SQA Advanced Unit Specification

General information for centres

Unit title: Software Development: Rapid Applications Development and Prototyping

Unit code: HP2F 48

Unit purpose: This Unit is designed to expose candidates to the development of a software product using recognised techniques within a modern well-defined methodology. The aim of the Unit is to increase the candidates' skills in designing and building software applications using fourth generation (HG) or object oriented languages. This Unit is aimed at candidates who have completed the first year of the SQA Advanced Diploma in Computing: Software Development and/or those candidates who have completed the SQA Advanced Certificate in Computing.

On completion of this Unit the candidate should be able to:

1. Describe the components of Rapid Application Development (RAD) environments.
2. Produce a working functional/design specification.
3. Carry out design and redesign of an application.
4. Test each completed prototype.

Credit points and level: 2 SQA Credits at SCQF level 8: (16 SCQF credit points at SCQF level 8*)

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from National 1 to Doctorates.*

Recommended prior knowledge and skills: Access to this Unit will be at the discretion of the Centre, however it is recommended that candidates have gained a variety of practical experience in using software developing systems in spreadsheets, databases and documenting applications using word processing packages. The level of competence should extend to the use of form objects, VBA coding and/or SQL. It is recommended that candidates should have achieved any of the following SQA Advanced Units: *Software Development: Object Oriented Programming* (HP2L 48) or S*oftware Development: Event Driven Programming* (HR8L 48).
It would also be beneficial if candidates had been exposed to an event driven or object oriented language. It is also suggested that candidates are aware of and have used some web authoring tools, eg Dreamweaver, Flash or FrontPage, etc. (Current application packages available at time of writing).

Alternatively candidates should have considerable practical work experience and some appreciation of the role of program design and implementation.

Core skills: There may be opportunities to gather evidence towards core skills in this Unit, although there is no automatic certification of core skills or core skills components.

Context for delivery: If this Unit is delivered as part of a group award, it is recommended that it should be taught and assessed within the subject area of the group award to which it contributes.

Assessment: Outcome 1 will be assessed by a number of multiple choice questions testing knowledge and/or skills.

The remainder of the Unit must be assessed by means of a single project covering the remaining three Outcomes. The achievement requirements are inherent in the evidence requirements. Outcomes 2, 3 and 4 are open book. Assessors must assure themselves of the authenticity of each candidate's submission.

Some of the evidence requirements may be produced using e-assessment. This may take the form of e-testing (for knowledge and understanding) and/or e-portfolios (for practical abilities). There is no requirement for you to seek prior approval if you wish to use e-assessment for either of these purposes so long as the normal standards for validity and reliability are observed. Please see the following SQA publications for further information on e-assessment: (i) *SQA Guidelines on Online Assessment for Further Education* (March 2003) and (ii) *Assessment and Quality Assurance in Open and Distance Learning* (Feb. 2001).

If a centre is presenting Outcome 1 online the following assessment methods, where appropriate, may be selected –

- Multiple choice
- Drag and drop
- Multiple response
- Mix and match
- A combination of the above

It is expected that the questions will be of the multiple choice variety. Centres may consider the use of alternative questions types, particularly if using Computer Assisted Assessment approaches. However, care should be taken that the questions are valid and at an appropriate level. The use of simple true/false question responses is unlikely to achieve this.

Unit specification: statement of standards

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The sections of the Unit stating the Outcomes, knowledge and/or skills, and evidence requirements are mandatory.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the knowledge and/or skills section must be taught and available for assessment. Candidates should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe the components of Rapid Application Development (RAD) environments

Knowledge and/or skills

- Stages of the application lifecycle
- Characteristics of traditional environments
- Characteristics of RAD environments, eg Dynamic Systems Development Methodology (DSDM), Unified Modelling Language (UML), Star Lifecycle, Spiral model, V & V model
- Stages and steps within a RAD methodology

Evidence requirements

Evidence for all the knowledge and/or skills in this Outcome will be assessed using a representative sample of 20 multiple choice questions. All knowledge and skills bulleted points must be covered. The questions presented must change on **each** assessment occasion.

Assessment must be undertaken in supervised conditions and is closed book. Candidates may not bring to the assessment event any notes, textbooks, handouts or other material.

Candidates must answer at least 60% of the questions correctly.

Candidates should complete this assessment within one hour.

Assessment guidelines

There is an opportunity for candidates to be assessed online subject to meeting the prescribed assessment conditions.

If a centre is presenting this assessment online the following assessment methods, where appropriate, may be selected:

- Multiple choice
- Drag and drop
- Multiple response
- Mix and match
- A combination of the above

Outcome 2

Produce a working functional/design specification

Knowledge and/or skills

- Document findings using recognised techniques,

Evidence requirements

The production of a working functional/design specification should employ recognised techniques including task analysis, story boarding.

Each candidate will be required to produce evidence to show that s/he can, with reference to the information supplied, develop documentation to meet a given problem specification. The RAD application user requirements documentation will consist of the following:

- Investigation of why the client needs the application and what they expect it to achieve
- Investigation of user requirements for the application
- Identification of the context in which the application will be used
- Identification of the hardware and software required to develop and run the application
- An outline of the task(s) which the application is to perform
- A description of the proposed features to be available to the user

Evidence should take the form of a report, ie the function/design specification, and must include identification of users, a description of user needs, delivery medium, purpose and likely location of the package, and identify the appropriate hardware and software.

On completion of this outcome, assessors must sign and date the documentation to assure themselves of the authenticity of each candidate's submission.

This assessment is open book.

The assessment of this Outcome will be the production of a document based on the candidate scenario**.**

Outcome 3

Carry out design and redesign of an application

Knowledge and/or skills

- Implement the given proposal
- Identify the software required for implementation
- Identify the advantages and disadvantages of the software that is to be used

Evidence requirements

Evidence for the knowledge and/or skills in this Outcome will be the production of a software product prototype. Each candidate will need evidence to show that s/he can, with reference to a particular problem description (ie the function/design specification produced for Outcome 2), identify information components, produce a design specification which shows the overall structure of the application, specify navigational techniques used to access information components and prototype and test the application.

The Application Prototype must consist of appropriate use of the software package features mapped to the function/design specification.

This assessment is open book.

Assessors must assure themselves of the authenticity of each candidate's submission.

Outcome 4

Test each completed prototype

Knowledge and Skills

- Implementing a test plan using a defined strategy
- Maintaining a test documentation
- Evaluating results of test runs
- Amending coding as necessary

Evidence requirements

The test plan is derived from the functional/design specification document completed in Outcome 2. This Outcome will be assessed by the production of completed test documentation recording both the expected results of the test data and the actual results. The bank of test data should be sufficient to thoroughly test the implemented solution in scope and range.

The candidate will be expected to record and evaluate the results of the test runs. Where there are discrepancies between the expected results and the actual results, the coding must be amended and corrected accordingly.

Since the implemented solution should meet the requirements of the project brief, the candidate must produce a complete and error-free program solution to meet the project brief and problem specifications.

This assessment is open book.

Assessors must assure themselves of the authenticity of each candidate's submission.

Administrative Information

Unit code: HP2F 48

Unit title: Software Development: Rapid Applications Development and Prototyping

Superclass category: CB

Date of publication: August 2017

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History of Changes:

Version	Description of change	Date

Source: SQA

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

Unit specification: support notes

Unit title: Software Development: Rapid Applications Development and Prototyping

This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the Centre, the notional design length is 80 hours.

Guidance on the content and context for this Unit

This Unit has been developed to ensure that the candidates' qualification reflected the current and future trends in software development. RAD has become a fundamental building block in the development and maintenance of software packages. With the enormous increase in the use of the Internet in today's society, RAD has become a recognised method of developing and ensuring quality assurance in web design. Since web design has evolved from a 'simple slide show' to a fully interactive, real time experience utilising database design and HCI concepts, RAD has grown to fill in the void which traditional methodologies had left. Its ability to handle complex systems and its ability to manage change has ensured that RAD will be around for a long time. With this in mind, a Unit providing candidates with the knowledge and/or skills in RAD is included the SQA Advanced Computing frameworks.

This Unit has been developed with a view towards software development using VBA, code generators rather than towards the more formal languages such as Java. However, formal-programming languages can be adopted. The intention of the Unit is to keep the Outcomes as generic as possible to allow the Unit to be delivered using any of the fourth generation languages or application developers that are available.

Candidates will be expected to research areas within the context of the Unit, eg candidates will be expected to develop research skills and Internet search skills. Candidates will develop an understanding of project management and need to review the production of the software product. An understanding of the iterative nature of the RAD lifecycle and the differences between the approaches taught in other traditional programming languages should allow candidates to experience practically the development and implementation of alternative methodologies which are currently being used, especially in the construction of web based material.

It is envisaged that the candidates' prior knowledge will play an important role in the content and context of this Unit. The 'flavour' of the assessment, be it web based, database based or a traditional software product, will be dependent on the context of the overall course structure, and the optional Units which candidates have been exposed to.

Outcome 1 should allow sufficient flexibility to research a variety of development models. Although this list is not complete, it should allow sufficient flexibility and an assessor may want to make candidates aware of new and emerging models. Therefore, a requirement to develop, replace and include future methodologies may need to be carried out.

The evaluation criteria can be further expanded upon by examining design heuristics as laid down by the likes of Nielsen and Morlich. These exponents of HCI laid down ten design heuristics that could be used as the basis for any prototype interface evaluation.

Guidance on the delivery and assessment of this Unit

Outcome 1 will introduce candidates to a variety of differing sources of information. The use of the Internet should be encouraged as a means of researching methodologies will supply candidates with enough background knowledge to answer any of the report questions in section one. It is envisaged that a series of lectures and tutorials will prepare candidates for the assessment.

If the resources are available, site visits to local businesses and software manufacturers, and the use of guest speakers should be encouraged. The demonstration of practical implementations of the methodology should reinforce candidates' ability to understand and apply the abstract methodology.

The remaining Outcomes should be assessed via a case study or mini-project with the exception of the series of multiple choice questions in Outcome 1 with closed book conditions. The closed book assessment should consist of programming techniques and concepts covering all the bullet points in Knowledge/Skills of Outcome 1.

Integration of Outcomes 2, 3 and 4 will provide a more holistic approach more akin to the production of a software product. However, the design specification will require moderation by the centre's assessor before candidates carry on to implement the final product.

The complexity of the final produce should be balanced with the amount of research which candidates have had to carry out, however, this must be at SCQF level 8.

Candidates should be exposed to a variety of small case studies which would be suitable context for an assessment. The implementation of stock control systems, invoicing systems, booking systems would be ideal for the development in most software products.

It is envisaged that limited formal teaching of the software product occurs. Candidates will be encouraged to research into those areas with are unfamiliar to them. Great care must therefore be taken in the formal acceptance of the design proposal. At this point, advice should be given to each candidate on his/her proposed method of implementation.

The assessment can be as diverse as the development of a web site using Dreamweaver, Flash or Fireworks, production of applications in ACCESS, EXCEL or ORACLE to the production of CAL packages. However, this assessment process must be at SCQF level 8.

Open learning

If this Unit is delivered by open or distance learning methods, additional planning and resources may be required for candidate support, assessment and quality assurance.

A combination of new and traditional authentication tools may have to be devised for assessment and re-assessment purposes. For further information and advice, please see *Assessment and Quality Assurance for Open and Distance Learning* (SQA, February 2001 — publication code A1030).

Equality and inclusion

This unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website www.sqa.org.uk/assessmentarrangements.

General information for candidates

Unit title: Software Development: Rapid Applications Development and Prototyping

You will learn about the features of a variety of RAD methodologies. In particular, you will understand, in depth, the features and characteristics of at least one RAD methodology.

You will develop a software product using one of the RAD methodologies. You will be expected to develop research skills and suggest a problem area which interests you as a basis for your assessment. However, this will have to be approved by your assessor.

You will submit the verbal proposal to your assessor who will discuss the appropriateness of the project. You will then be expected to carry out further research into the product and produce a functional prototype. This functional prototype will be assessed and form the basis for future work.

You will need to evaluate this prototype and gain approval from the assessor before further work can continue. The produce of this final piece of work will be the second prototype. This iterative process can continue several times, but must occur at least twice. At the end of each prototype you will gain acceptance from the assessor.

The software produced can be as diverse as a web site, computer aided learning package designed in FLASH, an invoice system developed in ACCESS or accounting system developed in EXCEL and using VBA. The aim of the Unit is the development of software using a RAD environment.

You may wish to use the experience to develop your skills in a particular type of software, or simply utilise skills gained in your course.

In Outcome 1 you will study several different Rapid Applications Development models. In order to assess this you will be required to answer a number of questions in closed book assessment situations.