integrated system. • Data consistency is seamless across software components. • Software looks and feels like a professional application and is consistent across all software components.
Overall ability to demonstrate artefact	• Unable to demonstrate software • No evidence of preparation for demonstration. • No diagrams/slides/posters to aid in demonstration of software. • Lack of coherence between presentation and demonstration elements • Unable to answer questions about code and technologies involved.	• Effort in demonstrating software • Individual capable of answering technical questions about code and technologies involved. • Posters/flowcharts/diagrams used to aid in demonstration.	• Software demonstrated in a very professional manner. • Clear evidence that the individual spent the time to think about how best to demonstrate the strengths and weaknesses of their work. • Good use of diagrams/posters/slides/flowcharts as aids to demo software. • Individual/individual clearly familiar with code and technologies involved and able to answer technical questions about same.