

GCE

Specification

Edexcel Advanced Subsidiary GCE in Applied Information
and Communication Technology (ICT)
(Single Award: 8751)/(Double Award: 8752)

Edexcel Advanced GCE in Applied Information and
Communication Technology (ICT)
(Single Award: 9751)/(Double Award: 9752)

Edexcel Advanced GCE with Advanced Subsidiary
(Additional) in Applied Information and Communication
Technology (ICT) (9753)

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This specification is Issue 4. Key changes are sidelined. We will inform centres of any changes to this issue. The latest issue can be found on the Edexcel website: www.edexcel.com

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Authorised by Roger Beard
Prepared by Phil Myers

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Contents

Introduction	1
Qualification overview	2
Structure	2
Guided learning hours	2
Overview of units	3
Rationale	4
End-users and practitioners	5
Recommended prior learning	5
Progression	5
Classification code	6
Links with other qualifications	6
Specification content	7
Unit 1: The Information Age	9
Unit 2: The Digital Economy	33
Unit 3: The Knowledge Worker	53
Unit 4: System Design and Installation	63
Unit 5: Web Development	83
Unit 6: Technical Support	103
Unit 7: Using Database Software	119
Unit 8: Managing ICT Projects	129
Unit 9: Communications and Networks	151
Unit 10: Using Multimedia Software	163
Unit 11: Using Spreadsheet Software	185
Unit 12: Customising Applications	205
Unit 13: Web Management	225
Unit 14: Programming	243

Assessment information	261
Assessment Objectives (AO) and weightings	261
External assessment	262
Internal assessment	263
Language of assessment	265
Statutory requirements	265
Grading information	267
Mark bands	267
Grading, aggregation and equivalence	267
Performance descriptions	269
Additional information	271
Learner entry	271
Resitting of units	271
Access arrangements and special requirements	271
Disability Discrimination Act (DDA)	271
Quality of Written Communication (QWC)	272
Stretch and challenge	272
Malpractice and plagiarism	272
Learner recruitment	272
The wider curriculum	273
Resources, support and training	275
Edexcel publications	275
Endorsed resources	275
Edexcel support services	275
Appendices	277
Appendix A: Key skills mapping	279
Appendix B: Key skills development suggestions	281
Appendix C: Wider curriculum	289
Appendix D: Performance descriptions	291

Introduction

This suite of nine qualifications comprises General Certificates of Education in:

- Applied Art and Design
- Applied Business
- Applied ICT
- Engineering
- Health and Social Care
- Leisure Studies
- Media
- Performing Arts
- Travel and Tourism.

The qualifications are designed to give learners a broad introduction to a vocational sector.

Edexcel GCE in Applied ICT

The Edexcel GCE in Applied ICT qualification has been developed to provide a broad educational basis for further training, further education or for moving into appropriate employment within the ICT sector. The Edexcel GCE has been designed to be delivered in a work-related context and to allow learners to develop an understanding of the sector.

Qualification codes

Each qualification title is allocated a QCA National Qualifications Framework (NQF) code.

QCA NQF codes

The QCA National Qualifications Framework (NQF) code is known as a Qualification Accreditation Number (QAN). This is the code that features in the DfES Funding Schedule, Sections 96 and 97, and is to be used for all qualification funding purposes. The QCA QAN is the number that will appear on the learner's final certification documentation.

The QANs for the qualifications in this publication are:

Edexcel Advanced Subsidiary GCE in Applied ICT (Single Award): 100/4723/2

Edexcel Advanced Subsidiary GCE in Applied ICT: (Double Award): 100/4724/4

Edexcel Advanced GCE in Applied ICT (Single Award): 100/4725/6

Edexcel Advanced GCE in Applied ICT (Double Award): 100/4726/8

Edexcel Advanced GCE with Advanced Subsidiary (Additional) in Applied ICT: 500/5854/X

Qualification overview

Structure

Advanced Subsidiary/Advanced GCE (Single Award)

All Single Award Advanced GCE qualifications in this suite comprise six equally-weighted units and contain an Advanced Subsidiary subset of three AS units. The AS is the first half of a GCE course and contributes 50 per cent of the total Advanced GCE marks. The A2, the second half of the Advanced GCE, comprises the other 50 per cent of the total Advanced GCE marks.

Advanced Subsidiary/Advanced GCE (Double Award)

All Advanced GCE (Double Award) qualifications in this suite comprise 12 equally-weighted units and contain an Advanced Subsidiary (Double Award) subset of six AS units. The Advanced Subsidiary (Double Award) is the first half of an Advanced GCE (Double Award) course and contributes 50 per cent of the total Advanced GCE (Double Award) marks. The A2, the second half of the Advanced GCE (Double Award), comprises the other 50 per cent of the total Advanced GCE (Double Award) marks.

Advanced GCE with Advanced Subsidiary (Additional)

All Advanced GCE with Advanced Subsidiary (Additional) qualifications in this suite comprise nine equally-weighted units.

Guided learning hours

The number of guided learning hours for the three-unit Advanced Subsidiary GCE (Single Award) qualification is 180.

The number of guided learning hours for the six-unit Advanced Subsidiary (Double Award) qualification is 360.

The number of guided learning hours for the six-unit Advanced GCE (Single Award) qualification is 360.

The number of guided learning hours for the nine-unit Advanced GCE with Advanced Subsidiary (Additional) qualification is 540.

The number of guided learning hours for the twelve-unit Advanced GCE (Double Award) qualification is 720.

Overview of units

Unit	Title	Unit code	Level	AS	AS (Double)	GCE	GCE with AS (Additional)	GCE (Double)	Assessment mode	Assessment availability
1	The Information Age	6951	AS	Compulsory	Compulsory	Compulsory	Compulsory	Compulsory	Internal	Jan/June
2	The Digital Economy	6952	AS	Compulsory	Compulsory	Compulsory	Compulsory	Compulsory	Internal	Jan/June
3	The Knowledge Worker	6953	AS	Compulsory	Compulsory	Compulsory	Compulsory	Compulsory	External	Jan/June
4	System Design and Installation	6954	AS	N/A	Compulsory	N/A	Compulsory	Compulsory	Internal	Jan/June
5	Web Development	6955	AS	N/A	Compulsory	N/A	Compulsory	Compulsory	Internal	Jan/June
6	Technical Support	6956	AS	N/A	Compulsory	N/A	Compulsory	Compulsory	Internal	Jan/June
7	Using Database Software	6957	A2	N/A	N/A	Compulsory	Compulsory	Compulsory	External	Jan/June
8	Managing ICT Projects	6958	A2	N/A	N/A	Compulsory	Compulsory	Compulsory	Internal	Jan/June
9	Communications and Networks	6959	A2	N/A	N/A	N/A	N/A	Compulsory	External	Jan/June
10	Using Multimedia Software	6960	A2	N/A	N/A	Optional	Optional	Optional	Internal	Jan/June
11	Using Spreadsheet Software	6961	A2	N/A	N/A	Optional	Optional	Optional	Internal	Jan/June
12	Customising Applications	6962	A2	N/A	N/A	Optional	Optional	Optional	Internal	Jan/June
13	Web Management	6963	A2	N/A	N/A	N/A	N/A	Optional	Internal	Jan/June
14	Programming	6964	A2	N/A	N/A	N/A	N/A	Optional	Internal	Jan/June

Rationale

This suite of nine General Certificates of Education is part of the Level 3 provision of the National Qualifications Framework (NQF).

These GCEs aim to:

- widen participation in vocationally-related learning
- allow learners to experience vocationally-related learning to see if it is suitable for them
- enable learners to make valid personal choices on completion of the qualification
- raise attainment at Level 3/Advanced level of the NQF.

The broad objectives of the GCEs are to:

- introduce learners to work-related learning
- give learners a broad introduction to a vocational sector
- give learners the technical knowledge, skills and understanding associated with the subject at this level
- equip learners with some of skills they will need in the workplace or in further education or training
- empower learners to take charge of their own learning and development
- provide a range of teaching, learning and assessment styles to motivate learners to achieve their full potential.

The Applied GCE suite of qualifications contributes to the quality and coherence of national provision, as shown by their place in the Government's Green Paper '14-19 Extending Opportunities, Raising Standards'.

The GCE in Applied ICT has been designed to provide a broad educational basis for further education or for moving into employment within the ICT sector. This is achieved by ensuring that learners develop the general skills, knowledge and understanding needed within the sector. This qualification conforms to the Qualifications and Curriculum Authority (QCA) General Qualification Criteria for GCEs, any additional criteria for GCE (Double Award) qualifications and to the subject criteria for GCE qualifications in Applied ICT, which set out the knowledge, understanding, skills and schemes of assessment common to all GCE qualifications in the subject. Subject criteria help ensure consistent and comparable standards in the same subject area across awarding bodies and help further and higher education institutions and employers know what has been studied and assessed.

All Edexcel GCE qualifications in Applied ICT are designed to give learners broad skills, knowledge and understanding of the ICT sector. In particular, they will encourage learners to develop:

- a broad range of ICT skills and knowledge of the uses of ICT in vocational contexts, as a basis for progression into further learning in ICT-related fields, including progression from AS to A2
- knowledge and understanding of the components, functions and applications of information systems within a range of organisations
- an understanding of the main principles of solving problems using ICT and development of the skills necessary to apply this understanding.
- In addition, the Advanced GCE ICT qualifications encourage learners to:
- apply their knowledge and understanding of ICT and use skills (eg planning, research, evaluation, problem solving) in vocational contexts
- develop an understanding of the impact of information systems on organisations' personnel, policies and practices
- develop project management skills and an understanding of the need to work with others.

In addition, Advanced GCE in ICT (Double Award) qualifications encourage learners to develop their understanding of:

- software system design to meet the needs of an end user
- networks and communications.

End-users and practitioners

The AS GCE (3-unit) and Advanced GCE (6-unit) qualifications give learners an opportunity to develop further as ICT end-users. End-users are those who use ICT, typically desktop applications, on a daily basis in a work role to enhance personal productivity, facilitate communication, enable collaborative working etc.

In addition, the AS GCE (Double Award) and Advanced (Double Award) qualifications provide a foundation for development towards practitioner competence. ICT practitioners are those working in an ICT role either in an IT organisation or in the IT department of a non-IT organisation.

Each unit also has either an end-user or a practitioner focus. This is reflected in the type of evidence that learners are required to produce. Practitioner-focused units require learners to demonstrate their ability to work with clients and end-users and produce products or services for someone else to use. In contrast, user-focused units assume that learners are using ICT for their own purposes and are not necessarily using ICT to produce something for someone else to use.

Recommended prior learning

Learners who would benefit most from a GCE in Applied ICT are likely to have one or more of the following:

- GCSE in Applied ICT (Double Award) at grades A*A*-CC
- GCSE in ICT at grades A*-C
- IGCSE in ICT at grades A*-C
- four GCSEs at grade A*-C
- BTEC First for IT Practitioners
- Intermediate GNVQ in ICT

Learners who have completed a NVQ at Level 2 may also consider the qualification if they have covered relevant areas of the subject.

Progression

This qualification supports progression into further education, training or employment. Appropriate further education might be:

- a BTEC Higher National in Computing
- a BTEC Foundation Degree in Computing
- a degree in computing, IT or related fields
- entry into employment.

Classification code

Every qualification is assigned a national classification code indicating the subject area to which it belongs. The classification code for this qualification is 0002.

Centres should be aware that learners who enter for more than one Level 3 qualification with the same classification code will have only one grade (the highest) counted for the purpose of the school and college performance tables.

Links with other qualifications

This qualification has links with the BTEC National for IT Practitioners.

Specification content

The guidance for learners sections are *Introduction*, *Recommended prior learning* and *What you need to learn* and, for internally assessed units only, *Assessment evidence*. The other sections give guidance for teachers.

Index of units

Unit 1: The Information Age ¹	9
Unit 2: The Digital Economy ¹	33
Unit 3: The Knowledge Worker ¹	53
Unit 4: System Design and Installation ²	63
Unit 5: Web Development ²	83
Unit 6: Technical Support ²	103
Unit 7: Using Database Software ¹	119
Unit 8: Managing ICT Projects ¹	129
Unit 9: Communications and Networks ²	151
Unit 10: Using Multimedia Software ¹	163
Unit 11: Using Spreadsheet Software ¹	185
Unit 12: Customising Applications ¹	205
Unit 13: Web Management ²	225
Unit 14: Programming ²	243

¹ End-user focus

² Practitioner focus

Unit 1: The Information Age

Internally assessed

Introduction

We are living in an age in which an enormous amount of information – television broadcasts, text messages, photographs, news reports, emails etc – is produced, communicated and stored in digital format every day. The pace of development is very fast.

In this unit you will learn about the information communication technologies that enable people to access and exchange information and to carry out transactions anytime, anywhere.

You will take a critical look at the impact that the internet has had on the way people conduct their personal and professional lives, explore the services it offers and gain ‘hands-on’ experience of using some of them.

As you will discover, the internet provides fantastic opportunities to those individuals and communities who are ‘technology enabled’. However, for one reason or another, not everyone is able to take full advantage of what is on offer. You will investigate the causes and effects of the digital divide which separates the ‘haves’ from the ‘have nots’ and evaluate measures being taken to bridge the gap.

Your investigation and evaluation of all these aspects of the age in which you live will be presented in the form of an e-book designed to be read on a computer screen.

You will probably already have some experience of using the ICT tools and techniques needed to produce an e-book. What you now need to learn is how to make the most of the medium in which you are working so as to make your e-book truly an artefact of the Information Age!

Throughout the unit you will acquire the tools and techniques you need to make effective use of the information available to you on the internet. The skills and knowledge you gain whilst studying this unit will be a useful foundation for the rest of the qualification.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use ICT on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the ICT knowledge and skills which you bring to the course. It assumes that you already have some experience of using ICT to combine and present information.

What you need to learn

1.1 The Information Age

This is the Information Age! Rapidly advancing computing power is resulting in ever-increasing volumes of information being created and stored. Much of this information can be accessed, copied and modified by anyone, anytime, anywhere. You, as an individual, can create and store information that can be accessed by anyone across the globe.

An increasingly wide range of digital technologies is affecting the way we lead our lives. You will need to be aware of key technologies used to convey information in various ways, including:

- internet
- multimedia
- broadband
- wireless
- digital television and video.

You will need to learn about some of the opportunities created by the Information Age, including:

- presenting information in different ways
- sharing information quickly
- greater interaction with others and organisations
- business opportunities, large and small
- virtual communities, where people are brought together via the internet
- mobile technologies that are blurring the distinction between home and work
- a self-service environment in which consumers carry out activities and transactions by themselves, including shopping, banking and learning.

You will need to develop an awareness of the issues and challenges arising from the Information Age, including:

- the need for us all to be lifelong learners in a world of change
- privacy rights
- copyright and legislation
- impact on employment
- the digital divide.

1.2 Online services The internet is a key player in the Information Age. Some people regard it as being an essential service on a par with water and electricity! You will need to find out about the types of online services available, including:

- communication, eg email, instant messaging, newsgroups, online conferencing, blogs, social networking
- real time information, eg train timetables, news services, traffic reports, weather
- commerce, eg shopping, banking, auctions
- government, eg online tax returns, e-voting, applications for services/grants, revenue collection
- education, eg online learning/training, VLEs
- business, eg videoconferencing, collaborative working, business networks
- entertainment, eg multi-user games, radio players
- download services, eg music, film, upgrades, software
- web storage
- online mapping and route planning (not Sat Nav).

You will be expected to explore and evaluate a range of different types of services available online, considering factors such as target audience, benefits and drawbacks, fitness for purpose, possible enhancements, non-internet alternatives etc.

From your investigation of different types of online services, you will be able to assess the current scope and limitations of the internet as a whole.

1.3 Life in the Information Age You will need to understand how ICT is affecting the way people conduct their personal, social and professional lives, including its impact on:

- working styles
- communication
- education
- entertainment and leisure
- banking and shopping
- decision making
- employment opportunities
- crime and crime prevention
- civil rights
- legislation.

From your research you will be able to piece together a realistic picture of life in the Information Age taking account of both advantages and disadvantages.

1.4 The digital divide

Many people believe that everyone, regardless of circumstances, should be able to benefit from the Information Age and that technology-enabled information and services should be available to all. You will need to consider whether this is always the case.

A so-called 'digital divide' exists both in your local community and globally, separating those who have full access and those who do not. You will need to be able to define the meaning of the term 'digital divide' and explain:

- factors which create the digital divide
 - technological
 - economic
 - social
 - geographical
 - fear of technology
 - lack of motivation
- the impact of the digital divide
 - economic
 - social
 - educational
 - cultural
- the extent of the divide
 - is it widening or narrowing?
 - how can the gap be reduced?
- measure being taken to narrow the gap
 - are they working?
 - what else could be done?
- the benefits and drawbacks of reducing the gap.

1.5 What is an e-book?

Digital technology potentially turns everyone into an e-author and opens up access to a worldwide readership on the web. You are going to produce an e-book to present your evidence for this unit.

E-books are digital and designed to be viewed on screen. Although the pages can be read in sequence as with most traditional books, e-books enable the reader to easily view pages in any order. In addition to the normal text and static images found in paper-based books, e-books can have animated video clips and audio files, animated diagrams, 360 degree stills, photographs that can be zoomed into etc, designed to immerse the reader in the subject matter and provide a multi-sensory experience.

Most e-books have a hypertext structure consisting of a series of information nodes (pages). Users navigate from node to node using the navigation links provided on each page.

E-books are produced in a format which can be easily distributed, archived and is environmentally friendly.

There is a wide range of e-books available on the web. You need to find examples of e-books produced for different purposes, such as:

- creative writing
- reference materials eg encyclopaedias, historical manuscripts
- collaborative projects
- children's books.

When looking at e-books produced by others you should be evaluating aspects, such as:

- content
- structure and layout
- format and style
- use of multimedia components
- navigation
- ease of use/accessibility
- fitness for purpose.

1.6 Developing an e-book

Once you have evaluated a variety of e-books found on the web, you will learn how to create e-books of your own that convey information using an appropriate format and range of multimedia components.

Before sitting down to design an e-book you need to be clear about:

- the intended audience
- the purpose of the e-book
- any prescribed content that must be included
- the message you are trying to convey
- the technical specification you must adhere to
- the deadline for completion.

You will learn how to use:

- storyboards to map out the layout and content of each page
- structure charts to provide a graphical representation of the overall structure of the product.

You should get feedback on your initial designs to ensure that your final product will meet the needs of the target audience.

As soon as you are happy that your design meets the specified requirements you will be in a position to implement your design on the computer.

In addition to using ready-made multimedia components in your e-book, you will learn how to create multimedia components for yourself (see *Section 1.7*).

As you develop an e-book you should test it by:

- proofreading content
- checking layout
- checking all links and pathways
- trying it out on 'test users'.

E-books should be tested during development by as many people as possible. You should listen to what they have to say and – if necessary – rethink your design in the light of their comments.

You will learn how to evaluate your e-books by considering individual features, such as:

- content
- structure
- screen layout
- use of multimedia components
- presentation techniques
- ease of navigation
- consistency
- accessibility.

You should also assess their overall fitness for purpose and audience. No matter how good a multimedia product is, there is always room for improvement. You will need to be able to identify possible improvements/enhancements.

1.7 ICT skills

You must be able to use a range of ICT tools and techniques to:

- carry out internet research tasks, including:
 - understanding and applying the main features of browser software, eg forward and backward buttons, book marking and organising favourites
 - understanding and applying the main search principles of internet search engines, eg string, key word searching
 - navigating large websites so as to be able to locate a specific information resource in a given site using hyperlinks within sites to pursue investigations
 - making informed judgements about the accuracy, reliability and currency of the information you find
 - acknowledging sources and references correctly
- produce the multimedia content for your e-book, including:
 - using ready-made multimedia components
 - using a digital camera and scanner to capture images
 - capturing screen-based images
 - producing word-processed documents
 - creating links
 - using appropriate file formats
 - combining and presenting information
 - adding information from one type of software to information produced using different software.

1.8 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements

- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
 - quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
 - legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
 - safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
 - eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will:

- investigate aspects of the Information Age in which you live (assessment evidence a, b and c)
- design and create an e-book to present your evidence for a, b and c (assessment evidence d and e) and provide a snapshot of life in today's Information Age
- evaluate your e-book and own performance (assessment evidence f).

Imagine that your e-book will form part of a virtual time capsule on the internet which is programmed to open in 100 years' time. The potential target audience for your e-book is enormous. Anyone with internet access in 100 years' time will be able to read it.

The e-book should be designed as an on screen publication. The technical specification for the e-book will be provided by your teacher.

Your eportfolio for this unit should include:

An e-book that provides a snapshot of life in the Information Age. It must include:

- (a)* A description and evaluation of at least five different types of online service, drawn together to give a picture of the current scope and limitations of the internet as a whole.
- (b) A description of how ICT is affecting at least five different aspects of people's lives, considering the benefits and drawbacks, drawn together to give a picture of life overall in the Information Age.
- (c) A description of at least three factors contributing to the digital divide and some of the measures being taken to bridge the gap, with an evaluation of the impact/extent of the digital divide, drawn together to give a picture of the current situation.

(d) and (e) The e-book should:

- contain your work for (a), (b) and (c)
- demonstrate your understanding of multimedia design principles and your ability to use software tools appropriately
- include some ready-made and some original multimedia components.

You must also include in your portfolio:

- (f) An evaluation of your e-book and your own performance on this unit.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 1: The Information Age

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 1, 2, 4) QWC (i-iii)	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find some relevant information about different types of online services, but needs extensive prompting gives a brief description of at least five different types of online service makes some evaluative comments about each of the online services described, but not sufficient to give a clear picture of the current scope and limitations of the internet as a whole uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy. <p>(0-5)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find a range of relevant information about different types of online services, needing only limited prompting gives a detailed description – supported by examples – of at least five different types of online service makes some relevant evaluative comments about each of the online services described and gives an indication of the current scope and limitations of the internet as a whole uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy. <p>(6-8)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find a wide range of relevant information about different types of online services, independently gives a comprehensive description – supported by a range of well-chosen examples – of at least five different types of online service provides a considered evaluation of each of the online services described and gives a clear and balanced picture of the current scope and limitations of the internet as a whole uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy. <p>(9-11)</p>	11

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO 2, 4)	<p>The learner:</p> <ul style="list-style-type: none"> uses a limited range of sources to gather some relevant information about how ICT affects different aspects of people's lives, but needs extensive prompting gives a brief description of how ICT is affecting at least five different aspects of people's lives identifies some benefits and drawbacks, but not sufficient to give a clear picture of life overall in the Information Age. <p>(0-5)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses a range of sources to gather relevant information, needing only limited prompting gives a detailed description – supported by examples – of how ICT is affecting at least five different aspects of people's lives describes some benefits and drawbacks, giving an indication of life overall in the Information Age. <p>(6-8)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses a wide range of sources to gather relevant information, independently gives a comprehensive description – supported by a range of well-chosen examples – of how ICT is affecting at least five different aspects of people's lives analyses the benefits and drawbacks, giving a clear and balanced picture of life overall in the Information Age. <p>(9-10)</p>	10
(c) (AO 2, 4)	<p>The learner:</p> <ul style="list-style-type: none"> gives a brief description of: <ul style="list-style-type: none"> at least three factors contributing to the digital divide some of the measures being taken to bridge the gap makes some evaluative comments about the impact/extent of the digital divide, but not sufficient to give a clear picture of the current situation. <p>(0-4)</p>	<p>The learner:</p> <ul style="list-style-type: none"> gives a detailed description – supported by examples – of: <ul style="list-style-type: none"> at least three factors contributing to the digital divide some of the measures being taken to bridge the gap makes some relevant evaluative comments about the impact/extent of the digital divide which give an indication of the current situation. <p>(5-6)</p>	<p>The learner:</p> <ul style="list-style-type: none"> gives a detailed description supported by a range of well-chosen examples (both global and local) of: <ul style="list-style-type: none"> at least three factors contributing to the digital divide some of the measures being taken to bridge the gap provides a considered assessment of the impact/extent of the digital divide, giving a clear picture of the current situation both globally and locally. <p>(7-8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO 1, 2, 3)	<p>The e-book:</p> <ul style="list-style-type: none"> demonstrates limited application of multimedia design principles for on screen publications shows limited awareness of audience and purpose. <p>Whilst working on the e-book the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p>(0-9)</p>	<p>The e-book:</p> <ul style="list-style-type: none"> demonstrates sound application of multimedia design principles for on screen publications shows some awareness of audience and purpose. <p>Whilst working on the e-book, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p>(10-13)</p>	<p>The e-book:</p> <ul style="list-style-type: none"> demonstrates sophisticated application of multimedia design principles for on-screen publications shows full awareness of audience and purpose. <p>Whilst working on the e-book the learner adheres to relevant standard ways of working, independently.</p> <p>(14-17)</p>	17

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 1, 3)	<p>In creating the e-book, the learner</p> <ul style="list-style-type: none"> selects and uses some suitable ready-made multimedia components, although not always appropriately creates and uses some suitable original multimedia components, although not always appropriately selects and uses software tools, although not always appropriately carries out some limited testing and quality control, but not sufficient to guarantee that it functions correctly. <p>(0-5)</p>	<p>In creating the e-book, the learner:</p> <ul style="list-style-type: none"> selects and uses suitable ready-made multimedia components appropriately creates and uses suitable original multimedia components appropriately selects and uses software tools appropriately carries out adequate testing and quality control of the e-book to ensure that it functions correctly. <p>(6-8)</p>	<p>In creating the e-book, the learner</p> <ul style="list-style-type: none"> selects and uses a range of suitable ready-made multimedia components effectively creates and uses a range of suitable original multimedia components effectively selects and uses appropriate software tools competently carries out extensive testing and quality control of the e-book to ensure that it functions correctly and is fully fit for purpose. <p>(9-10)</p>	10
(f) (AO 4)	<p>The learner makes some relevant evaluative comments about key features of:</p> <ul style="list-style-type: none"> the e-book their own performance. <p>(0-1)</p>	<p>The learner makes some relevant evaluative comments about key features of:</p> <ul style="list-style-type: none"> the e-book their own performance, incorporating feedback from others. <p>(2)</p>	<p>The learner evaluates key features of:</p> <ul style="list-style-type: none"> the e-book their own performance, incorporating feedback from others and suggesting at least one sensible improvement. <p>(3-4)</p>	4
Total marks				60

(For description of AOs see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-5 marks)

To be eligible for mark band 1, learners must have carried out some internet-based research. However, they will have used only a **limited range** of sources and will have needed extensive prompting to decide what to research and how to go about it. Not all the information collected will be relevant.

Learners should have described five different types of online service (see *What you need to learn* section 1.2). Learners who cover less than five cannot access the full range of marks. However, some of the descriptions are likely to be brief and have gaps and/or inaccuracies. Learners must also have made an evaluative comment about one of the services described.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have made at least one evaluative comment about each of the services described, but will not have drawn from this any general conclusions about the current scope and limitations of the internet as a whole.

Mark band 2 (6-8 marks)

To be eligible for mark band 2, learners must have used the internet to find a **range** of relevant information. (In this context, a range should be taken to mean at least four different sorts of information, eg extracts from websites, screenshots, journal articles, sound clips, quotes from discussion groups etc.) They will have needed some prompting to choose which types of service to investigate ie those that collectively will give a good overview of the current scope and limitations of the internet as a whole.

Learners should have described five different types of online service. The descriptions will be detailed and contain few – if any – omissions/inaccuracies. They will be illustrated with some appropriate examples. They must also have made some relevant evaluative comments about each of the services described.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have gone beyond evaluating individual online services, to give some indication of the current scope and limitations of the internet as a whole.

**Mark band 3
(9-11 marks)**

To be eligible for mark band 3, learners must have used the internet to find a **wide range** of relevant information without needing any prompting. (In this context, a wide range should be taken to mean at least six different sorts of information, eg extracts from websites, screenshots, journal articles, sound clips, quotes from discussion groups etc.) The services researched will have been carefully chosen so as to give a balanced picture of the current scope and limitations of the internet as a whole.

Learners must have described five different types of online service. The descriptions will be comprehensive – possibly considering examples of the same service supplied by different providers – and will really give a feel for what that service has to offer, as well as its limitations. They will be illustrated with a range of well chosen examples.

In addition to evaluating each of the five services individually, learners will have drawn from this some general conclusions about the current scope and limitations of the internet as a whole.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have given a clear and balanced picture of the current scope and limitations of the internet as a whole.

Assessment evidence (b)

**Mark band 1
(0-5 marks)**

To be eligible for mark band 1, learners must have carried out some research. However, they will have used only a **limited range** of sources and will have needed extensive prompting to decide what to research and how to go about it. Not all the information collected will be relevant.

Learners should have described how ICT affects five different aspects of people's lives (see *What you need to learn* section 1.3). Learners who cover less than five cannot access the full range of marks. However, some of the descriptions are likely to be superficial and/or sketchy.

Learners must have identified a benefit and a drawback.

For full marks in this band, learners must have identified more than one benefit and drawback, but will not have gone beyond this to draw any general conclusions about the benefits and drawbacks of life in the Information Age.

**Mark band 2
(6-8 marks)**

To be eligible for mark band 2, learners must have used a **range** of different sources to find relevant information. (In this context, a range should be taken to mean at least three different types of sources, eg newspaper or magazine articles, textbooks, interviews, personal experience, broadcasts etc.) Learners will have needed some prompting to choose appropriate aspects to investigate ie those that collectively will give a good overview of life in the Information Age.

Learners must have described how ICT affects five different aspects of people's lives. The descriptions will be detailed and illustrated with some relevant examples.

Learners must have described some benefits and drawbacks.

For full marks in this band, learners must have gone beyond descriptions of benefits and drawbacks of individual aspects to give an indication of the benefits and drawbacks of life overall in the Information Age.

**Mark band 3
(9-10 marks)**

To be eligible for mark band 3 learners must have found and used a **wide range** of sources to find relevant information without needing any prompting. (In this context, a wide range should be taken to mean at least five different types of sources, eg newspaper or magazine articles, textbooks, interviews, personal experience, broadcasts etc.) The aspects researched will have been carefully chosen so as to give a balanced picture of life overall in the Information Age.

Learners must have described how ICT affects five different aspects of people's lives. Each description will be comprehensive and give a real feel for how ICT is affecting that aspect of life. Descriptions will be illustrated with a range of well-chosen examples.

Learners must have weighed up the benefits and drawbacks and drawn some general conclusions.

For full marks in this band, learners must have given a clear and balanced picture of the benefits and drawbacks of life overall in the Information Age.

Assessment evidence (c)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have described three factors contributing to the digital divide and one measure being taken to bridge the gap (see What you need to learn 1.4). Learners who cover less than three cannot access the full range of marks. However, some of the descriptions are likely to be brief and/or sketchy.

Learners must also have made an appropriate evaluative comment about one aspect – social, economic, educational or cultural – of the impact of the digital divide.

For full marks in this band, learners must have made more than one evaluative comment about the impact of the digital divide.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must have described in detail three factors contributing to the digital divide and some of the measures being taken to bridge the gap. The descriptions will be illustrated with some appropriate examples.

Learners must also have made some relevant evaluative comments about the impact of the digital divide.

For full marks in this band, learners must have made at least one evaluative comment about the extent of the digital divide, either globally or locally.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must have described in detail three factors contributing to the digital divide and some of the measures being taken to bridge the gap. The descriptions will be illustrated with carefully-chosen examples – both local and global.

Learners must also have produced a considered assessment of the impact and extent of the digital divide.

For full marks in this band, learners must have given a clear and accurate picture of the current situation both globally and locally.

Assessment evidence (d)

Mark band 1 (0-9 marks)

To be eligible for mark band 1, learners must have designed and produced an e-book which includes all the work produced for (a), (b) and (c) and can be viewed on-screen. However, it is likely that learners will not have fully taken into account the constraints and opportunities of the medium, eg the e-book may have too much information on each screen requiring the user to scroll down, an essentially linear rather than hypertext structure, mostly textual content etc.

The e-book must also offer the user some means of moving from page to page. However, there is likely to be limited choice, eg it may only be possible to go from page to page sequentially rather than being able to jump to any page in any order.

Whilst working on the e-book, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, copyright, acknowledgement of sources etc.

For full marks in this band, learners must have demonstrated some awareness of purpose by, for example, adding a title page and introduction to the e-book, as well as some application of basic multimedia design principles relating to structure, layout and presentation.

Mark band 2 (10-13 marks)

To be eligible for mark band 2, learners must have designed and produced an e-book which includes all the work produced for (a), (b) and (c) and is designed to be read on screen, eg has a hypertext structure, takes into account the dimensions of the screen, the amount of text that can comfortably be accommodated, font size, colour etc.

The e-book must also offer the user a means of navigating from page to page, sequential and non-sequential.

Whilst working on the e-book, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have demonstrated some awareness of both purpose and audience. In addition, the e-book must present a coherent/consistent whole rather than a 'hotch potch' of different styles and content.

Mark band 3 (14-17 marks)

To be eligible for mark band 3, learners must design and produce an e-book which includes all the work produced for (a), (b) and (c), is easy to use and makes effective/creative use of the medium, eg by using rich media content as well as text to convey information. It must also be demonstrate awareness of accessibility issues.

Whilst working on the e-book, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. Learners will have adhered to them without being reminded.

For full marks in this band, learners must have created an e-book that effectively conveys a picture of life in the Information Age and is fully fit for purpose and audience, eg by setting the scene – produced when, where and by whom and – giving some background information/context for an audience not familiar with the 'here and now'.

Assessment evidence (e)

Mark band 1 (0-5 marks)

To be eligible for mark band 1, learners must have selected and used some ready-made multimedia components and at least one component (other than text) that they have created themselves in their e-book. However, the range of components used is likely to be limited to just text and graphics and some of the components may be inappropriate, eg a graphic that has nothing to do with the topic it is meant to illustrate. Furthermore, the positioning and/or size of some of the components may be inappropriate.

Learners must also have selected and used appropriate software tools to produce the e-book, although they may not always have chosen the best tool for the job or used it in the most effective way.

Learners must also have carried out some testing, although this will not be enough to guarantee that the e-book functions correctly in all anticipated circumstances.

For full marks in this band, the e-book must be largely functional and include more than one suitable original multimedia components.

Mark band 2 (6-8 marks)

To be eligible for mark band 2, learners must have used more than one multimedia component (other than text) which they created themselves. All the components used – both ready made and original – must be suitable and positioned/sized appropriately.

Learners must also have selected and used appropriate software tools to produce the e-book and have carried out some testing.

For full marks in this band, learners must have carried out sufficient testing, to ensure that the e-book functions correctly in all anticipated circumstances.

Mark band 3 (9-10 marks)

To be eligible for mark band 3, learners must have used a **range** of suitable ready-made and original components, eg graphics, text, animation, video, sound etc. The choice, positioning, size and mix of components is both effective and eye-catching.

Learners must have used appropriate software competently and carried out enough testing to ensure that the e-book functions correctly in all circumstances.

For full marks in this band, learners must have gone beyond simply testing for functionality to assess factors such as ease of use and fitness for purpose.

Assessment evidence (f)

Mark band 1 (0-1 mark)

To be eligible for mark band 1, learners must have made some relevant evaluative comments about key features of their e-book, such as content, structure, screen layout, use of multimedia components, presentation techniques, ease of navigation, consistency, accessibility, fitness for purpose/audience etc.

Learners must also have commented on their own performance.

Mark band 2 (2 marks)

To be eligible for mark band 2, learners must have taken account of feedback from others when evaluating key features of their e-book.

Learners must also have commented on their own performance.

Mark band 3 (3-4 marks)

To be eligible for mark band 3, learners must have taken account of feedback from others when evaluating key features of their e-book and suggested one sensible improvement.

For full marks in this band, learners must have given a well-rounded evaluation of both the e-book and own performance.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *assessment evidence* section is addressed to the learner and gives precise details of what they must do.

The *assessment criteria* grid, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Half the marks available for this unit are for practical, hands-on activities, much of it to do with the development of multimedia content and the creation of the e-book – assessment evidence (d) and (e).

Learners will need to be aware of the key digital technologies and services available today. Learners should ideally be given the opportunity to gain hands-on experience of some of these. They must have access to the internet in order to be able to carry out the necessary research.

The research tasks that are required – assessment evidence (a), (b) and (c) – are all about aspects of life in the Information Age which are relevant to learners. These are real, current issues which learners should find interesting and have no difficulty finding information about.

Vocational context

This unit has a user focus. It does not require learners to undertake work experience. However, learners will benefit from learning about industry practices in relation to the design and production of digital publications such as e-books, websites, e-learning packages. A number of software producers such as Macromedia run online design workshops and seminars which learners might find useful.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- the e-book
- an evaluation of the e-book and own performance.

Teaching and learning strategies

A range of strategies can be utilised to allow all learners to participate in the activities suggested below.

Personal audit

One way of introducing learners to this unit would be to ask them to keep a log over a given period of time, possibly a week, of all the instances when they need information/carry out transactions/communicate with others. This should include all exchanges of information/transactions etc irrespective of whether or not ICT is involved.

As a group, learners could pull together their experiences. They should consider how many of the interactions that did not involve ICT could have done so.

From their combined experiences, each learner should identify five areas for further consideration. They should then carry out individual research into these topics; this will involve the use and evaluation of online services.

Learners should be encouraged to consider how much of daily living can be conducted over the internet – what it has to offer and its limitations, how internet-versions of services compare with non-internet alternatives and the implications for health and wellbeing of over-dependence on the internet.

Learners will need to carefully select which online services to select in order to give a true flavour of the current scope and limitations of the internet. They could, perhaps, choose one from each of retail, finance, healthcare, education and entertainment.

Aspects of living in the Information Age

In this unit, learners investigate the impact of ICT on the way people lead their lives. Learners should draw on their personal audit to reflect on the impact that ICT has on their personal, social and school/college lives. Learners should also consider how ICT impacts on other people.

From these reflections learners could prepare individual multimedia presentations focusing on specific benefits and disadvantages of ICT. Each learner could present their findings to the group. The presentations should be followed by group discussion to allow learners to develop their opinions.

The digital divide

Learners should consider the negative aspects of the so called 'digital divide' from a local and global perspective. Local, in this case, can mean own community, region or country. Since learners are unlikely to have any personal experience to draw upon, it may be necessary for the work on this section of the unit to be introduced initially as a teacher-led activity. Once the issues have been raised, learners could break into groups to investigate

- the factors that create the digital divide
- the impact of the digital divide
- the extent of the divide
- measures being taken to overcome it
- the benefits and drawbacks of a reduction in the gap.

Each group could be asked to prepare a discussion document to be presented to the other groups.

Learners should be encouraged to look at the work of organisations such as ComputerAid International which provide developing countries with refurbished computers. Learners can find out more at www.computer-aid.org/home.htm. Is it right that people in developing countries should get our cast-offs? Can they actually do anything with them? Is the electricity supply reliable enough? What is the telecommunications infrastructure like? Lots of potential discussion here!

The e-book

The research and the conclusions learners reach whilst working on assessment evidence requirements (a), (b) and (c) should be presented in the form of an e-book. E-books themselves are a product of the digital world we live in. This unit gives learners an opportunity to explore the benefits and limitations of e-books.

The production of an e-book will enable learners to demonstrate their ICT competence and presentation skills. In addition, an e-book is a practical, innovative and appropriate mechanism for presenting assessment evidence for an ICT qualification.

Learners should carry out research into the range and scope of e-books currently available. Learners should compile a list of the different features used to create e-books and should evaluate the effectiveness of the facilities and techniques used.

Learners should reflect on their findings during the design and development of their own solutions and should evaluate their product accordingly.

Some of the e-books learners may come across use specialist software to emulate features of traditional books such as the turning of pages. Learners are not expected to do anything as complicated as this. Their e-book needs to be no more than a variation on a website. The most important thing is to get away from the linear approach associated with writing a report and to explore the potential of hypertext structures and multimedia content.

Learners should ensure their e-book content fulfils the requirements of assessment evidence (a) to (d). Assessment evidence (e) asks learners to reflect on their e-book product and produce evaluative comments.

Learners should use software with appropriate multimedia and publishing features to produce their e-books (see the *Resources* section). However, it is not necessary for them to use sophisticated multimedia authoring software for this activity. Standard applications software which allows hyperlinking is adequate.

Please note that learners are not expected to write about standard ways of working, but to demonstrate their knowledge of them by adhering to them, ideally without having to be reminded!

Evaluation

Learners must review both the quality of their e-book and their own performance in terms of what they set out to achieve compared with what they actually produced and the effectiveness of the process they went through to achieve it. Learners should be encouraged to view this review process as something more than a mere 'bolt-on' that will help them to become more effective and maximise their achievement on the rest of the course.

Links

Other units

This unit has close links to *Unit 2: The Digital Economy* and *Unit 3: The Knowledge Worker*.

Many of the ICT skills covered here are developed further in *Unit 5: Web Development* and *Unit 10: Using Multimedia Software*.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners should have access to:

- desktop/laptop computers ideally with the following minimum specification (based on the Becta workstation specification 2/10/03):
 - 256MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40GB hard drive
 - video card with 32MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
 - sound input (microphone)
- printing facilities
- digital camera, scanner, tape recorder
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software:
 - word processing, eg Microsoft Word, OpenOffice Writer
 - presentation, eg Microsoft PowerPoint, OpenOffice Impress
 - web authoring, eg FrontPage 2003, Quanta+, Mozilla Composer, Publisher 2003
 - graphics, eg CorelDraw, Adobe Photoshop Elements.

- Textbooks**
- Evans P – *Web Publishing with FrontPage Express* (Payne-Gallway, 2004) ISBN 1904467385
- Garrand T – *Writing for Multimedia and the Web, Third Edition* (Focal Press, 2006) ISBN 0240808223
- Geer S – *Essential Internet* (Economist Books, 2003) ISBN 1861975406
- Guy C and O'Byrne S – *Information and Communication Technology for Edexcel Applied A2: Single Award with CD-ROM* (Hodder Education, 2006) ISBN 0340926511
- Heathcote T – *Edexcel GCE In Applied ICT: AS Students' Book and CDROM* (Edexcel, 2006) ISBN 1903133815
- Websites**
- World Summit on the Information Society, Geneva 2003 – Tunis 2005**
www.itu.int/wsis
- Bridging the Digital Divide**, BBC News Special Report, October 1999
http://news.bbc.co.uk/1/hi/special_report/1999/10/99/information_rich_information_poor/466651.stm
- Multimedia**
- Salvation is Cheap** (example of a multimedia e-book), Guardian Unlimited
<http://www.guardian.co.uk/flash/mendel.swf>
- Examples of e-zines
- <http://www.jamesshuggins.com/h/awd1/awards.htm>
- <http://www.ezine-dir.com/>
- Other resources**
- Learners should be encouraged to keep up to date by reading some of the many computer/web magazines available, such as *Web User* published by IPC Media and *Internet & Broadband Advisor*, published by Future Publishing. In addition to topical information, most of these magazines provide handy hints and tips, ideas for projects, free software and inspection copies etc.
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Introduction

Paperless transactions are hallmarks of the digital economy. In the global e-marketplace transactional websites are the interface between e-enabled customers and organisations, allowing them to do business with one another anytime, anywhere. Enhanced connectivity underpins the growth of the digital economy. The proliferation of internet-enabled computers in the home and the use of credit cards to pay for goods are major factors in its evolution.

E-consumers exercise greater autonomy and have more choice than is available to them offline in their own locality. They expect to receive a personalised service and an instant response.

In this unit, you will investigate how organisations are responding to the pressures of the e-marketplace by using transactional websites to:

- present their products and services
- gather information
- provide a personalised service.

As an informed ICT user, you need to be aware of the methods used by organisations to persuade their customers to reveal personal information about themselves and what it is used for.

Security and privacy are two key concerns for organisations and individuals operating in the digital economy. You will assess potential threats to customer data and evaluate the effectiveness of current legislation and measures taken by organisations to protect data.

Databases are key to managing the large amount of data that organisations collect. You will learn how to use database software to analyse data and identify trends and patterns.

Your work for this unit will culminate in an in-depth investigation into the design of a commercial transactional website and the back-office processes involved in handling an online purchase.

You will apply your database skills to the task of storing and analysing given data in order to identify significant trends and then make recommendations based on your interpretation of them.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use ICT on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

No specific prior learning is recommended for this unit, although you will find it helpful to have had some experience of using database software to store and manipulate data.

What you need to learn

2.1 Information needs of organisation

The digitisation of information, the growth of the internet and developments in communication technology are transforming the way in which organisations communicate and do business. You need to know how different types of organisations are using ICT to:

- capture and process data
- present and exchange information
- conduct transactions
- market goods and services
- distribute goods
- manage customer relations
- optimise just-in-time purchasing of stock and components.

2.2 From 'brick' to 'click'

The internet has become an important channel for the delivery and/or sale of products and services. For many organisations operating in the digital economy a physical 'bricks and mortar' presence in the marketplace is not sufficient. They also need to be able to conduct business online. A transactional website capable of handling orders and processing transactions enables them to do so. An increasing number of organisations conduct their business entirely online.

You must understand the reasons why organisations – both public and commercial – are responding to the trend from 'brick' to 'click' by setting up transactional websites, including:

- access to a worldwide customer base
- low set-up and running costs
- extension of product range to include internet-specific goods and services
- 24 x 7 presence
- faster response times
- real-time sales information
- customer expectation.

As the dotcom disaster of the late 90s demonstrated, there are drawbacks associated with operating online. You need to be aware of these.

More and more people are accessing products and services online. You must be aware of the advantages and drawbacks to customers of conducting transactions in this way.

2.3 Transactional websites

In the digital economy, conducting business via transactional websites is commonplace for many organisations. You need to investigate a number of transactional websites run by organisations in the commercial and public sectors.

For each site you study, you should consider:

- the purpose of the site and how successfully it meets this objective
- how it is structured
- the goods and/or services it offers
- the product information provided
- types of transactions that can be made and how easy it is to do so
- methods used to capture customer information (both overt and covert) and authenticate the identity of customers
- techniques used to engage, retain and entice customers
- its usability and accessibility
- the 'customer experience' it offers.

You should note any references to terms and conditions of purchase and details of measures being taken to ensure the security of customers' personal and credit card information.

2.4 Back-office processes

There is a lot happening behind the scenes of a transactional website. You need to know about the information processing which is going on in the background before, during and after a transaction occurs, including:

- maintenance of the virtual shopping basket
- identification and authentication routines
- real-time tracking of customers' actions
- payment processing
- stock control
- despatch and delivery.

You must be able to draw diagrams to illustrate:

- the chain of events leading up to an online purchase
- the chain of events that an online purchase triggers
- the information that flows into and out of the organisation and between areas/departments as a result.

2.5 E-customers

Some essential customer details are required in order to complete an online transaction successfully. You need to find out what information is needed and why.

Organisations also need to gather information about their customers' likes and dislikes in order to offer the goods and services they want. You need to be aware of the techniques – both overt and covert – which organisations use to gather this type of information, including:

- analysis of purchase histories and sales information
- loyalty schemes
- surveys
- competitions
- cookies
- spy ware.

E-customers are faceless. The visual cues associated with conducting face-to-face transactions are absent. You need to know how organisations use ICT to gain a competitive advantage by building-up a profile of their customers, so as to be able to:

- offer a personalised service
- persuade customers to spend more
- predict market trends
- reduce wastage.

2.6 E-consumer awareness

We all want to be confident that the personal information we supply to organisations is being protected against theft and unauthorised access.

As a 'savvy' e-consumer you need to be concerned about:

- what information is held about you by organisations
- how it is protected
- how accurate it is
- what it is being used for
- who has access to it
- potential threats such as identity theft and fraud.

You should be aware of the legislation which affects organisations and individuals exchanging information and conducting transactions online, including:

- data protection
- civil rights
- distance selling.

2.7 Security

Organisations which want to operate successfully online must win their customers' confidence and trust. In order to do so, they need to demonstrate that they take threats to data security seriously.

You should know about a range of methods by which an organisation can protect itself from data security threats, including:

- risk assessment
- physical security
- user ID and access rights
- encryption
- secure electronic transactions (SET)
- firewalls
- virus protection.

2.8 The database

The single most important and – at the same time – least conspicuous component of a transactional website is the database which stores details, such as:

- products and prices
- stock levels
- customers
- orders.

You will learn how to design and create databases capable of storing large amounts of data and producing useful information. When designing a database structure you will need to consider the nature of the data to be stored as well as the information you want to find out.

You will learn how to:

- select appropriate field types and formats
- create simple validation rules
- create a one-to-many relationship between tables
- import a given data set
- use sorts to group and order data
- use searches to extract valid and meaningful information
- produce reports to present information clearly.

You must be able to interpret output from a database in order to identify significant features/trends and make recommendations based on the information you have extracted.

2.9 ICT skills

- Your investigation of transactional websites will give you an opportunity to develop and practice the internet research skills introduced in Unit 1.
- In addition, you must be able to use a range of ICT tools and techniques to:
 - produce diagrammatic representations of systems, events and information flows
 - use database software to handle data, including:
 - creating simple relational database structures
 - setting field characteristics
 - creating simple validation rules
 - importing data
 - sorting on single and multiple fields
 - searching on single and multiple fields within a table to extract information
 - searching on related tables to extract information
 - using logical and relational operators
 - producing reports to present information
 - saving information retrieved from the database appropriately
 - produce reports, including:
 - creating, editing and formatting word-processed documents
 - checking accuracy
 - combining and presenting information
 - adding information from one type of software to information produced using different software.

2.10 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
- selecting appropriate ICT tools and techniques
- customising settings
- creating and using shortcuts
- using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.

Assessment evidence

For this unit you will:

- investigate the design of a commercial transactional website (assessment evidence a)
- use diagrams to show what happens when someone purchases a product online (assessment evidence b)
- investigate potential threats to customer data collected via the web and the measures taken to protect it (assessment evidence c)
- create a database to store a given set of data and extract useful information from it (assessment evidence d)
- evaluate the database and your own performance (assessment evidence e).

Your eportfolio for this unit should include:

- (a)* A description of the main features of the site's design and an evaluation of its effectiveness, including some suggestions for improvements.
- (b) Diagrams illustrating the chain of events leading up to, and triggered by, the online purchase of a product and the associated flow of information.
- (c) A description of potential threats to customer data collected by organisations via their websites and an evaluation of measures being taken – including legislation – to protect it.
- (d) A database which has been designed, built and tested to store a given set of data.
Evidence that you have successfully imported the data.
Evidence that you have used and manipulated the database to produce meaningful information, identify significant trends and make recommendations based upon them.
- (e) An evaluation of the performance of the database and your own performance on this unit.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 2: The Digital Economy

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 1, 2, 4) QWC (i-iii)	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find and investigate a suitable transactional website, but needs extensive prompting gives a brief description of the main features of the site’s design, but with some inaccuracies or omissions makes some evaluative comments, but not sufficient to give a clear picture of the overall effectiveness of the site’s design. uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy. <p>(0-9)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find and investigate a suitable transactional website, needing only limited prompting gives a detailed description – supported by examples – of the main features of the site’s design makes some evaluative comments, which give a clear picture of the overall effectiveness of the site’s design. uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy. <p>(10-14)</p>	<p>The learner:</p> <ul style="list-style-type: none"> uses the internet to find and investigate a suitable transactional website, independently gives a comprehensive description – supported by a range of well-chosen examples – of the main features of the site’s design provides a considered evaluation, which gives a clear and balanced picture of the overall effectiveness of the site’s design, suggesting areas for improvement. uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy. <p>(15-18)</p>	18
(b) (AO 1, 2, 3)	<p>The learner produces diagrams giving an outline of the chain of events leading up to, and triggered by, an online purchase and the associated flow of information, but with some inaccuracies or omissions.</p> <p>(0-5)</p>	<p>The learner produces diagrams giving a clear and accurate picture of the chain of events leading up to, and triggered by, an online purchase and the associated flow of information.</p> <p>(6-8)</p>	<p>The learner produces diagrams that are effectively presented and give a complete and accurate picture of the chain of events, leading up to and triggered by, an online purchase and the associated flow of information.</p> <p>(9-10)</p>	10

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 2, 4)	<p>The learner identifies some potential threats to customer data collected by organisations via their websites and describes some measures being taken to protect it, including legislation, but draws no conclusions about their effectiveness.</p> <p>(0-3)</p>	<p>A description of potential threats to customer data collected by organisations via their websites and of the measures taken to protect it, including legislation, with some assessment of their effectiveness.</p> <p>(4-5)</p>	<p>A description of potential threats to customer data collected by organisations via their websites and of the measures taken to protect it, including legislation, with a clear and balanced assessment of their effectiveness.</p> <p>(6)</p>	6
(d) AO 1, 2, 3)	<p>The learner:</p> <ul style="list-style-type: none"> creates a database structure capable of storing the given set of data, but with room for further customisation carries out some limited testing, but not enough to ensure that it functions correctly imports the data into the database uses the facilities of the software to extract some valid and meaningful information. <p>(0-10)</p>	<p>The learner:</p> <ul style="list-style-type: none"> creates a database structure that is customised to take account of the characteristics of the given set of data carries out adequate testing to ensure that the database functions correctly imports the data into the database uses the facilities of the software to extract valid and meaningful significant trends. <p>(11-15)</p>	<p>The learner:</p> <ul style="list-style-type: none"> creates a database structure that is customised to take account of the characteristics of the given set of data and includes some data validation carries out extensive testing to ensure that the database functions correctly and efficiently imports the data into the database uses the facilities of the software to extract valid and meaningful information and identify some significant trends, interpreting output and making recommendations based on it. <p>(16-20)</p>	20

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4)	<p>The learner makes some evaluative comments about:</p> <ul style="list-style-type: none"> the performance of the database their own performance in the unit. <p>(0-3)</p>	<p>The learner evaluates:</p> <ul style="list-style-type: none"> the performance of the database their own performance in the unit, incorporating feedback from others and makes recommendations for improvements. <p>(4-5)</p>	<p>The learner fully evaluates:</p> <ul style="list-style-type: none"> the performance of the database their own performance in the unit, incorporating feedback from others and makes realistic recommendations for improvements. <p>(6)</p>	6
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-9 marks)

To be eligible for mark band 1, learners must have described key features of the transactional website they have investigated, including structure and navigation, type and range of goods on offer, types of transactions that can be carried out and at least one of the methods used to capture customer information (*What you need to learn* section 2.3). Learners will probably have needed some help to find a suitable site to investigate and to identify features to write about. Their descriptions are likely to contain some inaccuracies. In the evaluation of the transactional website, the learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have spotted some of the less obvious features of the website, such as the techniques employed to engage, retain and/or entice customers, covert methods of capturing customer information, usability and accessibility, learners must also have said something about their effectiveness. (*What you need to learn* sections 2.5-2.6)

Mark band 2 (10-14 marks)

To be eligible for mark band 2, learners must have found with very little in the way of prompting a website to investigate and have produced detailed descriptions of the main features of its design, using some examples – probably screenshots – as illustrations. Learners must also have evaluated the effectiveness of some of the features they describe. In the evaluation of the transactional website, the learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have said something about the effectiveness of the site as a whole, as well as having evaluated each of the features described.

Mark band 3 (15-18 marks)

To be eligible for mark band 3, learners must have selected a site to investigate without any prompting and produced a comprehensive description of the site's design, using well-chosen illustrations. Learners must also have fully evaluated each of the features described, as well as the effectiveness of the site as whole, considering both strengths and weaknesses. In the evaluation of the transactional website, the learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners will have demonstrated that they are discerning consumers, who can look beyond the obvious features of a transactional website and understand what the designer is trying to achieve. They will have commented on the 'customer experience' and have made some suggestions for improvements/enhancements.

Assessment evidence (b)

**Mark band 1
(0-5 marks)** To be eligible for mark band 1, learners must have produced diagrams that give an outline of some of the main events that take place in the run-up to an online purchase and those that take place once the purchase has been completed (*What you need to learn* section 2.4). The diagrams are likely to be 'top level', lacking substantial detail and may not be entirely accurate.

For full marks in this band, learners must have indicated the flow of information triggered by the purchase and produced diagrams that are reasonably well presented.

**Mark band 2
(6-8 marks)** To be eligible for mark band 2, learners must have produced clear and accurate diagrams.

For full marks in this band, learners must have used diagrams to describe all of the back-office processes associated with a purchase, the chain of events and the flow of information.

**Mark band 3
(9-10 marks)** To be eligible for mark band 3, learners must have produced effective diagrams that are easy to understand.

For full marks in this band, learners must have produced a comprehensive set of diagrams that together give a complete picture of all back-office processes including flows in and out of the organisation.

Assessment evidence (c)

**Mark band 1
(0-3 marks)** To be eligible for mark band 1, learners must have identified a potential threat to customer data and have described a protective measure being used by an organisation to protect its customer data and a piece of relevant legislation.

For full marks in this band, learners must have described more than one protective measure.

**Mark band 2
(4-5 marks)** To be eligible for mark band 2, learners must have described several threats to customer data and some of the measures and legislation that is designed to protect it.

For full marks in this band, learners must have made some attempt to assess the effectiveness of the measures and legislation described.

**Mark band 3
(6 marks)** To be eligible for mark band 3, learners must have produced a clear and balanced assessment, weighing up the threats on the one hand against the measures/legislation on the other and reaching an informed conclusion about the risks.

Assessment evidence (d)

Mark band 1 (0-10 marks)

To gain marks in this band, learners must have created an appropriate structure to store the given set of data, although they will not have specified the most appropriate field types or formats or incorporated any validation checks, carried out some testing before importing the data, although not enough to be sure that everything works properly, imported the data, manipulated the dataset and produced some valid information from the database.

For full marks in this band, learners must have created a valid one-to-many relationship, checked the data once imported and made some attempt to present the information extracted in a meaningful way.

Mark band 2 (11-15 marks)

To be eligible for mark band 2, learners must have created an appropriate database structure – using at least two tables – customised for the given data set, by selecting appropriate field types and formats. Learners must have imported and checked the given data. They will have produced evidence of having manipulated the dataset to include sorting on multiple fields in order to group and analyse data and having searched on multiple fields within a table in order to extract useful information. They will also have made some attempt to present output in a meaningful way.

For full marks in this band, learners must have included some relevant validation checks and have properly tested the database before importing the data. They must have identified some trends from the information extracted from the database.

Mark band 3 (16-20 marks)

To be eligible for mark band 3, learners must have studied the data set carefully before creating a relational database properly customised, including appropriate validation, to hold it. Learners will have carried out extensive testing prior to importing the data and have checked the data carefully – once imported – to make sure that it is correct. They will have used the facilities of the software to good effect, including searching on related tables to extract relevant information.

For full marks in this band, learners will have accurately interpreted the information extracted from the database, identified significant trends and made informed recommendations based upon them.

Assessment evidence (e)

Mark band 1 (0-3 marks)

To be eligible for mark band 1, learners must have made at least one relevant evaluative comment about performance of the their database they have created. They must also have commented on their own performance in the unit.

For full marks in this band, learners must have commented on several aspects on the performance of their database, such as the field types/sizes used, how easy it is to extract useful information from it, how effectively the validation prevents data entry errors, the quality of the reports etc.

Mark band 2 (4-5 marks)

To be eligible for mark band 2, learners must have taken account of feedback from others when evaluating the performance of their database they have created and own performance in the unit.

For full marks in this band, learners must have considered the effectiveness of the performance of the database as a whole, as well as commenting on individual aspects of it.

**Mark band 3
(6 marks)**

To be eligible for mark band 3, learners must have given a well-rounded evaluation of both the performance of the database they have created and their own performance in the unit and have recommended one realistic improvement to the database.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Recommended prior learning

This unit focuses on e-commerce. Learners look ‘beneath the surface’ of a transactional website. If they study Unit 1 first, they will be familiar with some of the techniques used to attract customers and entice them to use the services on offer. However, since most learners will already have considerable experience of using the internet, this is a recommendation rather than a requirement.

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria* grid, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner’s response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Half the marks available for this unit are for practical, hands-on activities. Learners use the internet to explore the design of a commercial transactional website; they produce diagrams showing the chain of events leading up to, and triggered by, an online purchase and the associated flow of information; they create a simple relational database, import data into it and use the facilities of the software to extract valid and meaningful information from it.

Learners must have access to the internet in order to be able to carry out the necessary research.

Vocational context

This unit has a user focus. It does not require learners to undertake work experience. However, learners will benefit from learning about industry practices in relation to the design and day-to-day running of transactional websites. Ideally, learners should be given an opportunity to look behind the scenes or at least talk to someone involved in designing and/or running a transactional website.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a description/evaluation of the design of the selected transactional website. Note - learners should select a transactional website that sells products from stock which are delivered to a stated address
- diagrams illustrating the back-office processes and information flows
- a description/evaluation of potential threats to customer data and measures and/legislation taken to protect it
- screen dumps showing the structure of the database created, and the testing and manipulation to include the design of queries, search criteria and queries/sorts used as well as output based on the manipulation
- recommendations based on output from the database
- an evaluation of the performance of the database and own performance in the unit.

Teaching and learning strategies

Section 2.1 of the *What you need to learn* section asks learners to look at the information needs of organisations and how they use ICT to communicate and do business. This provides the starting point for the work for this unit. Learners really need to appreciate that different types of organisations have different needs and this will affect how and where they employ ICT. At this point, learners will need to be clear of the difference between commercial and public sector organisations and may want to start to consider if this too may affect the type of ICT they use or the way they use it.

Although learners will spend considerable time accessing the internet for this unit, it actually requires them to go beyond using the web as a source of information and move on to consider how the internet is used by many business organisations as an extension of their marketplace, ie the 'from brick to click' phenomenon. Transactional websites can provide organisations with an interface to reach and gather information on a wider range of consumers than ever before. Learners should have the opportunity to discuss the advantages and disadvantages of the e-marketplace to both public sector/commercial organisations and consumers, hopefully developing their own e-consumer awareness.

Investigation of a transactional website

Wherever possible, work with a 'real' business organisation operating a transactional website will be extremely beneficial in helping learners to fully understand how the site works and all the back-office processes involved.

Learners should begin by exploring a range of transactional websites, both commercial and public service, before deciding which one to investigate in depth. Learners should ensure the transactional website they choose enables customers to buy products from stock which are delivered to a stated address.

In order to consider the requirements for data gathering and storage, learners would benefit from considering online supermarket sites. These sites allow learners to register and to carry out many functions without the need to subscribe or pay for using the facilities. In addition, many learners will be familiar with supermarket loyalty schemes, either from personal/family experience or from their KS4 studies.

Learners should examine how easy virtual shopping baskets are to use, what information has to be input in order to register, order and pay for goods selected.

The consideration of the stored customer data and the way that this data is gathered and used to analyse shopping patterns and to encourage customer spending via the issuing of targeted vouchers will give learners the opportunity to consider how online commercial organisations profile their customers.

The number of transactional websites are constantly increasing as businesses realise the value of selling 24/7 to a wide audience. Learners should be encouraged to select different transactional websites from each other and to choose one which sells products from stock and delivers to a stated address.

Learners should examine how the design, structure and features of transactional sites add to the customer experience.

Back-office processes

Learners see the front office (shopping basket and methods of payment) when accessing transactional websites. They will need to study what happens behind the scenes in the back office. This involves understanding the departments which have access to the information input into the system when a item is being purchased. This will also include the flow of information to third parties involved in the processes. Learners should use flowcharts and information flow diagrams to depict relevant back-office processes. Diagrams need to be produced using computer software and ideally they should use drawing software to produce their diagrams. Learners should look at a range of different types of diagrams in textbooks but need to create their own and add annotation to explain them.

Interrogation of a database

Databases are key to managing the large amounts of data organisations collect in the digital world. Assessment evidence (d) and (e) require learners to design a database to hold a given data set collected from a transactional website. Suitable datasets are made available on the Edexcel website for those centres who do not wish to produce their own. Datasets should be given to learners in a single file in csv format and should be large enough to contain trends. Learners will use database tools to design and create the database, test the created structure, import the dataset and then analyse/interrogate the given data to extract meaningful information and present the output in a meaningful way. Through this activity they will learn how databases assist decision making by helping to identify patterns and trends.

Learners should be encouraged to think about the data stored by the system underlying the transactional website they investigated and should consider how that data could be used to generate the information.

Learners will need to use relational database software. However, they are required to produce only simple relational database structures consisting of no more than two tables linked together by a one-to-many relationship. Learners are not required to produce front ends and forms, they should examine 2.8 and 2.9 to ascertain the skills needed.

Links

Other units

This unit has close links with *Unit 1: The Information Age* and *Unit 3: The Knowledge Worker*.

Many of the themes introduced here are developed further in other units. In particular, *Unit 5: Web Development* and *Unit 13: Web Management* both focus on aspects of website design and management from a practitioner's viewpoint; whilst *Unit 7: Using Database Software* builds on the introduction to database tools provided by this unit.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers, ideally with the following minimum specification (based on the Becta workstation specification 2/10/03):
 - 256MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40GB hard drive
 - video card with 32MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - word processing, eg Microsoft Word, OpenOffice Writer
 - database, eg Microsoft Access, Lotus Approach
 - drawing, eg Microsoft Visio, OpenOffice Draw
 - html authoring software, pdf converter.

Textbooks

Geer S – *Essential Internet* (Economist Books, 2003) ISBN 1861975406

Guy C and O'Byrne S – *Information and Communication Technology for Edexcel Applied AS level Single Award* (Hodder Murray, 2005) ISBN 0340907282

Heathcote F R – *Further Access 2000-2002* (Payne Gallway, 2003) ISBN 1903112982

Heathcote O H U – *Basic Internet, Third Revised Edition* (Payne-Gallway, 2002) ISBN 1903112893

Heathcote T – *Edexcel GCE In Applied ICT: AS Students' Book and CDROM* (Edexcel, 2006) ISBN 1903133815

Websites

Good examples of commercial websites include:

www.amazon.co.uk

www.boots.com

www.borders.co.uk

www.ebay.com

www.johnlewis.com

www.tesco.com

Good examples of public service websites include:

www.army.mod.uk

www.lincolnshire.gov.uk

www.met.police.uk

www.nhsdirect.nhs.uk

Other resources

Learners should be encouraged to keep up to date by reading some of the many computer/web magazines available, such as *Web User* published by IPC Media and *Internet & Broadband Advisor*, published by Future Publishing.

In addition to topical information, most of these magazines provide handy hints and tips, ideas for projects, free software and inspection copies etc.

Introduction

We all encounter situations where we have to weigh up alternatives and make decisions. For example, if you organise a school disco, you need to work out how much you should charge for tickets - enough to cover the cost of the event, but not so much that it puts people off coming. When choosing a university or college, you need to take factors such as fees, travelling costs and accommodation into account as well as the courses that are available and the entrance requirements. You may have a personal preference for a particular course, but other factors may lead you to choose another.

In this Information Age computers and communications technology provide many of us with access to vast quantities of information. As ICT users, we need to make judgements about sources and accuracy of information and be able to select and manipulate information to support sound decision making.

People who work at the tasks of developing or using knowledge are known as knowledge workers – in the world of ICT this includes programmers, systems analysts, technical writers and – most importantly – users. In other words, you are a knowledge worker! Knowledge workers are discerning consumers of information. They have the information-handling skills to turn information into knowledge.

In this unit you will learn about making informed decisions using the knowledge available to you. As you already know, not all information is current or accurate. You will learn how to select your sources and decide on how much credence you can place in them. You will learn that there are often many factors to consider when making a decision and that part of the process is to identify gaps in your knowledge. Decisions often have to be made within time constraints. You will learn how to manage your time effectively by prioritising tasks and setting interim deadlines.

In Unit 2 you will have used database software to organise and interrogate a large data set and to extract useful information. In this unit, you will develop your skills as a knowledge worker by learning how to use spreadsheet models to investigate alternatives and answer ‘what-if’ questions. The formulae in these models will allow you to try out some of the possible alternatives that you have identified. Together with information from other sources, you will use the outcome of the models to inform your decision making.

This is an externally assessed unit.

Recommended prior learning

No specific prior learning is recommended for this unit, although you will find it helpful to have had some experience of using spreadsheet software to handle data. It is recommended that you study *Unit 1: The Information Age* and *Unit 2: The Digital Economy* before starting work on this unit.

What you need to learn

3.1 Problem solving What shall I wear today? Which programme shall we watch? Many of the problems we encounter and the decisions we make are personal and have little effect on others. However, as an advanced ICT user and knowledge worker, you will be faced with making decisions that have a direct, often wide ranging, impact on other individuals, groups or the organisation as a whole.

Once a problem is defined, specific information is required to make decisions on how best to solve it. You will learn to process the information you have available to create new information, thereby increasing your knowledge of the situation.

Often you will find yourself faced with an enormous amount of potentially useful information and at times with information overload – far too much information available so that you cannot easily find the knowledge that you need. You will need to discard irrelevant information so that you are left only with information that you can process. Most importantly, you must remember that technology can only provide you with potentially useful information – it does not create knowledge for you.

3.2 The decision-making process Informed decision making is a systematic process which takes into account all the valid information available.

As a knowledge worker faced with making a decision you will need to:

- make sure that you fully understand the situation
- search for information related to the problem
- establish what sources of information there are and how reliable they are
- identify gaps in your knowledge that cannot be filled
- find out if there are any other factors which need to be considered, including constraints
- select the information you will use
- analyse the information
- identify alternatives
- make the decision
- justify the decision
- explain it to others.

You will need to consolidate your understanding of this process by considering examples, such as the problem of selecting the appropriate season ticket for a business commuter. There are a number of factors to take into account including the types of ticket available, the costs, the availability, the number of journeys, time of day, holidays etc.

- 3.3 Understanding the situation** In order to stand a realistic chance of making the right decision, it is essential to think things through.
- What exactly do you have to decide?
 - Are there different viewpoints?
 - How does this decision compare with similar decisions you may have had to make already?
 - Are there variations from time to time or place to place?
 - How long have you got to decide?
 - What resources are at your disposal?
- 3.4 Sources of information** When trying to make a decision you need to first establish what you know and what you need to find out. You need to identify all relevant sources of information and make judgements about their accuracy and usefulness. You will need to ask yourself the following questions.
- What do I need to know?
 - What relevant knowledge do I already have?
 - What are the gaps in my knowledge and can they be filled?
 - What information do I already have access to?
 - Where will any additional information come from?
 - What factors can affect the accuracy of information I have used or collected?
 - How will I evaluate sources of information to ensure that content is reliable?
- 3.5 Other factors to consider** This is where your qualities as a knowledge worker are really put to the test, as the best decisions take all available knowledge into account. Once you have assessed the usefulness of information, you must consider other factors that might influence the decision, such as:
- currency of data
 - accuracy of data
 - external factors, eg traffic, weather.
- 3.6 Making a decision** You should, at this stage, have gained as much information as possible about the situation. You now need to maximise your knowledge by analysing the information and by testing out alternative solutions.
- There are many ways of manipulating information to help you make decisions but one of the most useful is that of modelling.
- Spreadsheet models are powerful aids to decision making. A well-constructed model will capture the main features of a situation without getting bogged down with unimportant details. It will allow you to explore alternatives and predict behaviour under different conditions.
- The results of using the model, combined with all the other knowledge you have relating to the situation, should allow you to make a decision or recommendations for the future.

3.7 Computer modelling

You will need to practise using spreadsheet models to help you make decisions. But, bear in mind that the decisions you make are only ever as good as the model on which they are based! Before putting your trust in a model – whether created by you or somebody else – you need to check that it is correct.

- Is the logic of the model correct?
- Are the data formats appropriate?
- Is the syntax of the formulae correct?
- Are the cell references correct?

The quality of your model will affect the quality of the decisions you make so before using a model you should determine:

- the process/scenario being modelled
- what it does
- how well it does it
- whether it could be improved
- which variables can be input
- what the output tells you
- the decisions you could make using it.

3.8 Using a model to consider alternatives

Once you are sure that a model is working correctly you can use it to see the effects of various courses of action. For example, the model may indicate the most cost-effective solution, but that is unlikely to be the only consideration. You will often have to compromise between two opposing factors for example when you are buying a car you may have to compromise on power because of the cost. You will need to decide:

- which decision produces the best results or compromise
- the alternatives
- factors that differentiate between them
- anything that the model does not take into account
- what the impact of these might be.

3.9 Justifying the decision

Having considered both the results of your model and other factors, you will need to use your knowledge to make a decision. As a knowledge worker your task is not only to make recommendations based on the information you have selected or derived, but to justify your decisions to others. As you go through the decision-making process you should record your progress so that relevant documentation is available when you come to present your report.

3.10 Reporting it to others

In a business environment you will probably not have sole control of the decisions to be made and it is likely you will have to recommend a course of action to your management. Your recommendations should include:

- a summary of the current situation
- sources of information and alternatives you considered
- other factors you took into consideration
- the methods you used to reach your decision
- your decision
- justification of your decision, supported by evidence of the decision-making process.

Recommending decisions to management is normally done in one of two ways, through face to face presentations or written reports. For the examination you will need to know how to create fit-for-purpose presentations and reports.

3.11 Evaluating a model

You will need to be able to evaluate models. You will need to cross-reference your method of solution against the original objectives in considering the following.

- How well has the model performed?
- To what extent has the model helped you to make the decision?
- What else would you like to do?
- Does the model need extending and, if so, how?
- Will more information have to be found?

3.12 ICT skills

You must be able to use a range of ICT tools and techniques to:

- carry out spreadsheet modelling tasks, including:
 - entering and editing data, eg absolute and relative cell referencing, adding data and text to a chart
 - formatting data, eg colours, shading and borders, headers and footers
 - using formulae and functions, eg mathematical, statistical, financial and relational
 - validating and checking data, eg errors in formulae, accuracy of results
 - analysing and interpreting data, eg filters, subtotals
 - presenting information, eg graphs and charts
 - modifying spreadsheet models to take account of requirements
- produce word-processed documents that communicate effectively and impart information to an audience, including:
 - importing data from other applications, eg adding a spreadsheet graph/chart to a word-processing document
 - formatting documents
 - creating document layouts, eg tables and columns
 - checking and proofreading documents
- produce presentations that communicate effectively and impart information to an audience, including:
 - creating and editing presentations
 - formatting slides
 - inserting text, pictures and charts into presentations
 - importing data from other applications, eg adding a spreadsheet graph/chart to a presentation
 - checking and proofreading presentations.

3.13 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- assessment
 - labelling correctly all documents submitted for assessment
 - submitting documents in the order required
 - submitting evidence in the format required.

Assessment guidance

This unit is externally assessed through a two-and-a-half-hour examination and must be taken in one sitting during a designated five-day window.

Working under supervision, you will be required to make and justify a decision based on what you know about a given scenario and what you are able to deduce from the information provided.

To help you reach your decision you will be given a number of e-resources, including a spreadsheet model that partially represents the given situation. You will use the information provided to add to your knowledge of the scenario and inform your decision making.

Details of the scenario, and the spreadsheet model and the practice files will be issued in advance of the examination to give you an opportunity to familiarise yourself with them and to carry out some preliminary research. However, details of the decision to be made will be provided only at the start of the examination.

You will be expected to use standard office software to help you make, present and justify your decision. Marks will be awarded for the quality of your written communication.

By the end of the designated examination period, you will have to print your work and assemble it as specified on the front of the examination paper.

Delivering this unit

General information

Assessment requirements

This is an externally assessed unit. Instructions for the conduct of the examination will be published on the Edexcel website in advance of each examination series.

Vocational context

This unit has a user focus. Learners will need to explore a range of different spreadsheet models.

Pre-release time

This unit gives learners pre-release material. A practice spreadsheet model and datafiles will be released at the same time as the pre-release material to help learners prepare for the examination.

Standard ways of working

Learners must work safely and adhere to relevant legislation and codes of practice when carrying out the externally-set, practical computer-based activities required for this unit. Marks will be awarded for evidence of adherence to relevant standard ways of working.

Teaching and learning strategies

Learners should be encouraged to practise using models to help make decisions and to investigate the underlying logic/assumptions of models and to check their accuracy.

Learners should experience a range of situations in which they are either required to make decisions based on information provided by others or to evaluate decisions made by others in the light of available information. They should be encouraged to use critical thinking techniques to analyse problems in terms of what they know, what they need to know and how they will move from the initial position to the point at which they can make a decision.

One possible context for this work might be planning a holiday. Models could be created that take into account all factors involved in the process and allow learners to explore alternatives in order to aid their decision. Learners could also consider decisions related to their future. This could include consideration of their career aspirations (possibly in terms of cost of education-versus-future earning power). Also suitable would be the consideration of courses/institutions for higher education.

A group work approach may benefit learners at this stage, as it will provide them with the opportunity to present their decisions to others and will require them to justify their decisions when challenged and explain the underlying logic/assumptions used to create their model.

Knowledge workers are discerning consumers of information and learners should learn to question the quality of the information they have available to them and to realise that decisions are only as good as the information on which they are based.

Consideration should also be given to issues relating to ethical decision making – to what extent should a spreadsheet model alone be used as the basis for decision making?

Whilst not required to create spreadsheet models for themselves, learners will need to be able to use spreadsheet software effectively (see section 3.12).

Links

Other units

This unit has close links to *Unit 1: The Information Age* and *Unit 2: The Digital Economy*. Learners will be expected to draw on the ICT skills developed in these units in order to handle information and present their decisions.

Many of the decision-making/problem-solving skills introduced in this unit will be utilised and developed further at A2, especially in *Unit 8: Managing ICT Projects*.

Unit 11: Using Spreadsheet Software builds on the introduction to spreadsheet modelling provided by this unit.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers, ideally with the following minimum specification (based Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- Windows XP operating system or equivalent
- software:
 - spreadsheet, eg Microsoft Excel, OpenOffice Calc
 - word processing, eg Microsoft Word, OpenOffice Writer
 - presentation, eg Microsoft PowerPoint, OpenOffice, Lotus Approach
 - mindmappping, eg Inspiration.

Textbooks

Edwards J S and Finlay P N – *Decision Making with Computers – The Spreadsheet and Beyond* (Pearson Professional, 1997) ISBN 0273621289

Guy C and O’Byrne S – *Information and Communication Technology for Edexcel Applied AS level Single Award* (Hodder Murray Publishers) ISBN 0340907282

Heathcote T – *Edexcel GCE In Applied ICT: AS Students’ Book and CDROM* (Edexcel, 2006) ISBN 1903133815

Websites

Examples of models:

www.bizpeponline.com/index.htm

biz pep Business Support Software

Unit 4: System Design and Installation

Internally assessed

Introduction

In this digital world of ours, increasing numbers of people use ICT at home, school or work. Most of these people are 'ICT users' – they expect the ICT tools to do what they want, when they want without understanding how or why. Only a minority understand what is needed, what hardware and software to buy, how to connect it all together, how to use it effectively and what to do when things go wrong. These are the 'ICT practitioners' and users cannot survive without them. As the number of users escalates, so does the need for competent practitioners.

In this unit you will acquire a sound knowledge of the hardware and software requirements of computer systems. You will learn how to apply this knowledge to produce system specifications that meet users' requirements by analysing user needs, evaluating similar systems in different contexts and selecting and combining appropriate system components.

Most users do not have the skills or confidence to install computer systems or to attempt to deal with ICT problems themselves. You will learn the principles of system installation and how to install and test a stand-alone computer to a given configuration.

Users cannot be expected to know and understand the jargon and specialist terminology associated with ICT. It is up to the practitioner to communicate with them effectively using non-technical language. You will learn how to present complex ICT concepts in easy-to-understand, lay person's language.

Your work for this unit will culminate in the production of a detailed system specification for a specified client and the installation, configuration and testing of a stand-alone computer system.

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

No specific prior learning is recommended for this unit, although you do need to have had experience of using ICT applications for a wide range of different tasks.

What you need to learn

4.1 Needs analysis

When planning and implementing a new computer system the IT practitioner must work closely with the client to analyse their needs and agree the system specification. This is the only way to ensure that the new system will be fully fit for purpose.

You will learn how to investigate a client's requirements by carrying out a detailed needs analysis, including:

- establishing how the current system (either a manual system or an existing computer system) works
- identifying the problems/limitations of the current system and therefore any user dissatisfaction
- identifying the requirements for a new system
 - functionality
 - costs
 - timescales.

You will learn how use a range of different investigative/analytical techniques in order to find out what you need to know, including:

- interviews
- questionnaires
- face-to-face meetings
- observation
- document analysis
- data analysis.

Only when you have a clear picture of a client's needs, can you begin to consider how they can best be met.

There will almost certainly be an existing system somewhere that fulfils a similar need. You will learn how to evaluate existing systems, looking at features such as:

- components (hardware and software)
- effectiveness
- usability
- drawbacks and limitations.

By looking at these systems you will get an idea of what might be appropriate for your client, what alternatives there are and what – if any – drawbacks you need to consider.

4.2 Application software

You must be able to select appropriate types of application software and choose between different packages. In order to do so, you will need to know about, and have had hands-on experience of, as wide a range of software as possible, including:

- word-processing software
- spreadsheet software
- database software
- website software
- artwork and imaging software
- presentation software
- specialist software, such as
 - accounts applications
 - logistics planning applications
 - computer-aided design applications
 - digital video editing
 - music composition and editing
 - project management applications.

You will learn that your choice of software will be constrained by a number of considerations, including:

- budget
- the ICT competence of the intended user
- the training requirements – costs and implications
- availability of training materials
- availability of product support
- compatibility with other software used by colleagues.

As well as looking at commercial ‘off-the-shelf’ software, you should also consider the advantages and disadvantages of open source software.

Some organisations choose to invest in bespoke software solutions rather than use ‘off-the-shelf’ solutions. You should be aware of the reasons for doing this.

4.3 Operating system software

You must know about operating system software and be able to assess features, including:

- ability to customise
- support for connectivity of portable media
- security, stability and reliability
- ease of management
- associated utilities
- cost and support for the user.

You will need to learn how to select the most appropriate operating system for the systems you are designing.

It is not necessary at this stage to learn about networks, but you do need to understand the difference between single user and multi-user operating systems.

4.4 System hardware

Before you can design a hardware specification for a system, you need a good understanding of ICT components and their purpose, including:

- motherboards
- processors
- heat-sinks
- fans
- multimedia devices, such as graphics cards, sound cards, TV cards
- network interface cards
- hard disks
- optical drives
- other storage media
- main memory
- input and output devices
- ports.

It is important to consider whether a particular component is essential or optional, bearing in mind the client's requirements and the cost implications for your budget.

You also need to check the compatibility of the chosen hardware components with one another and with software you have selected.

4.5 Mobile technology

Mobile technology allows computing devices to become portable. You will investigate various mobile technologies so as to be able to make an informed recommendation to a client.

You need to learn about the features, cost implications, advantages and disadvantages of mobile technologies, such as:

- notebook/laptop computers
- mobile phones
- PDAs
- wireless data links
- Bluetooth.

4.6 Ergonomics

Ergonomics is defined as the study of the design and arrangement of equipment and systems that enables users to interact with them in a healthy and efficient way. You should understand the importance of the design of:

- hardware and software
- workstation layout
- furniture.

Your understanding of these principles should be reflected in every system specification that you produce.

4.7 System specification

It is your client who must pay for and feel comfortable with the system specification you devise. Therefore, not surprisingly, they will expect you to explain and justify your proposals and convince them that it is the best solution.

You will learn how to present the details of a proposed system specification to a client, using simple, non-technical language, including:

- the hardware and software components to be used, including any special equipment (if appropriate), such as Braille printer and/or keyboard, speech input and/or output, screen magnifier
- alternatives that you have considered (eg processor type, backup options) with a full justification for your choice
- workstation layout and furniture
- recommended security measures
- test plan
- training schedule.

It is important that there are no misunderstandings at this stage and that the client fully understands and accepts your proposals.

4.8 System installation

You will learn about the procedures involved in system installation and the need to work in a safe, controlled environment.

You will gain practical experience of installation by setting up a stand-alone computer system. You will learn how to:

- connect and set up equipment, such as
 - monitor
 - printer
 - modem/router
 - keyboard, mouse
 - speakers
 - microphone
- install components, such as
 - graphics card
 - sound card
 - CD/DVD drive
 - RAM
- install and configure software, including
 - operating system software
 - applications software
- create appropriate directory/folder structures.

4.9 System configuration

You will learn how to customise the system by altering the configuration of both system and application software to suit a client's needs, such as:

- accessing the BIOS and making suitable and safe changes, setting a BIOS password to prevent unauthorised access, editing power management options etc
- editing anti-virus configurations
- editing the desktop – icon size, font size, colour, background, icon choice etc
- creating start-up options
- setting file sharing/permissions
- creating and reconfiguring application toolbars.

4.10 Testing

It is essential that the system you hand over to a client has been thoroughly tested. You will learn how to plan and conduct effective testing to make sure that everything works as it should. This will include checking, amongst other things, that:

- software applications open and work as intended
- default folder settings are correct
- desktop shortcuts go to the right place
- the correct device drivers are installed
- the correct paper sizes are set for printing
- menu options work as intended
- the correct date and time are set
- (most importantly) the system is safe to use
- cables do not present a safety hazard.

4.11 ICT skills

In order to design and install a stand-alone system to meet specified user needs you will need to develop the following skills and techniques:

- installing a stand-alone PC
- installing operating system software
- installing application software
- configuring hardware and software
- preparing and implementing test procedures.

4.12 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly

- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
 - safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
 - eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will:

- carry out a needs analysis and produce a system specification for a specified client (assessment evidence a and b)
- install and test a computer system and configure system settings for a specified client/purpose (assessment evidence c and d)
- evaluate the system (assessment evidence e).

Your eportfolio for this unit should include:

- (a) A needs analysis for a specified client with complex needs, including a description and detailed evaluation of two existing systems that meet similar needs.
- (b)* A system specification that:
 - fully meets the needs of the specified client in (a),
 - is presented effectively in simple, non-technical language
 - includes a full justification for the choice of components
 - gives some consideration to ergonomics
 - demonstrates consideration of the audience.
- (c) Evidence of installation and configuration of the system
- (d) Evidence of testing to ensure that the system functions correctly
- (e) An evaluation of the performance of the system and your own performance on this unit.

* Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 4: System Design and Installation

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 4)	<p>The learner:</p> <ul style="list-style-type: none"> carries out a limited investigation of the client's requirements produces a limited needs analysis, but with some omissions provides a brief description of at least two existing systems that meet similar needs. <p>(0-6)</p>	<p>The learner:</p> <ul style="list-style-type: none"> carries out an adequate investigation of the client's requirements produces a sound needs analysis provides a detailed description with some evaluative comments of at least two existing systems that meet similar needs. <p>(7-9)</p>	<p>The learner:</p> <ul style="list-style-type: none"> carries out a thorough investigation of the client's requirements produces a comprehensive needs analysis provides a detailed description and considered evaluation of at least two existing systems that meet similar needs. <p>(10-12)</p>	12
(b) (AO 3, 4) QWC (i-iii)	<p>The learner produces an outline system specification that:</p> <ul style="list-style-type: none"> meets some of the client's needs is written using simple, non-technical language gives some explanation for the choices made, but without fully justifying them includes little or no consideration of ergonomics. <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p>(0-9)</p>	<p>The learner produces a detailed system specification that:</p> <ul style="list-style-type: none"> meets most of the client's needs is clearly presented, using simple, non-technical language gives a detailed explanation for the choices made, with some justification includes some consideration of ergonomics. <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p>(10-13)</p>	<p>The learner produces a comprehensive system specification that:</p> <ul style="list-style-type: none"> fully meets the client's needs in the most appropriate way is effectively presented, using simple, non-technical language, demonstrating full awareness of audience and purpose gives a detailed explanation and full justification for the choices made includes full consideration of ergonomics. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p>(14-18)</p>	18

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3)	<p>The learner:</p> <ul style="list-style-type: none"> produces a functional system that meets the specified requirements, with extensive prompting carries out some configuration of basic system settings. <p>Whilst working on the installation and configuration of the system the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p>(0-8)</p>	<p>The learner:</p> <ul style="list-style-type: none"> produces a functional system that meets the specified requirements, with only limited prompting carries out sufficient configuration of system settings to customise the system to meet the specified requirements. <p>Whilst working on the installation and configuration of the system the learner adheres to relevant standard ways of working, needing only occasional prompting.</p> <p>(9-12)</p>	<p>The learner:</p> <ul style="list-style-type: none"> produces a functional system that meets the specified requirements, independently carries out extensive configuration of system settings to optimise the system to meet the specified needs efficiently. <p>Whilst working on the installation and configuration of the system the learner adheres to relevant standard ways of working, independently.</p> <p>(13-15)</p>	15
(d) (AO 3)	<p>The learner carries out some limited testing of parts of the system, but not sufficient to guarantee that it functions correctly.</p> <p>(0-4)</p>	<p>The learner carries out adequate testing of the whole system to ensure that it functions correctly.</p> <p>(5-6)</p>	<p>The learner carries out extensive testing of the whole system to ensure that it functions correctly and is fully fit for purpose.</p> <p>(7)</p>	7
(e) (AO 2, 4)	<p>The learner makes some evaluative comments about:</p> <ul style="list-style-type: none"> the performance of the system their own performance. <p>(0-4)</p>	<p>The learner evaluates:</p> <ul style="list-style-type: none"> the performance of the system their own performance, incorporating feedback from others and makes recommendations for improvements. <p>(5-6)</p>	<p>The learner fully evaluates:</p> <ul style="list-style-type: none"> the performance of the system their own performance, incorporating feedback from others and makes realistic recommendations for improvements. <p>(7-8)</p>	8
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-6 marks)

To be eligible for mark band 1, learners must have investigated a client's needs – although the investigation will have been superficial – and produced a needs analysis for the client, identifying some of the key requirements. They must also have briefly described two existing systems that meet similar needs, although the selected systems do not match the client's requirements particularly well.

For full marks in this band, learners must have used more than one investigative technique (*What you need to learn* section 4.1) to investigate the client's needs and have identified and described two existing pc systems that closely match the requirements of the client.

Mark band 2 (7-9 marks)

To be eligible for mark band 2, learners must have investigated sufficiently to have a sound understanding of the client's needs and have described in detail two existing pc systems that have similar functionality to that required by the client.

For full marks in this band, learners must have said something about how well the existing pc systems would meet the client's requirements, identifying shortcomings.

Mark band 3 (10-12 marks)

To be eligible for mark band 3, learners must have carried out a comprehensive investigation, considering current and possibly future needs and produced a detailed evaluation of the two existing pc systems with similar functionality.

For full marks in this band, learners must have weighed up the pros and cons and come to an informed conclusion about what might be appropriate for the client, what alternatives there are and what – if any – drawbacks need to be considered.

Assessment evidence (b)

Mark band 1 (0-9 marks)

To be eligible for mark band 1, learners must have produced a system specification that meets some of the client's needs, identifying the hardware and software to be used.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have addressed all aspects of a system specification (see *What you need to learn* section 4.7) and given some explanation for the choices they have made. The specification must be written in non-technical language that an end-user could be expected to comprehend.

**Mark band 2
(10-13 marks)**

To be eligible for mark band 2, learners must have produced a system specification that meets most of the client's needs. They must have explained in detail the choices they have made and have considered ergonomics.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have identified some possible alternatives and justified the choices they have made. The specification must be clearly presented in simple, non-technical language.

**Mark band 3
(14-18 marks)**

To be eligible for mark band 3, learners must have produced a comprehensive system specification – clearly presented in simple, non-technical language – that fully meets the needs, both current and future, of the client. They must have fully explained and justified the choices they have made.

For full marks in this band, learners must have produced a system specification that is tailor-made for the client, demonstrating an excellent understanding of the client's needs. The specification will be effectively presented demonstrating full awareness in such a way as to ensure that the purpose of client fully understands the specification to its intended readers.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

Assessment evidence (c)

**Mark band 1
(0-8 marks)**

To be eligible for mark band 1, learners must have built and produced a functional pc system showing the installation of internal hardware components and the installation of software. They must also show that the system has been configured with some basic system settings, such as left and right mouse buttons, power-saving options, screen resolution, desktop theme, font size, default language setting, default folder locations etc, although they will have needed considerable prompting to do so.

Whilst building the system, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg safe working, file management, personal effectiveness.

For full marks in this band, learners must have built a system which can be used for the specified purpose, although further customisation would be desirable.

**Mark band 2
(9-12 marks)**

To be eligible for mark band 2, learners must have produced, with minimal prompting, a functional system that meets the specified requirements. They will have configured some system and application software settings in order to make the system more appropriate for the specified purpose.

Whilst building the system, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners will have carried out sufficient configuration of the system to customise it for the specified purpose.

**Mark band 3
(13-15 marks)**

To be eligible for mark band 3, learners must have independently built, produced and configured the system. They will have carried out extensive configuration in order to optimise the system for the specified purpose.

Whilst building the system, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must have maximised the efficiency of the system by configuring it appropriately.

Assessment evidence (d)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have carried out some testing of both hardware and software, but they will not have done enough to be certain that the system as a whole functions correctly all the time.

For full marks in this band, learners must have tried to ensure that the system works properly at all times.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must have done enough testing to be certain that the system as a whole functions properly at all times.

For full marks in this band, learners must have tested for performance as well functionality.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must have involved others in the testing, considering factors such as usability and accessibility.

For full marks in this band, learners must have tested sufficiently to ensure that the system is fully fit for purpose.

Assessment evidence (e)

**Mark Band 1
(0 – 4 mark)**

To be eligible for Mark Band 1, learners must have made at least one relevant evaluative comment about the performance of the system. They must also have commented on their own performance.

For full marks in this band learners must have commented on several aspects of the system, such as ease of use, fitness for purpose etc.

**Mark Band 2
(5 – 6 marks)**

To be eligible for Mark Band 2, learners must have taken account of feedback from others when evaluating system and own performance.

For full marks in this band, learners must have considered the effectiveness of the system, as well as commenting on individual aspects of it.

**Mark Band 3
(7 – 8 marks)**

To be eligible for Mark Band 3, learners must have given a well-rounded evaluation of both system and own performance and have recommended one realistic improvement, explaining how it would enhance the performance of the system.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria* grid, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Approximately one third of the marks available for this unit are for practical, hands-on activities (assessment evidence (c) and (d)). Simulation is not appropriate. Learners will need to be able to take apart and re-assemble, set up and configure a working, reasonably 'modern' computer.

In a multi-purpose classroom it is possible to have the majority of learners working on the research activities, whilst individuals do the actual practical work one at a time.

Vocational context

This unit has a practitioner focus. Learners will benefit from learning about industry practices in relation to systems analysis, design, installation and testing. It may be possible for them to shadow one of the school's/college's IT technicians and/or undertake a period of work experience in an IT department.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a needs analysis for a specified client
- a system specification
- evidence (possibly a photograph) of installation and configuration of a stand alone computer system
- evidence of testing
- an evaluation of the system and own performance.

Teaching and learning strategies

Although ideally learners should install and configure a system for the client whose needs were investigated in (a), it is recognised that this may not always be possible. Centres can, therefore, choose to tackle Assessment evidence (a) and (b) quite separately from (c), (d) and (e).

Needs analysis

Ideally, learners should have a 'real' client to work with. However, an acceptable alternative is for the centre to provide several different scenarios for learners to choose from – some more or less complex than others. Scenarios must be sufficiently complex and detailed to enable learners to carry out a detailed needs analysis. The complexity of the client's needs will determine which mark band a learner is eligible for. A needs analysis of a client with straightforward needs is only eligible for mark band 1 no matter how well it is carried out and documented.

Examples of appropriate scenarios include:

- small corner shop, owner with limited ICT skills and budget, needing to produce monthly accounts, accesses the internet to place orders, write letters to suppliers etc
- small tool-hire company, needing to produce monthly accounts, track equipment hire, produce simple website etc
- architect, needing to produce 3D designs, work on site, store and transmit large files, produce detailed drawings etc
- geology department of large multinational oil company with unlimited budget, needs bespoke specialist system for DTP, design work and map production, has to be able to communicate with colleagues internally and in other companies, large image files etc.

Learners will need to develop the skills necessary to analyse how a current system works and identify any limitations and problems.

Once they have determined the client's needs, they should investigate systems already in existence that fulfil a similar need to see if a similar solution would be appropriate.

System specification

Learners must produce a specification appropriate for the client whose needs were investigated in (a). The choice of each component, peripheral, and software must be justified.

There is scope here for learners to undertake internet research to learn about hardware components. They should be encouraged to investigate cutting edge technology rather than safe options.

It is important that the final specification includes all the necessary hardware and software components for the system to work. Any other optional extras must be justified.

System installation

Learners need to learn how to install hardware components such as graphics cards and drives into the systems unit safely. This needs to be done under careful supervision – not least to ensure longevity of resources.

Health and safety must be a priority and learners must be taught how to work in a safe manner.

One possible strategy is for learners first to work on 'dead' computers, or even just components not in a casing, before progressing on to a 'live' machine as their skills develop.

Once built, the computer must be tested and evidence provided of a successful installation such as screenprints, digital photos, video. These can be supported by a witness statement.

Some technical assistance can be given, although to be eligible for mark band 3 learners must carry out the work independently. It is not acceptable to simulate system installation. Learners must actually carry out this work.

System configuration

In addition, some information about the user may be provided in order for the learner to make some configuration changes that are relevant to them.

System evaluation

Learners must evaluate how well the system they have built and configured meets the specified purpose and the needs of the specified user.

Recommendations for future expansion of the system or upgrading need to be included.

Links

Other units	This unit links closely with <i>Unit 6: Technical Support</i> , which requires learners to upgrade an existing system.
Skills Framework for the Information Age, (SFIA), October 2003	<p>The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:</p> <p>Strategy and planning</p> <ul style="list-style-type: none">• Technical strategy and planning – systems architecture <p>Development and implementation</p> <ul style="list-style-type: none">• Systems development – business analysis• Systems development – systems design• Systems development – systems testing• Installation and integration – systems installation/decommissioning.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment	<p>Learners will need access to:</p> <ul style="list-style-type: none">• reasonably modern, working computers that they can take apart and re-assemble, set up and configure• Phillips screwdrivers (preferably not with adaptable heads) <p>legal copies of a range of system and applications software that they can install and configure.</p>
Textbooks	<p>Bradley R – <i>Understanding Computer Science</i> (Nelson Thornes, 1999) ISBN 0748740465</p> <p>Dick D – <i>PC Support Handbook</i> (Dumbreck Publishing, 2002) ISBN 0954171101</p> <p>Harris M – <i>Build, Upgrade and Repair Your Computer</i> (Paladin Press, 2006) ISBN 1581606311</p>
Websites	<p>www.computing.co.uk</p> <p>www.computerweekly.com</p> <p>www.helpwithpcs.com</p>
Software	VM Ware allows learners to experiment with a virtual copy of the machine set up, BIOS etc without being able to do any damage.
Other resources	Learners should be encouraged to keep up to date by reading some of the weekly trade newspapers, such as <i>Computing</i> , published by VNU business and <i>Computer Weekly</i> , published by Reed Business Information. In addition to news and commentary, these often include features on particular technology and/or business applications.

Introduction

If you want information on a product or a service, do you look for the phone book or use the internet? Do you prefer to write a letter or send an email? As more people turn to the web for information, it becomes increasingly important for businesses to promote themselves and their products/services online.

Many ICT practitioners work as web developers, designing and building websites for client organisations.

In this unit you will learn how to plan, design and build simple static websites. You will learn to differentiate between clients and end users (customers) and to work effectively with both groups to produce websites that are fit for purpose and suitable for their target audience.

Website visitors are discretionary users, who can just as easily go elsewhere if their first impression of a site is unfavourable. You will learn the importance of conducting end-user acceptance tests to make sure your sites are fully functional, easy to use and accessible to disabled users.

Your work for this unit will culminate in the design and production of a static 'brochure' website for a specified business client. The website must provide up-to-date information about products and prices and capture customer information. In addition, you will produce a set of proposals for your client detailing ways in which the functionality of the site can be further enhanced so as to fully support online trading (e-tailing).

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

No specific prior learning is recommended for this unit, although you will find it helpful to have had some experience of using web authoring software.

What you need to learn

5.1 Software development lifecycle

Building a website for a client is a form of software development and – as such – involves a number of activities, including:

- requirements analysis
- design
- prototyping
- user evaluation
- testing.

With the exception of requirements analysis, which must take place at the start of the process, all the other activities are interlinked. You will use an iterative approach to website development in which – working closely with the client and end-users – you will develop and refine successive versions of the site until you, and your client, are satisfied that it meets all the specified requirements.

5.2 Project planning

Before working on any project, a period of planning is vital to ensure overall success and to avoid wasting time. You will learn how to draw up a project plan identifying:

- the tasks – broken down into subtasks – to be carried out
- the amount of time allocated to each task
- the order in which they should be completed
- key milestones
- any factors that might cause delay.

Ideally, you will use project management software to produce your plan. You must know how to use a plan to monitor project progress and to alert you to potential problems.

5.3 Requirements analysis

When any website project starts it begins as an idea which may have had little detailed analysis.

You will learn the importance of spending time at the outset of a project gathering information and analysing requirements. You will use a variety of research techniques to establish what exactly is required. The requirements should include: required, including:

- the purpose of the site
- the target audience
- how users will access the site (eg hardware, software, connection)
- the information that must be provided
- features that must be included (eg logo, form, counter, interactive components, multimedia counter)
- the user interaction that is required
- visitor information to be collected
- plans for maintaining/updating the site once it is up and running
- security requirements
- legal requirements.

5.4 Design

In Unit 2 you will have investigated the design of commercial websites. In this unit you will learn how to produce well-designed websites that

- establish an identity/brand
- enable users to find what they want easily
- provide the right balance of information on each page
- are responsive and secure.
- You will produce detailed designs covering every aspect of the website, including:
 - layout and structure
 - style and format
 - navigation routes, action controls and navigation aids
 - page content and layout
 - interactive features
 - accessibility options for disabled visitors.

You will use:

- storyboards to map out the layout and content of each screen
- structure charts to show how content is organised
- flowcharts to describe the user interaction and pathways through the website.

5.5 Implementation

There are various ways of producing web pages. In this unit you will use dedicated web authoring software to build your sites.

You will also need some knowledge of 'raw' HTML to enable you to make simple edits to pages, such as adding:

- comments to the code
- third-party components, eg counter, animation, banner
- enhancements, eg scrolling marquees
- metatags, eg keywords.

5.6 Testing and user evaluation

The functionality of a website must be thoroughly tested before it goes live.

You will learn how to carry out systematic testing of a website to ensure that:

- the layout and presentation of each page is appropriate
- hyperlinks work and go where expected
- there are no dead ends
- any interactive actions work as intended
- it is displayed properly by all common browsers
- it renders properly at different screen resolutions
- it is accessible to disabled users.

You must involve other people in this process so as to ensure that the finished product meets the needs of the target audience and is fit for purpose. This will involve asking users to comment on features of a site, including its:

- usefulness
- effectiveness
- content
- presentation
- navigation
- usability
- accessibility.

You should be aware of, and make use of, web-based services such as those provided by the World Wide Web Consortium (W3C), which allow you to test web pages and help identify and repair barriers to accessibility.

5.7 Functionality

Websites are constantly evolving. You must keep abreast of developments in this area so as to be able to provide sensible advice to clients about ways of enhancing the functionality of a website. This might involve:

- adding an online ordering/payment facility
- improving security
- providing a better, more personalised service to customers
- encouraging customer feedback/evaluation
- holding product information in a database linked to the website
- providing an edit facility so that the client can make changes and additions to the site independently.

You must also be able to advise on the impact that the changes you propose might have on personnel and practices within the organisation.

5.8 ICT skills

In order to produce a website for a specified client you will learn how to use web authoring software to produce:

- web pages
- colour schemes and styles
- multimedia content
- tables
- hyperlinks
- interactive components, eg buttons, hotspots and rollovers
- simple animations
- forms
- menus
- replacement text for visually disabled access.

You must also understand the basic principles of HTML and be able to modify and edit HTML code.

5.9 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.

Assessment evidence

For this unit you will:

- plan and manage a project to build a static website for a specified client (Assessment evidence a)
- design, build and test the website (Assessment evidence b and c)
- evaluate the website and recommend an improvement (Assessment evidence d)
- produce a proposal for enhancing the functionality of the site to support e-commerce (Assessment evidence e).

The website you design and build must have:

- a number of linked pages
- a menu system or navigation buttons providing easy access to all pages.

Your eportfolio for this unit should include:

- (a) Your project plan. Plus evidence of how you used the plan to monitor progress.
- (b) Evidence of your investigation of the client's requirements, plus your design documentation (storyboards, structure diagram and flowcharts).
- (c) Evidence of how you developed the website, using prototyping, user feedback and testing to reach the final version (the finished website).
- (d) Your evaluation of the finished website, assessing its performance and functionality.
- (e)* Your proposal for enhancing the functionality of the site to support e-commerce.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 5: Web Development

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 3)	<p>The learner produces an outline project plan for the design and creation of the website showing:</p> <ul style="list-style-type: none"> the main tasks to be carried out the order in which tasks are scheduled for completion, though this is not entirely sensible the time allocated to complete each task, but not entirely realistic. <p>Whilst working on the project, the learner makes limited use of the plan to monitor progress, and needs frequent prompting.</p> <p style="text-align: right;">(0-4)</p>	<p>The learner produces a detailed project plan for the design and creation of the website clearly showing:</p> <ul style="list-style-type: none"> the main tasks and most subtasks to be carried out that tasks are scheduled for completion in a sensible order that a realistic amount of time has been allocated to complete each task. <p>Whilst working on the project, the learner makes good use of the plan to monitor progress, needing only occasional prompting.</p> <p style="text-align: right;">(5-6)</p>	<p>The learner produces a comprehensive project plan for the design and creation of a website clearly showing:</p> <ul style="list-style-type: none"> all the main tasks and subtasks to be carried out that tasks are scheduled for completion in a sensible order that makes efficient use of time and resources that a realistic amount of time has been allocated to complete each task, with some allowance for contingencies built-in. <p>Whilst working on the project, the learner makes effective use of the plan to monitor progress, independently.</p> <p style="text-align: right;">(7-8)</p>	8
(b) (AO 1, 3)	<p>The learner:</p> <ul style="list-style-type: none"> carries out a limited investigation of the client's requirements produces documentation giving some outline details of the proposed design for a website to meet these requirements, but with some gaps and omissions. <p style="text-align: right;">(0-8)</p>	<p>The learner:</p> <ul style="list-style-type: none"> carries out an adequate investigation of the client's needs produces documentation giving details of the proposed design for a website to meet these requirements. <p style="text-align: right;">(9-12)</p>	<p>The learner:</p> <ul style="list-style-type: none"> carries out a thorough investigation of the client's requirements produces documentation giving comprehensive details of the proposed design for a website to meet the client's requirements. <p style="text-align: right;">(13-16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3)	<p>The learner:</p> <ul style="list-style-type: none"> • makes limited use of prototyping and user feedback to refine the initial design • selects and uses software tools, although not always appropriately • carries out some limited testing and quality control, but not sufficient to identify all shortcomings • produces a functional website that meets some of the client's requirements. <p>Whilst working on the website the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(0-10)</p>	<p>The learner:</p> <ul style="list-style-type: none"> • makes good use of prototyping and user feedback to refine the initial design • selects and uses software tools appropriately • carries out adequate testing and quality control to ensure that the website works as intended • produces a fully functional website that meets most of the client's requirements. <p>Whilst working on the website the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(11-15)</p>	<p>In building the website, the learner:</p> <ul style="list-style-type: none"> • makes effective use of prototyping and user feedback to refine the initial design • selects and uses software tools competently • carries out extensive testing and quality control to ensure that the website works as intended and is easy to use • produces a fully functional website that meets all of the client's requirements in an effective way. <p>Whilst working on the website the learner adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(16-20)</p>	20
(d) (AO 2, 4)	<p>The learner makes some evaluative comments about the performance and functionality of the site.</p> <p style="text-align: right;">(0-3)</p>	<p>The learner evaluates the performance and functionality of the site, incorporating feedback from others, and recommends at least one sensible improvement.</p> <p style="text-align: right;">(4-5)</p>	<p>The learner fully evaluates the performance and functionality of the site, incorporating feedback from others, and recommends at least one sensible improvement, explaining how this will enhance the site.</p> <p style="text-align: right;">(6)</p>	6

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 2, 3) QWC (i-iii)	<ul style="list-style-type: none"> The learner produces an outline proposal for enhancing the functionality of the site to support e-commerce, but not sufficiently detailed to give a clear overview of what is involved. The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy. <p style="text-align: right;">(0-5)</p>	<ul style="list-style-type: none"> The learner produces a detailed proposal for enhancing the functionality of the site to support e-commerce. The proposal is appropriately presented and gives a clear picture of what is involved. The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy. <p style="text-align: right;">(6-8)</p>	<ul style="list-style-type: none"> The learner produces detailed proposals for enhancing the functionality of the site to support e-commerce, including consideration of how they might be implemented. The proposal is effectively presented, and gives a clear and realistic picture of what is involved. The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy. <p style="text-align: right;">(9-10)</p>	10
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have produced a project plan up front, that identifies the main tasks to be carried out, the order in which they will be tackled and the time allocated to each one. It is not acceptable for learners to draw up the plan retrospectively. However, the plan is likely to have some flaws, eg the scheduling of some tasks may not be entirely sensible, some of the time allocations may be unrealistic.

For full marks in this band, learners must have demonstrated some use of the plan to monitor progress during the project, although they will probably have needed frequent reminders to do so.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must have produced a detailed project plan identifying all the main tasks, broken down in some cases into subtasks, scheduling tasks in a sensible order and allocating a realistic amount of time to each task. They must also have made some use of the plan to monitor project progress.

For full marks in this band, learners must have made good use of the plan to monitor progress, needing only occasional reminders to do so.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must have produced a comprehensive project plan, identifying all the main tasks, broken down where appropriate into subtasks, scheduling tasks in a sensible order – so as to make best use of time and resources – and allocating a realistic amount of time to each task. The plan should allocate some 'catch-up' time to cater for contingencies.

For full marks in this band, learners must have demonstrated how they used the plan to manage the project effectively throughout.

Assessment evidence (b)

**Mark band 1
(0-8 marks)**

To be eligible for mark band 1, learners must have carried out some investigation into the client's requirements – although the investigation will have been superficial – and produced some outline design documentation describing the main aspects of the website (see *What you need to learn* section 5.4).

For full marks in this band, learners must have produced a design that meets the requirements of the client, using storyboards and a structure diagram to describe what the website will look like.

**Mark band 2
(9-12 marks)**

To be eligible for mark band 2, learners must have carried out sufficient investigation to have a sound understanding of the client's requirements and have produced detailed design documentation covering all aspects of the website.

For full marks in this band, the design must demonstrate that learners have a sound understanding of the purpose of the website and its target audience. They must have used a flowchart (or something similar) to show the main user pathways through the website.

**Mark band 3
(13-16 marks)**

To be eligible for mark band 3, learners must have carried out a thorough investigation of the client's needs and produced comprehensive design documentation covering all aspects of the proposed website that demonstrates their awareness of purpose and target audience.

For full marks in this band, the design must include a wide range of relevant features demonstrate originality and fitness for purpose.

Assessment evidence (c)

**Mark band 1
(0-10 marks)**

To be eligible for mark band 1, learners must have produced a website that meets some of the client's requirements and demonstrates some awareness of purpose. They must have selected and made some appropriate use of software tools to produce the site and have carried out some basic testing to check functionality, although this will not be enough to ensure that the website always functions as intended.

Whilst working on the website, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, copyright, acknowledgement of sources, quality assurance.

For full marks in this band, learners must have made some use of prototyping to improve and refine the initial design.

**Mark band 2
(11-15 marks)**

To be eligible for mark band 2, learners must have produced a functional website that meets most of the client's requirements and demonstrates some awareness of audience and purpose. They must have made good use of software tools to produce the site and carried out enough testing to ensure it is fully functional.

Whilst working on the website, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have made effective use of prototyping and user feedback to refine the design.

**Mark band 3
(16-20 marks)**

To be eligible for mark band 3, learners must have produced a fully functional website – making effective use of prototyping and user feedback – that meets all the client's requirements and demonstrates sound awareness of audience and purpose. They must have made effective use of the software tools and carried out thorough testing to ensure that the site is both fully functional and easy to use.

Whilst working on the website, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance, they will have adhered to them without being reminded.

For full marks in this band, learners must have produced an effective and accessible site that is fully fit for purpose. Learners must have produced evidence of modifying and editing html coding during prototyping.

Assessment evidence (d)

**Mark band 1
(0-3 marks)** To be eligible for mark band 1, learners must have commented on both the performance and functionality of the site.

For full marks in this band, learners must have made some assessment of how well the site meets the client's requirements.

**Mark band 2
(4-5 marks)** To be eligible for mark band 2, learners must have recommended one sensible improvement.

For full marks in this band, learners must have taken account of feedback from others when evaluating the performance and functionality of the site.

**Mark band 3
(6 marks)** To be eligible for mark band 3, learners must have evaluated all aspects of the website, incorporating feedback from others, and suggested a sensible improvement. They must also have explained how this proposed improvement would enhance the site.

Assessment evidence (e)

**Mark band 1
(0-5 marks)** To be eligible for mark band 1, learners must have produced a proposal for enhancing the functionality of the website, although they will not have provided enough detail for the client to get a clear picture of what is being proposed. The proposition must be sensible. In the proposal, the learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have shown some awareness of audience (the client) and purpose (to provide enough information for the client to decide whether or not to go ahead with the upgrade).

**Mark band 2
(6-8 marks)** To be eligible for mark band 2, learners must have produced a detailed proposal, providing sufficient information for the client to fully understand what is being proposed and to make a decision. In the proposal, the learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have presented the proposal in an appropriate format and given a clear picture of what it would entail.

**Mark band 3
(9-10 marks)** To be eligible for mark band 3, learners must have produced an effective proposal, including details of how the proposed upgrade might be implemented. In the proposal, the learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have given a realistic picture of what the upgrade would entail.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria* grid, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

A third of the marks available for this unit are for practical, hands-on activities related to the development of the website.

Learners will need to use web authoring software for this task.

Vocational context

This unit has a practitioner focus. Ideally, learners should be given an opportunity to visit a web design company or – at least – speak to a professional web designer.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation or equivalent web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for onscreen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a project plan with evidence of how the plan was used to monitor progress
- evidence of an investigation of the client's requirements, plus design documentation (storyboards, structure diagram and flowcharts)
- selected prototypes showing the development of the website, plus evidence of testing and user feedback. The finished website.
- an evaluation of the site

a proposal for enhancing the functionality of the site to support e-commerce.

Teaching and learning strategies

Scope

Learners are required to produce a functioning commercial website. However, they are not expected to produce a fully-fledged e-commerce site, with advanced features such as shopping baskets, customer personalisation, methods of payment, customer feedback etc. These could be investigated as part of the research into possible future enhancements.

The website must consist of a number of linked pages, each of which is fully accessible from anywhere. Although preferable, it is not essential for learners to work with a real client. A role-playing exercise with the assessor posing as a 'client' would suffice. Centres should ensure that the client's requirements -- real or imaginary -- include:

- company contact details
- a detailed product catalogue
- some multimedia elements
- a consistent corporate look and feel to whole site
- an appropriate method of navigation giving access to all pages
- a facility for contacting the company from the site
- a downloadable order form
- a sitemap
- at least one ready-made applet such as a hit counter.

Learners are not expected to upload the websites they produce to a web server and no credit will be given for doing so in this unit. However, those going on to study *Unit 13: Web Management* will do so as part of their work for that unit.

Learners are required to demonstrate their understanding of the processes involved in the production a website, ie the planning, design and prototyping as well as the summative testing of the final product. The marks for strands a and b, plus many of the marks in strand c take this into account.

Project plan

Although it is not essential to use project management software to produce the project plan, learners are required to produce a graphical representation of their plan, as well as a straightforward numbered list. Note - project management software will be required for the A2 unit 8 and this unit provides some of the underpinning skills needed.

Learners need to produce evidence of having used the plan throughout the implementation of the website.

Website design

Learners should be reminded of the investigation into transactional websites that they undertook in Unit 2. Some of the good design elements identified could be incorporated into their own website designs.

Various research techniques should be used in the investigation of the client needs, eg investigating similar websites, surveying target audience, interviews/meetings with the client.

Designs should be well presented and ideally be produced using computer software. The designs should be explained and/or be clearly annotated to reflect 5.4.

Website creation

Learners should use a web authoring package that offers a drag and drop approach as well as raw HTML code development to produce the website. They must demonstrate their ability to edit HTML code.

Learners must incorporate some ready-made applets, eg banner or counter. They do not have to create their own.

Evidence of testing is required. Learners must test every aspect of the website – content, functionality and accessibility. To be eligible for mark band 3 learners must have incorporated some accessibility features.

Evaluation

The evaluation of the website created should focus on the extent to which it is fit for purpose (client's requirements) and meets the needs of the intended end users (visitors to the website). Learners should demonstrate they understand the difference between functionality (client requirements) and performance (how does it work).

Proposals for enhancing functionality

The proposals must take the website beyond its present level of functionality and consider how it could be developed further to enable the client organisation to trade online.

Learners are not expected to carry out this work. However, their proposals should be quite detailed and must relate to the specified client and the website they have produced. It is not appropriate to talk in general terms about features of transactional websites. However, learners will find it very helpful to re-visit the work they undertook in Unit 2. The emphasis must be on 'what' and 'why' rather than 'how' at this stage.

Learners who go on to study *Unit 13: Web Management* will have the opportunity to investigate, in detail, options for implementing a simple e-marketing upgrade to capture visitors' details and of implementing this enhanced functionality.

The proposals should be presented in a professional manner (eg a formal report) and addressed to the client.

Links

Other units

This unit builds on the work learners did in *Unit 2: The Digital Economy* and acts as a stepping stone into *Unit 13: Web Management*. It also provides an introduction to project management, which is the focus of *Unit 8: Managing ICT Projects* and touches on some of the topics covered in *Unit 10: Using Multimedia Software*.

Skills Framework for the Information Age, (SFIA), October 2003

The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:

Development and implementation

- Systems development – business analysis
 - Systems development – systems design
 - Systems development – systems testing
 - Human factors – media creation.
-

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers, ideally with the following minimum specification (based on the Becta workstation specification 2/10/03:
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
 - sound input (microphone)
- printing facilities
- digital camera, scanner, tape recorder
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - word processing, eg Microsoft Word, Open Office suite
 - presentation, eg Microsoft PowerPoint, Open Office suite
 - web authoring, eg Macromedia MX Studio, Microsoft FrontPage 2003, Mozilla Composer, Microsoft Publisher 2003
 - graphics, eg Macromedia Freehand, Adobe Photoshop, Corel Draw.

Textbooks

- Aho K (editor) – *Multimedia Projects* (Course Technology, 2002)
ISBN 0619055146
- Aho K et al – *Digital Design Curriculum Guide: Foundations of Web Design*
(Course Technology, 2002) ISBN 0619055162
- Austin B – *Web Page Design, Third Revised Edition* (Computer Step, 2003)
ISBN 1840782536
- Cunliffe D and Elliott G – *Multimedia Computing* (Learning Matters, 2003)
ISBN 1903337186
- DiNucci D and Guidice M – *Elements of Web Design, Second Edition*
(Adobe, 1998) ISBN 0201696983
- Heathcote F R – *Dreamweaver Right from the Start* (Payne-Gallway, 2004)
ISBN 1904467806
- Heller S and Drennan D – *The Digital Designer* (Watson-Guptill
Publications, 1997) ISBN 0823013464
- Strauss R – *Developing Effective Web Sites: A Project Manager's Guide*
(Focal Press, 2001) ISBN 0240804430
- Williams R and Tollett J – *The Non-Designer's Web Book, Third Edition*
(Peachpit Press, 2005) ISBN 0321303377
- Zeldman J – *Designing with Web Standards* (Peachpit Press, 2006)
ISBN 0321385551

Websites

- www.adobe.com/designcenter – Adobe Design Center
- www.pctechguide.com – a useful guide to the component parts of a PC
- [www.thesitewizard.com/webdesign/
test-different-screen-resolutions.shtml](http://www.thesitewizard.com/webdesign/test-different-screen-resolutions.shtml) – tools for checking how sites
render at different screen resolutions and in different browsers
- www.webpagethatsuck.com – examples of poor web page design
- www.w3.org – World Wide Web Consortium guidelines, tools etc on web
accessibility

Other resources

Learners should be encouraged to keep up to date by reading some of the weekly trade newspapers, such as *Computing*, published by VNU Business, *Computer Weekly*, published by Reed Business Information and *Web User*, published by IPC Media.

In addition to news and commentary, these often include features on particular technology and/or business applications.

Introduction

With the installation of a new system the work of the ICT practitioner has only just begun. Once users have familiarised themselves with a new computer system they soon become almost totally dependent on it. A competent technical support team is vital to the smooth running of these systems. Support technicians are required to carry out first-line troubleshooting activities – diagnosing the problem and finding a solution. They are competent in the use of diagnostic tools and other fault-finding techniques. They devise routine maintenance procedures to help prevent problems occurring and backup systems to limit the damage in case of system failure.

End-users soon realise the potential of their computer system and will want more from it. They may want their system upgraded for different reasons such as to fix a fault, to improve performance, to improve functionality, to increase capacity or perhaps just because they want the latest technology (even if a business case cannot be made for it). You will learn how to implement appropriate hardware and software upgrades.

You should, by now, be aware that communication is central to everything we do in the digital world. The internet and other technologies allow us to send and access information anytime and just about anywhere. As a practitioner you need to understand the different methods of digital communication and be able to support users who wish to use these technologies effectively.

You will learn about internet connectivity, security issues, email and web-based tools for collaborative working.

Your work for this unit has four strands. The first two relate to an existing system – an upgrade to the system and an onscreen technical support manual. You will also produce a presentation on web-based tools for collaborative working and, finally, a report addressing the communication requirements of a small business.

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

This unit builds on the practitioner skills learned in *Unit 4: System Design and Configuration*. You should have completed Unit 4 before attempting this unit.

What you need to learn

- 6.1 Routine maintenance** 'Prevention is better than cure' and a routine maintenance plan is vital. You will learn how to describe and carry out procedures, such as:
- virus-checker updates
 - storage management, eg defragmentation,
 - backup, restore and archiving
 - file management, eg removal of temporary files and cookies.
- You will also need to know how to schedule and keep track of routine maintenance.
- 6.2 Troubleshooting strategies** You will learn how to make use of troubleshooting procedures, such as:
- initial checks, eg connections, power supply, system setup
 - diagnostic tools, eg Power On Self Test (POST), manufacturer-supplied packages, free diagnostics and commercial alternatives
 - operating system utilities, eg task manager, system restore etc
 - alternative boot-up modes
 - manufacturers' manuals, CDs and websites.
- You will learn how to predict potential problems and produce step-by-step instructions to help technical support staff diagnose and solve problems.
- 6.3 Upgrades** You should be able to advise on, implement and test simple hardware and software upgrades required by either the user (to fix problems or to improve functionality or performance) or by the manufacturer, including:
- replacing a floppy disk or CD or DVD drive
 - adding additional RAM
 - adding an additional internal or external hard drive
 - upgrading to a new operating system
 - installing manufacturer updates (eg Service Releases/Packs)
 - installing additional software requested by the user.
- 6.4 Internet connectivity** There are a number of methods of connecting to the internet. You need to be aware of the different methods and the advantages and limitations of each. You need to be able to make informed decisions to meet a client's communication needs.
- You need be able to:
- select the most effective method of connection
 - select an appropriate ISP
 - advise on hardware and software required.

6.5 Email

One of the most important methods of communication is email. You need to be able to advise on company policy for the configuration and use of email such as:

- spam and filtering
- automatic features such as digital signatures, out of office response
- email address book distribution lists
- restrictions on use
- virus checking
- allow/disable HTML emails
- size and type of attachments
- web-based email
- legal requirements.

6.6 Collaborative working

New web-based tools for collaborative working have the potential to improve productivity as they allow employees to work together irrespective of their physical locations, share information and contribute to shared documents at a distance.

You will learn about the features of different types of collaborative software, such as:

- group email
- instant messaging
- web conferencing
- video conferencing
- wikis
- online forums
- project management.

You will gain practical experience by setting up and using at least one of these tools and you must be able to advise clients on the benefits, limitations and hardware requirements for each type.

6.7 Internet security and legal issues

You will need to be able to advise clients on potential threats and adequate internet security measures, such as:

- virus protection software
- hackers and firewalls
- spyware
- data mining
- email address protection
- denial of service attacks
- digital security certificates
- spam blockers.

Non-work use of a company's internet connection is not only a waste of time and bandwidth, it could have serious legal and security repercussions. You must be aware of legal and security issues relating to use of the internet at work for non-work purposes and be able to explain why an organisation should have an internet access policy and what it should cover.

6.8 ICT skills

In order to successfully support end-users you will need to develop the following skills and techniques such as:

- implementing and testing hardware and software upgrades
- installing and testing new software
- troubleshooting
- using system maintenance utilities
- using email
- setting up and using web-based collaborative software tools.

6.9 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.

Assessment evidence

For this unit you will:

- install and test a hardware and a software upgrade for an existing system (assessment evidence a)
- recommend routine maintenance procedures and troubleshooting strategies for an existing system (assessment evidence b)
- investigate web-based tools for collaborative working and demonstrate the setup and use of one of these tools (assessment evidence c)
- describe the communication needs of a specified small business (SME) and make recommendations to meet these needs (assessment evidence d).

Your eportfolio for this unit should include:

- (a) Evidence of successful installation and testing of one hardware and one software upgrade to an existing system.
- (b) An onscreen technical support manual describing the routine maintenance procedures, schedules, tracking procedures and troubleshooting strategies for an existing system.
- (c) A presentation describing and evaluating the features of four different types of web-based tools for collaborative working and a demonstration of the setup and use of one of them.
- (d)* A report in simple, non-technical language, describing the communication needs of a specified small business (SME) with justified recommendations for internet connectivity, security procedures, an internet access policy and use of email.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 6: Technical Support

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 1, 3)	<p>The learner:</p> <ul style="list-style-type: none"> successfully installs one hardware and one software upgrade, with extensive prompting carries out some limited testing of the system, but not sufficient to guarantee that it works correctly. <p>Whilst working on the upgrade, the learner adheres to relevant standard way of working, but needs frequent prompting.</p> <p>(0-5)</p>	<p>The learner:</p> <ul style="list-style-type: none"> successfully installs one hardware and one software upgrade, with only limited prompting carries out adequate testing of the system to ensure that it works correctly. <p>Whilst working on the upgrade, the learner adheres to relevant standard way of working, with only occasional prompting.</p> <p>(6-8)</p>	<p>The learner:</p> <ul style="list-style-type: none"> successfully installs one hardware and one software upgrade, independently carries out extensive testing of the system to ensure that it works correctly and to optimise its performance. <p>Whilst working on the upgrade, the learner adheres to relevant standard way of working, independently.</p> <p>(9-10)</p>	10
(b) (AO 1, 3)	<p>The learner produces an onscreen technical support manual that gives brief instructions for carrying out some routine maintenance and troubleshooting, but omits some essential information.</p> <p>(0-8)</p>	<p>The learner produces a clearly presented, on-screen technical support manual that gives detailed instructions for carrying out routine maintenance and troubleshooting.</p> <p>(9-12)</p>	<p>The learner produces a clearly presented, on-screen technical support manual that gives complete and easy to follow instructions for carrying out routine maintenance and troubleshooting, enabling someone else to maintain the system without further assistance.</p> <p>(13-15)</p>	15

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3, 4)	<p>The presentation includes:</p> <ul style="list-style-type: none"> • a brief description of the key features of at least four web-based tools for collaborative working • a description of the capabilities and limitations of each tool, but with little or no comparison • a demonstration of aspects of the setup and use of a web-based tool, but not detailed enough to give a clear picture of what is involved. <p>(0-8)</p>	<p>The presentation includes:</p> <ul style="list-style-type: none"> • a detailed description – supported by examples – of the key features of at least four web-based tools for collaborative working • a detailed description and comparison of the capabilities and limitations of each tool • a clear demonstration of the setup and use of a web-based tool, giving an accurate picture of what is involved. <p>(9-11)</p>	<p>The presentation includes:</p> <ul style="list-style-type: none"> • a comprehensive description – supported by a range of well-chosen examples – of the key features of at least four web-based tools for collaborative working • a detailed description and comparison of the capabilities and limitations of each tool, assessing their suitability for particular tasks • an effective demonstration of the setup and use of a web-based tool, giving a full and accurate picture of what is involved. <p>(12-15)</p>	15

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO 2, 3) QWC (i-iii)	<p>The report:</p> <ul style="list-style-type: none"> identifies some of the communication needs of a small business (SME) makes some recommendations, for internet connectivity, security procedures, an internet access policy and use of email is written in simple, non-technical language <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p>(0-10)</p>	<p>The report:</p> <ul style="list-style-type: none"> describes most of the communication needs of a small business (SME) makes detailed recommendations, with some justification, for internet connectivity, security procedures, an internet access policy and use of email is clearly presented in simple, non-technical language <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p>(11-15)</p>	<p>The report:</p> <ul style="list-style-type: none"> describes all the communication needs of a small business (SME), both current and future makes detailed and appropriate recommendations, with full justification, for internet connectivity, security procedures, an internet access policy and use of email is effectively presented in simple, non-technical language, demonstrating full awareness of audience and purpose. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p>(16-20)</p>	20
			Total marks	60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-5 marks)

To be eligible for mark band 1, learners must have installed one hardware and one software upgrade. They will have needed extensive prompting to do so.

Whilst upgrading the system, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg safe working, file management, personal effectiveness.

For full marks in this band, learners must have carried out some testing of the upgraded system hardware and software, but not enough to be certain that the upgraded system works properly under all conditions.

Mark band 2 (6-8 marks)

To be eligible for mark band 2, learners must have installed the upgrades with minimal prompting.

Whilst upgrading the system, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have carried out enough testing to ensure that the upgraded system works as intended.

Mark band 3 (9-10 marks)

To be eligible for mark band 3, learners must have independently upgraded the system.

Whilst upgrading the system, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must have thoroughly tested the upgraded system to ensure full functionality and optimise its performance.

Assessment evidence (b)

Mark band 1 (0-8 marks)

To be eligible for mark band 1, learners must have produced an on-screen support manual giving instructions for some routine maintenance tasks and suggesting some obvious things to try if the system is malfunctioning (*What you need to learn* sections 6.1 and 6.2), but the manual will not provide all the information needed to enable someone else to maintain the system.

For full marks in this band, learners must have produced information in a format that is suitable for on-screen presentation (see section on Eportfolios).

Mark band 2 (9-12 marks)

To be eligible for mark band 2, learners must have produced detailed instructions for carrying out routine maintenance and have included step-by-step troubleshooting strategies for several potential problems. The manual must be designed to be used on-screen.

For full marks in this band, learners must have included a suitable maintenance schedule in their manual. The manual must be presented clearly and demonstrate an awareness of audience (ICT technician).

**Mark band 3
(13-15 marks)**

To be eligible for mark band 3, learners must have produced complete and easy to follow instructions, including a maintenance schedule and a recommended procedure for recording any maintenance work carried out. The manual must make effective use of the medium, enabling the reader to locate the information required quickly and easily.

For full marks in this band, the manual must be clearly presented and easy-to-use, enabling someone else to maintain the system without assistance.

Assessment evidence (c)

**Mark band 1
(0-8 marks)**

To be eligible for mark band 1, learners must have identified some of the key features of four different types of web-based tools used for collaborative working (*What you need to learn* section 6.6). They will have given some indication of the capabilities and limitations of each tool. They must also have provided evidence to show that they have setup and used one web-based tool for collaborative working.

For full marks in this band, learners must have described the key features, capabilities and limitations of each tool, making some comparisons between them.

**Mark band 2
(9-11 marks)**

To be eligible for mark band 2, learners must have produced a presentation describing in detail the key features of four different types of web-based tools used for collaborative working, comparing their capabilities and limitations and giving some examples. They must also have demonstrated the setup and use of one web-based tool for collaborative working.

For full marks in this band, learners must have given an accurate picture of what setting up and using such a tool entails.

**Mark band 3
(12-15 marks)**

To be eligible for mark band 3, learners must have used a **range** of well-chosen examples to illustrate the key features of each chosen web-based tool used for collaborative working (in this context a range should be taken to mean at least three). They must also have assessed the tools' suitability for particular tasks and given an accurate picture of what setting up and using such a tool entails.

For full marks in this band, learners must have presented enough information to enable someone else to make an informed decision based upon it.

Assessment evidence (d)

**Mark band 1
(0-10 marks)**

To be eligible for mark band 1, learners must have carried out an investigation – although rather superficial – into the communication needs of an SME and produced a report identifying some of these. They must also have made at least one sensible recommendation for **one of**: internet connectivity, security procedures, an internet access policy, use of email.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have made at least one sensible recommendation for **each of**: internet connectivity, security procedures, an internet access policy, use of email. Their report must be presented in simple, non-technical language, showing some awareness of the intended readers of the report.

**Mark band 2
(11-15 marks)**

To be eligible for mark band 2, learners must have produced a report in simple, non-technical language, that describes most of the SME's communication needs and makes detailed recommendations for **each of** internet connectivity, security procedures, an internet access policy and use of email.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have justified each of their recommendations. The report must be clearly presented, demonstrating sound awareness of the intended readers of the report.

**Mark band 3
(16-20 marks)**

To be eligible for mark band 3, learners must have produced a report in simple, non-technical language, that describes all the SME's communication needs - including some possible future needs – and makes detailed and appropriate recommendations, fully justifying each of them.

For full marks in this band, learners must have demonstrated full awareness of the purpose of the report and the intended readers of the report and produced an effective business report where the learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

A tenth of the marks available for this unit are for practical, hands-on activities related to upgrading of an existing computer system. However, learners will need to carry out extensive practical work in order to be able to produce the manual, presentation and report.

Vocational context

This unit has a practitioner focus. Ideally, learners should have an opportunity to gain real-life type experience of providing technical support. This could perhaps be achieved by shadowing the school's network manager or IT technician, although ideally learners should spend some time in a large technical support department.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for onscreen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- evidence of upgrading an existing computer system (hardware and software)
- an on-screen technical support manual
- a presentation describing/evaluating four web-based tools for collaborative working
- a report describing the communication needs of a specified SME and making recommendations for internet connectivity, security procedures, an internet access policy, use of email.

Teaching and learning strategies

Upgrades

User requirements change over time and computer systems need to be upgraded. Learners must add at least one new hardware device and carry out at least one software upgrade to an existing system. As in Unit 4, some technical assistance can be given, although to be eligible for mark band 3 learners must carry out the work independently. It is not acceptable to simulate upgrading the computer. Learners must actually carry out the work and all upgrades must be fully tested.

Appropriate hardware upgrades could include installing a CDROM or a DVD drive, replacing the graphics card, adding a bigger hard drive or an additional external or internal hard drive, adding a sound card, increasing internal memory.

Appropriate software upgrades could include installing a new operating system, a new virus checker, a new application or an upgrade to an existing piece of software.

Evidence of learners undertaking and testing the upgrades should be used to confirm achievement. Witness statements supporting learners' work are not acceptable on their own as a confirmation of achievement.

Technical support manual

Learners will need to have plenty of practical experience of carrying out routine maintenance and troubleshooting so as to be able to produce a technical support manual for someone else to use. The manual is designed to be used by an ICT technician. It is **NOT** intended to be a self-help guide for end-users.

Learners should be able to recognise and correct common physical faults, eg a monitor cable being unplugged, the mouse and keyboard cables plugged in each others sockets, drive light staying on.

They must be able to make use of troubleshooting procedures, eg read and understand the POST, configure the BIOS to user needs, use operating system utilities such as Scandisk, Task Manager, Performance Manager, Disk Cleanup and System Restore, and System Logs.

They should know how to use alternative boot up modes such as safe mode.

Web-based tools for collaborative working

Learner should be given the opportunity to set up and use different types of web-based tools for collaborative working so that they are able to comment on their features, advantages and limitations. There are several available on the web that can be downloaded and used for a limited trial period.

The presentation should include screen shots that illustrate functions of the software. It should be designed to be delivered to an audience and not for someone to read on-screen. In other words the details should appear in the speaker notes/hand-outs not on the slides themselves, which should be designed to convey key messages only.

Communication needs of a specified SME

Learners will need to investigate different methods of internet connection, services offered by ISPs, available email services etc.

Learners need to be aware of the dangers of operating in a low security internet environment. They should investigate how security can be improved. There are a number of good free firewall programs available to download. Alternatively, a good industry standard such as Norton internet Security, MCAFEE, AVG or similar may be provided for them to experiment with.

Lack of security awareness among users is the biggest cause of virus infections in many organisations. Learners could be encouraged to collect and study the network codes of practice of a number of organisations. A draft network code of practice could form part of their evidence for (d).

Only after thorough investigation can the learners draft a proposal for a suitable internet security environment.

They need to find out about available email options and consider their suitability for office-based staff, those who sometimes need to be able to access email at home, as well as mobile workers who need to access email on the move.

Links

Other units

This unit links closely with *Unit 4: System Design and Installation*. It also introduces learners to a number of topics relating to the communication needs of an organisation such as connectivity, security and support for flexible and collaborative working, all of which are relevant to *Unit 9: Communications and Networks*.

Skills Framework for the Information Age, (SFIA), October 2003

The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:

Strategy and planning

- Technical strategy and planning – systems architecture

Development and implementation

- Systems development – business analysis
- Systems development – systems design
- Systems development – systems testing
- Installation and integration – systems installation/decommissioning.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers, ideally with the following minimum specification (based on the Becta workstation specification 2/10/03)
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
- video conferencing equipment
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - word processing, eg Microsoft Word, Open Office suite
 - presentation, eg Microsoft PowerPoint, Open Office suite
 - web-based collaborative tools, eg Microsoft Outlook, Macromedia Breeze, First Virtual Click To Meet, Moodle.

For 6(a) learners will need a reasonably modern computer to upgrade (same as that used in Unit 4) and some suitable hardware and software to install.

Textbooks

Harris M – *Build, Upgrade and Repair Your Computer* (Paladin Press, 2006) ISBN 1581606311

MacRae K – *Computer Manual, Fourth Revised Edition* (J H Haynes & Co, 2007) ISBN 1844254402

Websites

www.computerweekly.com

www.computing.co.uk

www.helpwithpcs.com

Other resources

Learners should be encouraged to keep up to date by reading some of the weekly trade newspapers, such as *Computing*, published by VNU Business and *Computer Weekly*, published by Reed Business Information.

In addition to news and commentary, these often include features on particular technology and/or business applications.

Unit 7: Using Database Software

Externally assessed

Introduction

In Unit 2, you used database software to organise and to interrogate structured information. You saw how large organisations rely on databases to manage their information and provide them with fast and flexible access to it. You looked at examples of transactional websites which use databases to store product, customer and sales information and learned at first hand how database queries can be used to analyse information and identify trends.

In this unit you will develop your knowledge of, and skills in using, databases further. You will learn the principles of data modelling and sound database design, and will use relational database software to build working database systems capable of storing large quantities of data and of handling both routine and one-off requests for information.

In all likelihood, people other than yourself will want to use some – if not all – of the databases you create. With this in mind, you will design and implement user interfaces that make it easier for people to enter data and extract information, whilst ensuring the overall security and integrity of the database.

You will make full use of the facilities of the software to generate reports that are well presented, easy to read and fit for purpose. Your work for this unit will culminate in the design, development, testing and evaluation of a database for a specific purpose within a given scenario.

This is an externally assessed unit.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use advanced ICT skills on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the database knowledge and skills you acquired in *Unit 2: The Digital Economy*.

What you need to learn

7.1 Database applications

In Unit 2, you looked at the role that databases play in the day-to-day operation of transactional websites. You will find it useful to begin your work for this unit by exploring other database applications in areas such as commerce, education and manufacturing.

You should pay particular attention to design issues such as:

- the database structure
- the user interface
- measures used to protect the quality of the data
- types and forms of output
- the methods used to extract information.

You will be able to put much of what you learn to good use when you start to design and implement relational databases of your own.

7.2 Functional specification

As you will have realised by now, databases are too complex and usually too important to the business for their creation to be left to chance. They need to be systematically designed, built and tested.

As with all software development, the first step in the process is to produce a functional specification identifying the requirements of the database – what exactly it needs to do – including:

- the task(s) the database must perform
- the information it must supply, in what format, to whom
- the data to be input into the database, how and from where
- the processing that is required
- the levels of security and validation needed.

Having a clearly defined functional specification will help to keep you on track once you start building the database. By checking what you have achieved against the functional specification from time to time you can measure progress and make sure you do not lose sight of your goal.

7.3 Database development

Once you are clear about the functional requirements, you can begin work on the design of the database.

The first thing to do is to analyse the data requirements of the system and produce a data model.

The next step is to translate the data model into a physical database structure using your chosen database software.

You must be able to convert data models into physical database structures and test that they work correctly, before beginning work on other aspects of the system, including:

- data entry and validation functions
- queries
- reports
- menus.

7.4 Data modelling

You are already familiar with the concept of a model. In Unit 3, you used spreadsheet models to represent real-life processes and situations. In this unit you will learn a technique known as entity-relationship modelling to represent the data in a given scenario.

Entity-relationship models (ER models) have three components:

- entities
- attributes
- relationships.

You will learn what each of these terms means and will practise constructing ER models showing the entities, their attributes and the relationships between them for a given scenario.

You will need to be able to construct Entity Relationship Diagrams and Data Flow Diagrams to show you understand the task of the database.

You will learn how to determine the degree of a relationship and to take steps to resolve many-to-many relationships.

Normalisation is a process for removing unnecessary duplicated data and maximising the efficiency of a database. You will learn how to normalise an initial data model to third normal form and the reasons for doing this.

7.5 Creating a relational database structure

You will learn how to use database software to build physical representations of data models, in which entities are represented as tables and attributes as fields.

You must be able to choose suitable data types and formats for fields, including:

- text, eg limited length, unlimited length, memo
- number, eg integer, auto record number, floating point
- Boolean, eg true and false, Y and N
- date, eg dd/mm/yy, dd month
- time, eg 24-hr clock, hh/mm/ss
- currency, eg pound (£), dollar (\$).

You should also know how to store pictures and other forms of non-textual data.

You must understand how these data types are actually stored and how the database software converts them to the format required.

It is important that you are aware of the limitations of particular number formats and choose the most appropriate.

You will learn how to index a field or group of fields in order to speed up data retrieval and when it is appropriate to do so.

You will use the primary/foreign/composite key mechanisms to create relationships between tables and learn how to make relationships compulsory by enforcing referential integrity wherever possible or needed.

7.6 Validation techniques

The 'garbage in, garbage out' rule is particularly relevant to databases. You must make every effort to stop incorrect data from getting into a database.

You will learn a number of techniques for validating data, including building in checks, such as:

- presence check
- range check
- file lookup check
- list check
- format (picture) check
- length of data check.

7.7 The user interface

You will learn how to design and implement user-friendly interfaces to help people enter data into your databases and extract information from them.

You must be able to produce screen input forms with facilities, such as:

- input masks
- drop-down lists
- option buttons
- command buttons.

You must incorporate help for users by means of:

- instructions
- help screens
- easy to understand error messages.

You will learn how to minimise the potential for invalid data input by incorporating validation checks into all elements of the database.

You also need to think about how information from your databases will be selected and displayed. You should know how to create menus and searches to make it easier for people to use a database and to control how much or how little users are allowed to see and do.

You will use the presentation and formatting features of the software to produce reports onscreen and on paper that turn database output into meaningful information, using titles, layout etc. Where appropriate, you will incorporate calculations such as totals and running sums into reports.

7.8 Testing and evaluation

You will learn to test any databases you create to make sure that they work correctly and are fit for purpose. You should design and carry out tests to ensure that:

- the solution meets all the requirements of the functional specification
- all menus work properly
- validation checks prevent unacceptable data from being entered
- the database can cope with normal, extreme and abnormal data
- output from the database is complete, accurate and in the required format
- other people could use it without help.

Testing will help you to verify that any database that you have created works as it was designed to do.

Evaluation should include whether the database is 'fit for purpose' and that you did not lose sight of the functional specification you identified in 7.2. It also includes how well this has been achieved and how easy it is to use.

You will need to consider both quantitative and qualitative criteria for judging success. You will also need to identify any shortcomings in the database system and ways in which it could be improved.

- As an evaluation should be an informative document the quality of the written communication needs to be carefully addressed.

7.9 ICT skills

In order to produce relational databases you must be able to use database software to carry out tasks, including:

- constructing tables to represent entities
- defining the fields in each table to represent attributes
- defining appropriate data types and formats
- defining primary keys
- creating relationships between tables
- defining searches and sorts (single and multiple fields and tables)
- using relational logic in searches
- importing data from and exporting data to other databases and applications
- using macros to automate common tasks
- using wizards effectively
- creating screen data-entry forms that
 - enable the entry of data into single and multiple tables
 - have appropriate entry-form field lengths
 - provide clear labelling of entry-form fields
 - provide instruction fields where necessary
 - include validation checks on field entries as appropriate
 - enable the selection and entry of data from built-in lists (constructed from other tables)
 - include calculation (formula) fields
 - make use of automated number fields (counter fields)
 - use date and time fields
- creating database reports that
 - have suitable headers and footers
 - have an appropriate format and layout
 - have sorted data grouping
 - include calculations and total fields
 - include specified queries.

7.10 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
 - personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
 - quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
 - legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
 - safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
-

Assessment guidance

This unit is externally assessed.

Working under supervision, you will be required to design, implement and test a relational database system to meet a given set of functional requirements. Some of the data to be stored in the database will be supplied to you as a comma separated values (csv) file.

You will have 10 hours in which to complete this work. This will be divided into a number of sessions by your centre. You will not be able to remove your work from the examination room but you will be able to look things up between sessions. However, you must not discuss the task with other learners and the final database solution must be entirely your own work.

As well as creating the database to solve the task set, you will need to evaluate what you have done. You will review your solution, taking into account how else you could have approached the task and changes you could have made to the database. This evaluation will involve narrative text and you will need to be very precise when presenting it. Marks will be awarded for the quality of your written communication in this part of the examination.

Only fully functional relational database software capable of supporting one-to-many relationships should be used for this unit. An up-to-date list of acceptable software will be maintained on the Edexcel website.

At the end of the designated examination period, you will assemble the printed output produced in response to instructions specified on the front of the examination paper for submission to Edexcel.

Delivering this unit

General information

Assessment requirements

This is an externally assessed unit. Instructions for the conduct of the examination will be published on the Edexcel website in advance of each examination series.

Vocational context

This unit has a user focus. It is important that learners acquire some experience of live, large-scale database systems: the sheer volume of data they handle, the different views of the data they provide and the way in which data is imported from and exported to other software applications.

Pre-release time

This unit provides learners with pre-release material. It is important that learners use that time to investigate possible database structures to fit the scenario and create practice data to test these structures.

Standard ways of working

Learners must work safely and adhere to relevant legislation and codes of practice when carrying out the externally-set practical computer-based activities required for this unit. Marks will be awarded for evidence of adherence to relevant standard ways of working.

Teaching and learning strategies

Learners should be reminded of the work they did at AS level in *Unit 2: The Digital Economy* and may find it useful to revisit the database concepts introduced there before beginning to create database structures of their own.

Learners should be encouraged to follow a structured systems development process, involving investigation and analysis of the problem, design and implementation of the solution. They should be instructed in data modelling using entity relationship diagrams and normalisation and they should be given opportunities to practise the techniques they have learnt.

Learners need to develop skills in the chosen database management software and be familiar with the development tools supplied with this software. They should be able to create related tables, interactive forms, complex searches of their database (including linked tables, parameter searches, calculated fields, multi-field searches, range searches and totals), sophisticated reports and macros. *There is no expectation that learners will need to supply programmed solutions.*

Learners need to understand the importance of testing a system and choosing appropriate test data to ensure their system works. They will also need to understand the need for evaluation and the ways in which this may be done.

The quality of written communication will be assessed in a response that requires continuous prose.

Learners need to have practised developing parts of a system and simple systems prior to the exam.

Links

Other units

This unit builds on the database work undertaken in *Unit 2: The Digital Economy*. The concept of a model introduced in *Unit 3: The Knowledge Worker* is a useful foundation for the work on data modelling that learners undertake in this unit.

Learners taking the Double Award may wish to study *Unit 12: Customising Applications* in conjunction with this unit.

Learners taking *Unit 14: Web Management* will benefit from having already completed this unit, since they need to understand how and why database integration has become a key feature of most websites.

Assessors may want to use this unit as a vehicle for introducing some of the project management techniques covered in *Unit 8: Managing ICT Projects*.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers ideally with the following minimum specification (based on the Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - relational database software, eg Microsoft Access, Lotus Approach

Books

Heathcote P M – *Successful ICT Projects in Access* (Payne-Gallway, 2002) ISBN 1903112737

Warrender R L – *Databases* (Learning Matters, 2003) ISBN 1903337089

Unit 8: Managing ICT Projects

Internally assessed

Introduction

You already have considerable experience of planning and carrying out small-scale projects. You know how difficult it can be to juggle resources and make effective use of time. Imagine how much more difficult it is when the project you are managing involves large numbers of people, lots of resources and substantial amounts of money! Determining what has to be done when and by whom, keeping track of progress and reporting to senior management requires considerable expertise. Perhaps not surprisingly, a large number of projects – particularly in ICT – do not fully meet their objectives. Some fail spectacularly!

It is now widely recognised that specialist knowledge and skills are required to manage projects successfully. This unit will introduce you to some formal project management tools and methods and give you an opportunity to use specialist software to plan and monitor projects.

You will be able to put into practice what you have learnt by setting up and running a small-scale software project. You will have to draw on the knowledge and skills you have learned throughout the course in order to plan for and produce the required software product. It is assumed that you already have skills in at least two different software applications and some experience of the processes involved in software design and implementation.

Although - in real life - budgeting is an important factor in any project, you will not be expected to consider finance. However, you will need to identify other resource requirements such as expertise, equipment and time. This is not a team activity, but will involve working closely with others, since people skills and good communication are key to successful project management.

The summative evaluation of your work for this unit will take the form of an end-of-project review at which you and other project stakeholders will assess the success of the project and your performance as the project manager.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use ICT on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the work you have done throughout the course. It assumes that you already have some experience of developing a software product, possibly though your work on *Unit 7: Using Database Software*.

What you need to learn

8.1 Examples of projects

As you know from your own experience, a project is not a never-ending process. It runs for a pre-determined period of time, involves a number of people and is intended to achieve a specific goal. A number of factors contribute to the success of a project including detailed planning, efficient use of resources and effective communication.

You will find it useful to begin your work for this unit by studying some real-world examples of projects, both large and small. In particular, you should try to identify:

- the characteristics they have in common
- critical success factors
- reasons why some projects fail.

8.2 Stakeholders

In the course of your research, you will discover that even small projects have a surprisingly large number of people associated with them. These are known collectively as stakeholders. A stakeholder is an individual or organisation actively involved in the project or whose interests may be affected by it.

You must understand the roles and responsibilities of the following stakeholders:

- senior management
- customer/client
- user
- project manager
- team member
- peer reviewer
- supplier.

8.3 Project proposal The starting point for any project is either a problem that needs solving or a bright idea! Someone identifies a need or an opportunity that may be worth pursuing.

You will learn how to carry out a thorough investigation of an initial project idea and produce a project proposal detailing:

- what the project is about
- what it will deliver
- what benefits it will bring and any potential risks
- impact on personnel and practices
- the functional requirements
- who will use the product(s)/service(s) that are produced
- how long it will take
- when it must be finished
- what resources will be needed
- who else will be involved
- ways of tackling the project including recommendations.

Getting senior management approval is not a foregone conclusion. Project managers need to be good communicators, able to impart complex information in a jargon-free way, willing to compromise if necessary but also confident and determined enough to hold out for what they really believe is important.

A project proposal can be presented on paper, electronically or verbally or any combination of these. You will learn how to conduct yourself appropriately in formal meetings and communicate complex technical information to a non-specialist audience.

8.4 Definition of scope

Once a project is given approval to proceed, it is important that everyone involved knows exactly what it is meant to achieve, by when and how. In other words, it must be formally defined and signed off. Whereas the project proposal consists of initial ideas, the project definition sets out the details (scope) of the project and provides a yardstick against which to judge the performance of the project.

You will learn how to produce a project definition that includes:

- the reason for undertaking the project
- the expected benefits to the organisation
- the objectives of the project
- key success criteria
- the constraints
- areas of risk
- the project roadmap ie a rough estimate of what will be delivered when
- resource requirements ie people, materials, equipment and time
- the project's stakeholders
- interim review points.

Clear objectives are crucial, since a project's success will be judged by how closely it meets them.

You will learn how to define specific, measurable objectives, covering:

- the project deliverables, ie the product(s)/service(s) to be produced
- the quality criteria that the deliverables must meet
- the target completion date.

8.5 Project organisation

Since a project will involve other people, it is essential that the ground rules for communication and reporting are established at the outset.

You will learn how to set up and use procedures for:

- storing documents relating to a project (project folder)
- protecting information from accidental damage
- communicating with stakeholders
- reporting on progress
- holding reviews.

8.6 Phases of a project

Detailed planning is critical to the success of any project. A project manager needs to be able to analyse the requirements and to draw up a project plan.

You are already familiar with the sequence of activities involved in designing and producing software products such as relational databases and complex spreadsheet models. You will draw on this knowledge to help you divide up projects into phases, such as:

- analysis
- initial design
- prototyping and formative testing
- summative testing
- documentation
- hand over to customer.

You will learn how to break down each phase into a number of activities, estimate how much time will be needed for each and identify any dependencies between activities.

8.7 Project planning

A good plan should be easy to read and maintain. You will use project management software to help you produce detailed project plans, showing:

- the phases of the project
- the activities to be carried out in each phase
- start date and end date of each activity
- dependencies
- resources required for each activity
- dates of key milestones
- potential risks, their affect on the plan and how their impact can be minimised.

You will use charting facilities provided by the software to produce graphical representations of plans, such as:

- Gantt charts
- PERT charts.

Far from being fixed in time, the project plan is a dynamic document. It is likely to change many times during the course of a project. You will learn the importance of checking progress against your plan at regular intervals and of modifying and updating the plan so that it is always current and gives an accurate picture of what work has been completed, what still needs to be done and what problems or potential problems – if any – need to be addressed.

The plan provides a snapshot of the project at a particular point in time. Anyone looking at it should see at a glance the current state of the project. A complete project history can be built up overtime by capturing and storing copies of the plan at key points in the project (known as base lining).

You will learn the importance of base lining project plans at regular intervals to create a detailed project history.

8.8 Project execution

Once the initial plan has been drawn up and approved, the execution of the project in accordance with the plan can get underway.

You will learn how to use techniques for measuring progress against plan and spotting potential problems. Even the best-made plans can go awry! You need to be aware of what can go wrong in a project, such as a change to user requirements, a missing piece of equipment, illness or simply that the project is too ambitious.

A delay in completing one part of the plan is likely to have knock-on effects elsewhere. You will learn how to assess the impact of a hold up and take appropriate corrective action – if possible, to get the project back on target and thereby meet the stated handover date. You must decide how much deviation from the plan is acceptable before you inform senior management that there is a problem.

8.9 Deliverables

The output of a project is a set of deliverables, not all of which are necessarily delivered at the end.

You will need to be able to identify project deliverables, such as:

- software products
- documentation
- user training
- and produce a schedule for what will be delivered when and to whom.

8.10 Reviews

One way of checking that a project is on course and likely to succeed is to get someone who has no day-to-day involvement with it to carry out an independent review. Reviewers feed back to the project manager and to senior management.

You will learn how to identify suitable people and persuade them to act as reviewers for your projects and to make full use of their knowledge and expertise.

Formal management reviews also take place from time to time throughout the lifecycle of a project. Dates for these are usually agreed at the outset and listed in the project definition. You should never forget that senior management have the power to order work on a project to cease or change direction at any time. You will learn to prepare and present information at a formal management review.

8.11 Close down and end of project review

Sometimes projects simply refuse to come to an end. This is usually down to poor planning. The plan should specify dates for formal close down and end-of-project review, giving all those involved the opportunity to air their views about the strengths and weaknesses of the project and to formulate a list of lessons learnt. The project definition should be used as a yardstick to measure achievement.

You will learn how to set up and run an end-of-project review meeting, encourage attendees to voice their opinions, take accurate notes of the discussion and produce a written summary of the main points.

You should use this opportunity to gather information about your own performance and identify further development needs.

8.12 ICT skills

In order to manage projects efficiently you should be able to use ICT to:

- produce and maintain a project plan using project management software
- create and manage a shared work area
- present information to stakeholders
- produce agendas and minutes of meetings.

8.13 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using ‘readme’ files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality

- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will:

- research and produce a proposal for a new software product, present your proposal to senior management and draw up a project definition that defines the scope of the project once this has been agreed (assessment evidence a)
- produce a detailed project plan using project management software and use it to monitor and communicate progress throughout the project (assessment evidence b)
- keep detailed records showing how you managed the project (assessment evidence c)
- design and produce the software product and other deliverables specified in the project definition in accordance with the project plan (assessment evidence d)
- evaluate the project and your own performance, incorporating feedback from the end-of-project review (assessment evidence e).

Your eportfolio for this unit should include:

- (a) A project proposal, with evidence of how you presented it to senior management, and a project definition document that has been approved by senior management.
- (b) A project plan covering all the key phases of the project. Plus evidence of your use of the plan to monitor and communicate progress throughout the project.
- (c) Evidence of your performance as a project manager, showing how you communicated with stakeholders, acted on feedback, provided accurate information and ran meetings.
- (d) The software product – plus any other specified deliverables that you produce as outcomes of the project. Plus evidence showing how the production of the product correlated with the schedule specified in the plan.
- (e)* An evaluation – using feedback from the end-of-project review – assessing the success of the project, the effectiveness of the project management methods you used and your own performance.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) - (i-iii).

Assessment criteria – Unit 8: Managing ICT Projects

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2)	<p>An outline project proposal that:</p> <ul style="list-style-type: none"> provides some information, but not sufficient on its own for senior management to make an informed decision shows limited awareness of audience and purpose. <p>Plus, a project definition document that defines the scope of the project.</p> <p>(0-3)</p>	<p>A well-researched, detailed project proposal that:</p> <ul style="list-style-type: none"> provides sufficient information for senior management to make an informed decision considers the impact of the proposal on others is clearly communicated, demonstrating sound awareness of audience and purpose. <p>Plus, a project definition document that fully defines the scope of the project.</p> <p>(4-5)</p>	<p>A well-researched, comprehensive project proposal that:</p> <ul style="list-style-type: none"> provides all the information needed for senior management to make an informed decision carefully considers the impact of the proposal on others is well argued and clearly communicated, demonstrating sound awareness of audience and purpose. <p>Plus a project definition document that fully defines the scope of the project and identifies clear and measurable objectives.</p> <p>(6)</p>	6

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO 1, 2, 3)	<p>An outline project plan – produced at the start of the project – that:</p> <ul style="list-style-type: none"> divides the project into a number of phases, though these may not be entirely logical identifies some of the main activities to be carried out in each phase allocates time and resources to each activity, although these may not be entirely realistic identifies some potential risks. <p>Evidence that some limited use was made of the plan to monitor and communicate progress.</p> <p>(0-6)</p>	<p>A detailed project plan – produced at the start of the project – that:</p> <ul style="list-style-type: none"> divides the project into a number of logical phases identifies most of the main activities to be carried out during each phase allocates a realistic amount of time and resources to most activities identifies and assesses some potential risks uses graphical representation appropriately. <p>Evidence that the plan was used throughout the project to monitor and communicate progress.</p> <p>(7-9)</p>	<p>A comprehensive project plan – produced at the start of the project – that:</p> <ul style="list-style-type: none"> divides the project into a number of logical phases identifies all of the main activities to be carried out during each phase allocates a realistic amount of time and resources to every activity, taking account of dependencies between them identifies and accurately assesses potential risks uses graphical representation effectively to give an ‘at a glance’ overview of the project. <p>Evidence that the plan was used effectively throughout the project to monitor and communicate progress and identify potential problems and that contingency measures were taken when necessary to keep the project on track.</p> <p>(10-12)</p>	12

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 3, 4)	<p>During the project, the learner:</p> <ul style="list-style-type: none"> communicates with stakeholders – both formally and informally – but needs frequent prompting provides some accurate information, but only on request needs support to organise, run and record the outcomes of formal project meetings. <p>(0-10)</p>	<p>During the project, the learner:</p> <ul style="list-style-type: none"> communicates appropriately with stakeholders – both formally and informally – making some use of feedback received provides accurate, information, with only occasional prompting independently organises, runs and records the outcomes of formal project meetings. <p>(11-15)</p>	<p>During the project, the learner:</p> <ul style="list-style-type: none"> communicates effectively with stakeholders – both formally and informally – making good use of feedback received provides accurate, detailed and up-to-date information, without needing to be prompted independently organises, runs and records the outcomes of formal project meetings confidently and professionally actively drives the project forward, adopting a proactive approach to project management, anticipating problems and taking appropriate corrective action when necessary. <p>(16-20)</p>	20

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO 1, 3)	<p>A software product produced in accordance with the project plan that meets some of the objectives specified in the project definition, with some deliverables meeting the agreed quality criteria.</p> <p>(0-5)</p>	<p>A software product produced in accordance with the project plan that meets most of the objectives specified in the project definition and is delivered on time, with most deliverables meeting the agreed quality criteria.</p> <p>Throughout the development of the product there is some correlation between what the plan indicates should be happening and what is actually happening.</p> <p>(6-8)</p>	<p>A software product produced in accordance with the project plan that meets all of the objectives specified in the project definition and is delivered on time, with all deliverables meeting the agreed quality criteria.</p> <p>Throughout the development of the product there is a close correlation between what the plan indicates should be happening and what is actually happening.</p> <p>(9-10)</p>	10

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4) QWC (i-iii)	<p>An evaluation - taking account of feedback from the end-of-project review meeting – commenting on:</p> <ul style="list-style-type: none"> the success of the project the effectiveness of the project management methods used their own performance as a project manager. <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p style="text-align: right;">(0-6)</p>	<p>An evaluation – using feedback from the end-of-project review meeting – assessing:</p> <ul style="list-style-type: none"> the success of the project the effectiveness of the project management methods used, identifying key lessons learnt strengths and weaknesses of their own performance as a project manager. <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p style="text-align: right;">(7-9)</p>	<p>A critical evaluation - making extensive use of feedback from the end-of-project review meeting – analysing:</p> <ul style="list-style-type: none"> the success of the project, measured against the objectives specified in the project definition document the effectiveness of the project management methods used, exploring key lessons learnt and justifying actions taken/decision made strengths and weaknesses of their own performance as a project manager, identifying areas for improvement. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p style="text-align: right;">(10-12)</p>	12
Total marks			60	

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-3 marks)

To be eligible for mark band 1, learners must have produced an outline project proposal providing some of the required information (*What you need to learn* section 8.3) and an approved project definition document (8.4). However, the proposal will not provide sufficient information to enable senior management to make a decision.

For full marks in this band, learners must have shown some awareness of the audience for, and purpose of, the project proposal.

Mark band 2 (4-5 marks)

To be eligible for mark band 2, learners must have produced a detailed project proposal which has been well researched and that provides enough information for senior management to make an informed decision. Subsequently, learners must have drawn up a project definition document that accurately reflects this decision.

For full marks in this band, learners must have considered the likely impact of their proposal on others (Impact of personnel and practices 8.2) and have demonstrated a sound awareness of audience and purpose for both the proposal and the project definition documents.

Mark band 3 (6 marks)

To be eligible for mark band 3, learners must have produced a well-researched, comprehensive project proposal that gives careful consideration to the impact of their proposal on others.

The proposal provides all the information needed by senior management to make an informed decision. Learners will have communicated their proposal clearly, arguing their case if necessary. Their project definition document will contain a set of clear and measurable objectives.

Assessment evidence (b)

Mark band 1 (0-6 marks)

To be eligible for mark band 1, learners must have produced the plan before starting work on the project! They must have made some attempt to divide the project into phases and identify some of the main activities that will take place in each phase.

For full marks in this band, the learner must have allocated time and resources to each activity, although these may not always be realistic, and have identified some (at least two) potential risks. Project management software has been used to produce graphical representation of the plan.

Learners must also have updated the plan from time to time during the course of the project, though not often enough to ensure that it accurately reflects the current state of the project at all times.

**Mark band 2
(7-9 marks)**

To be eligible for mark band 2, learners must have produced a detailed plan up front using project management software, dividing the project into logical phases, identifying most of the main activities associated with each phase and allocating realistic amounts of time and resources to each activity and identifying some potential risks.

They must also have updated the plan regularly throughout the project and made some use of it to monitor and communicate progress through progress reports and meetings.

For full marks in this band, learners must have identified and assessed some potential risks, categorising them according to their likelihood/impact. They must have updated the plan regularly throughout the project and used graphical representation to show progress to plan and explained the changes made.

**Mark band 3
(10-12 marks)**

To be eligible for mark band 3, learners must have produced a comprehensive plan using project management software, dividing the project into logical phases, identifying all of the main activities associated with each phase and allocating realistic amounts of time and resources to each activity – taking account of dependencies between tasks – and have identified and assessed risks, categorising them realistically according to their likelihood/impact.

Learners must also have updated the plan frequently throughout the project, so that it always conveyed an accurate picture of progress to plan, using graphical representation effectively to communicate this and explaining changes made.

For full marks in this band, learners must have used the plan effectively throughout the project to communicate progress and identify potential problems (through progress reports and meetings), taking contingency measures when necessary to keep the project on track.

Assessment evidence (c)

**Mark band 1
(0-10 marks)**

To be eligible for mark band 1, learners must have made some attempt to manage the project, though they will have needed considerable ‘hand-holding’. They must have set up a project folder, organised and run one formal meeting – keeping a record of the outcomes – and produced one progress report.

For full marks in this band, learners must have communicated with stakeholders – formally and informally – at intervals throughout the project and organised and run different types of review meetings eg peer, formal management, end-of-project.

**Mark band 2
(11-15 marks)**

To be eligible for mark band 2, learners must have managed the project with very little prompting. They will have set up and maintained a project folder, organised and run various review meetings – keeping accurate records of the outcomes – and produced regular progress reports.

For full marks in this band, learners must have demonstrated that they made constructive use of the feedback they received from others, taking corrective action where appropriate. The documents produced must be appropriately presented.

**Mark band 3
(16-20 marks)**

To be eligible for mark band 3, learners must have taken ownership of the project, communicating effectively with stakeholders, maintaining detailed records, holding meetings, providing accurate and up-to-date information and making good use of feedback.

For full marks in this band, learners must have adopted a proactive approach to project management, using project processes and methodology to good effect to drive the project forward and produce the required results. They will have managed the project confidently and professionally.

Assessment evidence (d)

**Mark band 1
(0-5 marks)**

To be eligible for mark band 1, learners must have produced a software product **in accordance with the project plan** which meets some of the objectives specified in the project definition. The emphasis here is on working to the plan. A product that meets the objectives but was not developed in line with the sequence/timings of phases and activities specified in the project plan should not be awarded any marks.

For full marks in this band, the product must meet most of the objectives, with some of the deliverables produced meeting agreed quality criteria.

**Mark band 2
(6-8 marks)**

To be eligible for mark band 2, learners must have produced a software product in accordance with the project plan that meets most of the objectives and is delivered on time, with most of the deliverables meeting agreed quality criteria.

For full marks in this band, there must be some correlation throughout the development of the product between what the plan says should be happening and what is actually happening.

**Mark band 3
(9-10 marks)**

To be eligible for mark band 3, learners must have produced a software product in accordance with the project plan that meets all the objectives specified in the project definition and is delivered on time, with all deliverables meeting agreed quality criteria.

For full marks in this band, there must be a close correlation throughout the development of the product between what the plan says should be happening and what is actually happening.

Assessment evidence (e)

Mark band 1 (0-6 marks)

To be eligible for mark band 1, learners must have made some use of feedback from the end-of-project review meeting when commenting on the success of the project and their own performance as a project manager. The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have commented on the effectiveness of the project management methods they employed.

Mark band 2 (7-9 marks)

To be eligible for mark band 2, learners must have made good use of feedback from the end-of-project review to inform their evaluation. They must have produced an accurate assessment of the success of the project, the effectiveness of the project management methods used and their own performance as a project manager. The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have identified key lessons learnt and assessed the strengths and weaknesses of their own performance.

Mark band 3 (10-12 marks)

To be eligible for mark band 3, learners must have made extensive use of feedback from the end-of-project review to inform their evaluation. They must have analysed the success of the project (measuring it against the objectives specified in the project definition), the effectiveness of the project management methods employed and their own performance as a project manager (assessing strengths and weaknesses) and have explored key lessons learnt. The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have included some justification for their actions and decisions and have identified areas for self-improvement.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria* grid, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

All the marks available for this unit are for practical activities related to planning and managing a project using formal project management methods.

Learners will need to use project management software for this unit.

Vocational context

This unit has a user focus. Ideally, learners should experience a large-scale ICT project, possibly by sitting in on reviews, studying project documentation etc.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- the project proposal, plus evidence of how it was presented to senior management
- the project definition document
- the project plan using project management software, plus evidence of its use to monitor and communicate progress
- a collection of evidence of performance as a project manager, eg project reports, agendas, minutes, diaries, project logs
- the software product, plus any other deliverables, plus evidence of how the production of the product correlated with the schedule (project plans, progress reports, minutes of meetings)
- an evaluation of the project and own performance resulting from feedback obtained at the end of project review meeting.

Teaching and learning strategies

Teachers may wish to combine this unit with one of the 'Using software' units, eg *Unit 10: Using Multimedia Software*, *Unit 11: Using Spreadsheet Software* or *Unit 12: Customising Applications*. Learners will need to have had some experience of developing software prior to attempting to produce a detailed project plan.

If combining the unit with another, learners must ensure that each unit is individually evidenced with clear links to the relevant unit strands.

Although this is not a team project, learners must involve other people to act as stakeholders: senior manager, reviewer, customer. Ideally they should work with 'real' stakeholders, but failing that they will need to have someone acting the part, eg the teacher could act as the senior manager, a fellow learner as a reviewer and other people role play the customer and end user/s.

When researching their project proposal, learners should consider carefully the impact that the proposed software will have on others. This is covered in 8.3 Impact on personnel and practices. The new product could impact on working practices.

The projects learners undertake must address a genuine need or opportunity. Ideally, a real client has a project to be undertaken, but, – failing this, teachers will need to devise a list of appropriate projects for learners to choose from. They should be complex enough to require at least 10 weeks to complete. Possible software projects could be:

- a bespoke software application such as a customer database, a stock control system or an invoicing and sales system, a sports league table
- a multimedia product such as an e-learning resource, an e-book or an eportfolio
- a website for an organisation.

Learners must set up and hold regular reviews throughout the project as well as a formal end-of-project review.

Teachers may wish to consider splitting the class into smaller ‘management’ groups of five to six learners for the purposes of formative review. Each learner has one management group to which they belong and to which they regularly report on project progress using the review dates built into the project plan at the outset. This will give learners opportunities to formally present ideas to a ‘management board’, to record minutes and to learn how to conduct themselves in a formal setting. This approach will also enable learners to receive peer support whilst maintaining a personal project.

The emphasis in this unit is very much on project management rather than software development, this is reflected in the way in which marks are allocated for assessment evidence (d) – not for the software product itself, but for its production in accordance to the plan and project definition.

Project proposal and definition of scope

Learners should understand the difference between the two documents. The project proposal is drawn up as the result of a limited project brief from the client. This enables the ‘project manager’ to discuss the project requirements with the client and draw up a detailed definition of scope which forms the basis of the implementation of the project.

Project Plan

Learners should use project management software to draw up an initial plan using the phases in 8.6. Gantt charts are a good way of depicting the plan in a graphical format and incorporating much of 8.7. The plan should be updated throughout the project period, incorporating changes to the different phases thus enabling the target handover date of the product and deliverables to the client to be met. Learners need to take into account possible risks to the implementation of the project by making provision in the plan. A variety of risks should be considered and learners should be able to categorise whether they are likely to happen or not. Learners need to understand how the plan is used at review meetings with stakeholders to ensure the project is kept on track.

Communicating with stakeholders

Learners need to appreciate the roles of a range of stakeholders to be used in the project. The client and senior manager are two essential stakeholders who undertake very different roles and these should be clearly defined and used appropriately. The client requires a software product and deliverables by a target handover date. The senior manager has allocated this project to a project manager and oversees a series of projects. Reviewers can help see the project is kept on track and target end users and peers can be used as testers in the prototyping and implementation of the product.

Different types of communication need to be evidenced. The learner needs to develop skills related to the running and recording of meetings. Undertaking the role of chair at these meetings involves a range of communication skills for the learner in their role as project manager. Learners will need to set up a project folder and ensure all aspects related to the project are clearly stored. The less formal communication could be recorded in the form of diaries/logs. Formal documents should be presented in an appropriate format and the learner will need to know the layouts of formal reports, agendas and minutes.

There will be meetings with the client, interim reviews with the senior manager and other stakeholders at key points. Such meetings should be incorporated into the project plan. Meetings set into the plan are formal communication. There should be some form of formal handover of the product and deliverables to the client. There needs to be a formal end of project review meeting where the stakeholders, including the project manager and senior manager discuss the strengths and weaknesses of the project and formulate a list of lessons learnt. Feedback from this meeting is essential in order for strand e to be addressed and should be fully documented in the minutes resulting from this meeting.

The project manager should present progress reports detailing where the project is in relation to the project plan at the formal review meetings.

There is likely to be informal communication between the different stakeholders during the implementation of the project. This may be informal discussion whilst various prototyping and testing is carried out. There could be telephone and/or email contact. A record needs to be kept of such communication and project diaries/logs could be used as well as screen prints of email in and sent boxes.

Delivering the project

The learner must evidence that a software product has been produced in accordance with the project plan that meeting the objectives specified in the project definition. Evidence the product has been produced using project management methods should be found in the plans and communication with stakeholders. The product needs to be delivered to the client on the target handover date which was set in the definition of scope and which formed the basis of the plan and updates. The learner will demonstrate that the project should be formally handed over and this is to include all deliverables. Apart from the product there may be user and technical guides as well as training for users. Some products may require an ongoing programme of updates over a specified period of time. This is often the case with a website that is maintained/hosted by a third party and not the client. The client accepts the product which should meet the objectives defined in the definition of scope.

Evaluation

The evaluation is based on feedback obtained from the stakeholders at the end of project review meeting. The learner should have ensured that such feedback was obtained and clearly documented. The emphasis is on the project and covers three areas listed in the assessment criteria. Learners should produce a thoughtful evaluation which assesses the strengths and weaknesses of the project, the project management methods and the learner's own performance as a project manager.

Links

Other units

The concept of project planning is introduced in *Unit 5: Web Management*. The project management skills and techniques that learners learn in this unit are generic. They can be transferred to work in other units.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers ideally with the following minimum specification (based on Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024 x 768
 - sound output (16 bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software:
 - project management, eg Microsoft Project (note - there are many open source applications available to download from the internet)
 - word processing, eg Microsoft Word, OpenOffice Writer
 - presentation, eg Microsoft PowerPoint, OpenOffice Impress.

Textbooks

Guy and O'Byrne – *ICT for Edexcel Applied A2 Single Award* (Hodder Murray, 2006) ISBN 0340926511

Heathcote T – *Edexcel GCE in Applied ICT A2 Single Award* (Edexcel, 2006) ISBN 1903133785

Johnston A – *A Hacker's Guide to Project Management* (Butterworth Heinemann, 2003) ISBN 0750657464

Watson M – *Managing Smaller Projects* (Multi-media Publications, 2006) ISBN 1895186854

Young T L – *Implementing Projects* (Spiro Press, 1992) ISBN 0852908806

Websites

www.ganttproject.biz – open source project management software

www.openworkbench.org – open source project management software

www.spottedog.u-net.com – Spottedog's Project Management website

Unit 9: Communications and Networks

Externally assessed

Introduction

Nowadays, computer networks are essential to most organisations, enabling them to access their information irrespective of its geographic location, make efficient use of hardware and software resources and communicate effectively.

In this unit you will acquire a sound knowledge of network architectures, topologies and components, as well as the protocols and standards that govern the way in which hardware devices communicate with one another on a network.

You will draw on this knowledge to help you devise effective network solutions. You will use network design software to produce detailed designs that are clearly presented and easy to understand.

You will learn about the benefits of networks, as well as the risks associated with them. You will find out what managing a network involves and – ideally – get some hands-on experience of carrying out routine network management tasks.

Users cannot be expected to know and understand specialist network terminology or have an in-depth understanding of management issues. You must be able to provide professional, unbiased advice to clients and present complex concepts in easy to understand, non-technical language.

Your work for this unit will culminate in the design and presentation of a network solution to meet the needs of a specified client. This unit is externally assessed.

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

This unit builds on the ICT practitioner knowledge and skills you acquired in *Unit 4: System Design and Installation* and *Unit 6: Technical Support*.

What you need to learn

9.1 Benefits of networks

A computer network consists of a number of hardware devices such as desktop computers, laptops and printers linked together. Nowadays, networks are essential - not to say business critical - to most organisations. You must be able to explain the benefits that a computer network will give to an organisation, including:

- efficient use of hardware and software resources
- information sharing
- effective communication
- support for group, collaborative and flexible working
- productivity gains
- centrally managed backup, administration, security and user support
- control and monitoring of access and activity
- cost savings.

You must also be aware of the drawbacks/risks associated with networks, including:

- security implications
- reliability
- critical dependency
- purchase, set-up and maintenance costs.

You need to understand the impact of networked systems on organisations' personnel, policies and practices.

9.2 Types of networks

There are many different types of networks. One way of categorising them is based on the geographical area they cover. You need to know about the characteristics, properties and uses of the following types of networks:

- personal area network (PAN)
- local area network (LAN)
- metropolitan area network (MAN)
- wide area networks (WAN).

You must be able to select the most appropriate network type for a given situation/organisation and justify your choice.

9.3 Network architectures

The architecture of a network defines the functional relationship between its components. You need to know about the two major network architectures:

- peer-to-peer
- client-server.

You must be able to explain - using diagrams - the difference between these two architectures, describe their advantages and disadvantages and choose the most appropriate architecture for a given situation/organisation.

9.4 Network topologies

A network topology describes the physical shape of a network. You must be able to describe - using diagrams - the common types of network topology, including:

- bus
- tree
- star
- ring
- mesh
- hybrid.

You will learn about the advantages and disadvantages of different topologies and be able to select an appropriate topology for a specified purpose.

There are a number of different technologies that can be used to implement a network. You must be able to describe the characteristics and operation of Ethernet and token ring technologies, including:

- method of access
- topology
- cable type
- advantages/disadvantages.

9.5 Components of a network

Computer networks are made up of hardware devices, software and media.

You need to know the function of common hardware devices, including:

- network interface card (NIC)
- modem
- server
- repeater
- hub
- bridge
- switch
- multi-station access unit (MAU)
- router
- gateway.

You need to be aware that many hardware devices are multifunctional, incorporating two or more devices into a single piece of equipment. You must be able to describe these devices and explain how the different functions work together to give a network solution.

You must also understand the role and functions of a network operating system and how it interacts with other software.

You need to be aware of the types and properties of transmission media used to connect devices together, including:

- unshielded twisted-pair (UTP) wire
- shielded twisted-pair (STP) wire coaxial cable
- fibre optic cable
- radio (eg WiFi, dish-to-dish, Bluetooth)
- microwave (eg satellite, dish-to-dish)
- infrared.

You should understand and be able to use terms relating to connectors and cables, such as:

- RJ-11 and RJ-45 used for telephone and twisted pair connections
- BNC connector used for coaxial cable
- ST fibre optic connector.

9.6 Network addressing and protocols

Protocols are rules that govern the way in which network devices communicate with each other. You will learn about the function and importance of networking protocols and be able to choose between alternatives, such as UDP or TCP.

You need to have a good understanding of the purpose and operation of the two common layer models:

- OSI seven layer model
- TCP/IP four layer model.

You must be able to identify the layers in each model and describe their function. You must also be able to specify in which layer, or layers, a piece of network equipment operates.

In order to communicate with each other, network devices must be uniquely identifiable. You need to understand the difference between physical and logical addressing and know which one to use when.

9.7 Connectivity

You must be able to discuss the issues involved in connecting two or more networks, including:

- packet routing
- security implications
- hardware and software requirements
- impact on performance
- compatibility.

9.8 Network design

In Unit 4 you learnt that the first stage of designing any new computer system is to work closely with the client to gather information and agree the functional specification. Network design is no different. You will be expected to use a range of investigative techniques to find out what you need to know, including:

- number of users
- size/geographical spread
- layout of buildings
- required functionality
- any plans for the future which may have an effect on the network
- existing equipment/infrastructure/software
- capacity required
- expectations
 - response time
 - reliability
 - security
- budget
- relevant legislation.

Only once you have a detailed understanding of what is required, are you in a position to start to design an appropriate network solution. You will use network design software to produce detailed network designs, showing:

- structure of the network
- network devices and other equipment
- positioning of network devices and equipment
- connection medium
- IP addresses.

You will also need to specify details, such as:

- collision detection/segmentation
- network operating system and other software
- protocols.

9.9 Network management

Networks are both highly complex and usually business critical. Once they are set up and working they need to be managed properly in order to ensure smooth and uninterrupted operation.

You will learn about the key tasks involved in managing a network, including:

- system configuration
- user support
- user management
- usage monitoring
- misuse monitoring
- fault finding
- allocating passwords and access levels
- backup procedures
- security procedures such as anti virus and firewall configuration
- contingency planning
- strategic long-term planning
- software licensing
- formulating a network code of practice
- server management
- managing updates
- centralised software rollout
- user training
- supervision and management of network staff
- advising on purchasing
- writing policy documents and reports to management
- legislation.

You must be able to make recommendations and provide advice on network management issues.

9.10 ICT skills

In the external assessment, you will be asked to produce network designs and reports for specific clients or purposes. You will be expected to use word processing and network design software and standard network symbols to carry out these activities.

At intervals during the examination window you will need to carry out research into specific topics. You must therefore be able to use the internet to locate, select and retrieve electronically stored information effectively.

As well as creating a network solution, you will need to report on what you have done. You will review and evaluate your solution taking into account how else you could have approached the task and changes you could have made. This will involve narrative text and you will need to be very precise when presenting your evidence. Marks will be awarded for the quality of your written communication in this part of the examination.

Assessment guidance

This unit is externally assessed.

Working under supervision, you will be required to produce and justify a network design solution to meet a given functional specification for a specified scenario.

You will have 10 hours in which to complete this work.

You will need access to network design software such as Network Notepad as well as word processing, spreadsheet and presentation software for the duration of the examination.

At the end of the designated examination period, you will assemble the printed output produced in response to instructions on the examination paper for submission to Edexcel.

Delivering this unit

General information

Assessment requirements

This is an externally assessed unit. Instructions for the Conduct of the Examination will be published on the Edexcel website in advance of each examination series.

Vocational context

This unit has a practitioner focus. It aims to provide learners with knowledge, skills and understanding of current and emerging network technologies. It is essential that they acquire some experience of live, large-scale computer networks. A period of work experience in an appropriate environment is one way of achieving this. Alternatively, learners may be able to shadow the school/college network manager for a period of time.

Pre-release time

This unit gives learners pre-release material. It is important that learners use that time to investigate possible network structures to fit the scenario.

Standard ways of working

Learners must work safely and adhere to relevant legislation and codes of practice when carrying out the externally-set practical computer-based activities required for this unit. Marks will be awarded for evidence of adherence to relevant standard ways of working.

Teaching and learning strategies

Ideally, learners should be given the opportunity to put theory into practise by designing, building and managing a small network. In reality this may not be feasible, although – as a minimum – learners should be given the opportunity to set up a simple peer-to-peer network.

Learners should also be given the opportunity to use network operating system software to carry out routine activities such as adding users and groups, assigning rights, producing login scripts etc. Centres may wish to use a virtual operating system software package such as VM ware for this purpose.

Learners should be reminded of the work they did at AS level in *Unit 4: System Design and Installation* and *Unit 6: Technical Support*. All of the concepts introduced in these units are relevant to the work they will be doing in this unit.

Learners will need to be familiar with, and be able to use, a network design software package. They should be given plenty of opportunities to design and develop networks for a range of scenarios.

During the course of their studies, learners will have many opportunities to transmit and receive data using electronic communications. As part of their work on this unit they should be encouraged to consider the technology, protocols and rules that underpin and support this communication.

Links

Other units

This unit has links with *Unit 4: System Design and Installation*, *Unit 5: Web Development* and *Unit 6: Technical Support*.

Skills Framework for the Information Age (SFIA), October 2003

The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:

Strategy and planning

- Network planning

Development and implementation

- Systems development – business analysis
 - Systems development – systems design
 - Systems development – systems testing.
-

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers, ideally with the following minimum specification(based on the Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - network design, eg Network Notepad, Microsoft Visio
 - word processing, eg Microsoft Word, Open Office suite
 - presentation, eg Microsoft PowerPoint, Open Office suite
 - spreadsheet, eg Microsoft Excel, Open Office suite.

Learners should also ideally have access to:

- a range of network components which they can connect together to create simple peer-to-peer networks
- network operating software which they can install and configure.

Textbooks

Cisco Networking Academy Program, First Year Companion Guide (Cisco Press, 2001) ISBN 1587130254

Dick D – *PC Support Handbook* (Dumbreck Publishing, 2002)
ISBN 095417110 1

Hodson P – *Local Area Networks, Second Edition* (Thomson Learning, 2002)
ISBN 0826458661

Irving P – *Computer Networks, Second Revised Edition* (Lexden, 2005)
ISBN 190499508X

Websites

www.comptechdoc.org

www.comptechdoc.org/independent/networking/index.html – useful quick guide, which can also be downloaded in PDF form

www.networktutorials.info/index.html – a good set of simple tutorials on most aspects of networking

www.pctechguide.com – excellent technical, up-to-date advice (CD available to purchase)

Software

VM ware allows learners to experiment with a virtual copy of the machine set-up, BIOS etc without being able to do any damage.

Other resources

Learners should be encouraged to keep up to date by reading some of the weekly trade newspapers, such as *Computing*, published by VNU business and *Computer Weekly*, published by Reed Business Information.

In addition to news and commentary, these often include features on particular technology and/or business applications.

Unit 10: Using Multimedia Software

Internally assessed

Introduction

Everything is created to be communicated! Advances in digital technology have transformed the way we live and learn and, in particular, how we communicate.

One of the major areas of development is digital multimedia which combines two or more media types such as text, graphics and video, and allows us to present information in ways that have a major impact on the audience. Multimedia is widely used throughout the world in business, education, industry and leisure.

You will already have gained experience of some of the ICT tools and techniques needed to develop a multimedia product. In this unit you will increase your understanding of the features and possibilities of these and other tools so that you can combine them to produce well-designed multimedia products that communicate your ideas effectively.

Your work for this unit will culminate in the design, development and testing of an interactive multimedia product for a specified target audience.

You will establish the functional requirements of the product at the outset and carry out formative evaluation and testing throughout its development. You will learn the importance of seeking and making use of feedback from others to help you in your work.

The summative evaluation of your work for this unit will include a self-assessment of your current skill level and an indication of what else you need to know or be able to do in order to further enhance your ability to produce interactive multimedia products

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use advanced ICT skills on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the knowledge and skills related to producing on-screen publications that you acquired in *Unit 1: The Information Age*.

What you need to learn

10.1 Applications of multimedia

You have already gained some experience of producing a multimedia product – your e-book for Unit 1. This was designed to communicate information about the digital society in which you live. Every multimedia product is designed to carry some communication to an audience. In this unit you will identify and learn to use more advanced multimedia tools and techniques and apply these skills in the creation of useful multimedia products.

You will need to explore the use of multimedia in a variety of contexts, including:

- education and training
- entertainment
- marketing and advertising
- teleconferencing
- publishing
- interactive television
- product demonstration.

In each case, you should evaluate the multimedia features used, the effectiveness of the underlying design and the extent to which the product is fit for purpose.

10.2 Functional specification

You are very unlikely to produce a multimedia product that completely fulfils all its objectives unless you are absolutely clear what these are.

You will learn the value of a functional specification, both in terms of explaining to others what it is you are aiming to achieve and helping to ensure that you never lose sight of your goals. You must be able to produce a functional specification at the outset, specifying:

- the purpose of the multimedia product
- the information it must supply
- how that information must be presented
- how the product will be used
- how you will judge the effectiveness of your solution.

The functional specification is not a static document. It is quite possible that once you begin work your understanding of what is required alters or becomes clearer.

You will learn the value of a functional specification, both in terms of explaining to others what it is you are aiming to achieve and helping to ensure that you never lose sight of your goals.

10.3 Product design

The effectiveness of any multimedia product lies in the quality of the design.

Designing a solution involves making decisions about:

- structure and navigation
- graphical design
- interactivity and user interface
- use of multimedia components
- timelines and storyboards
- layout and presentation
- consistency
- testing.

There is almost certainly more than one way of meeting the requirements. You will need to experiment with alternative designs before finally deciding which one to choose.

The more expert you get at applying multimedia tools and techniques, the better you will be at producing detailed designs up front. However, at this stage you will probably find it easier to use an iterative approach to software development.

You will be familiar with this approach if you have studied *Unit 5: Web Development*. It involves producing a series of prototypes. Each prototype brings you that much closer to a final fully-functional solution and helps clarify in your mind what it is you really want the product to do.

In the context of this unit, a prototype is a working, but incomplete, multimedia product which can be used to:

- refine your initial design and try out alternatives
- test that the product is functional and works as expected
- check for ease of use
- test for robustness
- test users' response/reaction to the product.

Prototyping enables you to interweave design, implementation and testing, rather than each of these being a distinct one-off stage of development.

10.4 Navigation

Another crucial element of any multimedia product is the navigation structure – the way in which the user can move around/through the product.

You will learn about the need for different navigation structures in relation to the product being developed including:

- hierarchical
- linear.

10.5 Graphical design

It is essential that you learn to make your multimedia products as user-friendly as possible by structuring the content appropriately and making effective use of available presentation and formatting features.

By looking critically at a range of products and by experimentation you will learn about:

- user interface
- effective use of colour including
 - contrast
 - pattern
 - background and borders
 - web-safe colours
- the impact of layout on the overall effect
 - composition
 - shape
 - balance
- how fonts can enhance or detract from the readability
 - styles
 - typefaces
 - emphasis
- consideration of presentation method
 - screen size
 - nature of audience
- consistency
- the importance of a corporate image/brand, including logos.

10.6 Interactivity design

Much of the success of digital multimedia is due to its interactive capabilities, which allow users to interact with the product by responding to prompts.

You will learn about suitable uses of interactive user elements, including:

- buttons
- image maps
- hot spots
- text links
- rollovers
- menus.

You will also learn about user response methods including:

- text boxes
- list boxes
- radio buttons
- check boxes.

10.7 Image capture and manipulation

You need to be able to store and manipulate images in order to incorporate them effectively.

You will learn how to:

- capture ready-made images
 - paper-based sources, eg photos and drawings
 - digital sources
- create original images
 - using a digital camera
 - using graphics software
- manipulate images using techniques including
 - filters
 - resize and crop
 - colour.

You will need to understand:

- characteristics and uses of bitmap and vector graphics
- image resolution
- types of compression (lossy and non-lossy) and the effects on image quality and file size.

10.8 Video

You will learn how to incorporate video into your own multimedia products.

You need to be able to:

- capture ready-made video clips
- record original video clips
- edit video clips
- select and use appropriate file formats.

10.9 Sound

Sounds such as music and narration are used to enhance the multimedia experience.

You will learn how to incorporate sound into your own multimedia products.

You need to be able to:

- record live sound
- select and import pre-recorded sound
- manipulate sound using techniques including
 - cut and edit
 - speed up, slow down, and reverse
- assign sound to an action or event
- select and use appropriate file formats including
 - WAV
 - MIDI
 - MP3/MPEG
- understand and use compression and codes.

10.10 Animation

You will learn about different types of animation, including:

- stop frame
- tweened
- animated gif.

You will learn how to create animations and use them in appropriate ways in your own multimedia products.

10.11 User interface

Ease of use is a key requirement for any multimedia product. You will learn how to design an effective user interface, including:

- using a consistent layout
- using graphics to illustrate a message
- adding prompts or messages to help users find their way around
- using interactivity features to allow users to initiate certain procedures.

10.12 Testing

No amount of flashy graphics and interactive features are any use if the product does not work properly. One of the advantages of prototyping is that you can carry out formative testing as you develop your products. You should also undertake summative testing when you think you have finished.

Summative testing involves asking questions, such as:

- Does the product meet all the requirements listed in the functional specification?
- Do all the interactive features work correctly?
- Does every link go where it should with no dead-ends?
- Is the product robust or can it be made to fail?
- Can other people use the product without help?
- What do people think about it in terms of design, layout etc?

It is essential to involve others in this process.

10.13 Distribution

If you create a multimedia product using specialised software, it is quite possible that some of your target users will not have this software available to run the product.

You will learn how to create a run-time version of a multimedia product – this will allow a user to run the program independently of the software used to create it and will mean that you can distribute the product freely on a portable storage medium such as a CD or memory stick.

10.14 Evaluation

The starting point for an evaluation of any software development project is the functional specification which lists what the software has to do. The key question to answer is how well the solution meets the requirements.

Being able to assess your own performance on a project critically is also important. You must learn how to judge your performance in terms of what you did well and what you could have done better in order to determine your current level of competence, identify areas for improvement and future training needs.

10.15 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly

- Eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will design, produce, test and evaluate a multimedia product to meet a given set of functional requirements.

Your eportfolio for this unit should include:

- (a) A functional specification that describes the purpose, audience and context for the multimedia product and explains what it is required to do.
 - (b) An initial design that:
 - satisfies the functional requirements
 - considers all aspects of multimedia design
 - plans the timing of events using a timeline
 - combines multimedia components – both ready made and original to convey information.
- Plus evidence of your use of prototyping to improve and refine the design.
- (c) A run-time version of a fully working multimedia product, with supporting ‘getting started with ...’ instructions for users.
 - (d) Evidence of formative and summative testing.
 - (e)* An evaluation assessing:
 - the multimedia product
 - your own performance and current skill level.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 10: Using Multimedia Software

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 3)	<p>A functional specification that:</p> <ul style="list-style-type: none"> briefly describes the purpose of the product, the context and intended audience outlines what it must do, but not in sufficient detail to give a clear picture of what is required. <p>(0-2)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> describes the purpose of the product, the context and intended audience explains what it must do. <p>(3)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> fully describes the purpose of the product, the context and intended audience explains clearly what it must do, specifying measurable success criteria. <p>(4)</p>	4
(b) (AO 1, 2, 3, 4)	<p>A design for a multimedia product that:</p> <ul style="list-style-type: none"> satisfies most of the functional requirements, but demonstrates limited awareness of audience and purpose gives some consideration to key aspects of multimedia design uses some ready-made and original multimedia components has been developed and improved, making limited use of prototyping, with some explanatory comments at each stage. <p>(0-8)</p>	<p>A detailed design for a multimedia product that:</p> <ul style="list-style-type: none"> satisfies all the functional requirements, demonstrating sound awareness of audience and purpose gives full consideration to most aspects of multimedia design makes good use of different types of ready-made and original multimedia components, combining them together to convey information has been developed and refined, making good use of prototyping, with some evaluative comments at each stage. <p>(9-12)</p>	<p>A comprehensive design for a multimedia product that:</p> <ul style="list-style-type: none"> satisfies all the functional requirements, demonstrating astute awareness of audience and purpose gives full consideration to all aspects of multimedia design makes effective use of different types of ready-made and original multimedia components, combining them together to convey information effectively making effective use of prototyping, with evaluative comments at each stage showing how feedback was acted on. <p>(13-16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3)	<p>A working multimedia product – produced with some assistance – that:</p> <ul style="list-style-type: none"> meets most of the functional requirements makes appropriate use of some of the facilities of the software. <p>Plus some ‘getting started with ...’ instructions, giving an indication of how to install and use the product.</p> <p>Whilst working on this project, the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(0-9)</p>	<p>A fully-working, easy-to-use multimedia product – produced with occasional prompting – that:</p> <ul style="list-style-type: none"> meets the majority of the functional requirements makes good use of the facilities of the software. <p>Plus detailed ‘getting started with ...’ instructions, enabling a competent user to install and use the product.</p> <p>Whilst working on this project, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(10-14)</p>	<p>An attractive, fully-working, easy-to-use, multimedia product – produced independently – that:</p> <ul style="list-style-type: none"> meets all the functional requirements, communicates effectively and is easy to use makes full and efficient use of the facilities of the software <p>Plus comprehensive ‘getting started with ...’ instructions enabling a novice user to install and use the product.</p> <p>Whilst working on this project, the learner adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(15-18)</p>	18
(d) (AO 4)	<p>Evidence of some limited formative and summative testing, but not sufficient to ensure that the multimedia product works as intended.</p> <p style="text-align: right;">(0-4)</p>	<p>Evidence of systematic formative and summative testing – making some effective use of feedback from test users – sufficient to ensure that the multimedia product works as intended.</p> <p style="text-align: right;">(5-6)</p>	<p>Evidence of thorough and systematic formative and summative testing – making effective use of feedback from test users – sufficient to ensure that the multimedia product works as intended and is easy to use.</p> <p style="text-align: right;">(7-8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4) QWC (i-iii)	<p>Some evaluative comments assessing:</p> <ul style="list-style-type: none"> the extent to which the final multimedia product meets the specified requirements, identifying any shortcomings the effectiveness of the solution their own performance throughout the project. <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p style="text-align: right;">(0-7)</p>	<p>A thoughtful evaluation assessing:</p> <ul style="list-style-type: none"> the extent to which the final multimedia product meets the specified requirements, explaining any shortcomings the effectiveness of the solution, with some sensible suggestions for improvements their own performance throughout the project and current skill level. <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p style="text-align: right;">(8-11)</p>	<p>An well-rounded evaluation – incorporating feedback from others – critically assessing:</p> <ul style="list-style-type: none"> the extent to which the final multimedia product meets the specified requirements, fully explaining any shortcomings the effectiveness of the solution, with some well-thought-out suggestions for enhancements their own performance throughout the project, current skill level and identifying areas for improvement. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p style="text-align: right;">(12-14)</p>	14
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-2 marks)

To be eligible for mark band 1, learners must have made an attempt at describing the context, purpose of the product and the intended audience. However, at this level the information is likely to be somewhat vague and incomplete.

For full marks in this band, learners must have given enough information for the product requirements to be surmised – even if they are not explicitly stated.

Mark band 2 (3 marks)

To be eligible for mark band 2, learners must have outlined what the product must do, indicated how it will be distributed and provided sufficient information for the requirements to be clear.

Mark band 3 (4 marks)

To be eligible for mark band 3, learners must have produced a complete functional specification and specified measurable success criteria by which to judge it.

Assessment evidence (b)

Mark band 1 (0-8 marks)

To be eligible for mark band 1, learners must have produced outline design documents for a multimedia product that address most of the functional requirements, although they will have given little thought to audience and purpose. They must have:

- designed the product's structure and navigation
- produced a timeline showing the order of events, effects and transitions used
- given some thought to screen layout and presentation
- chosen some appropriate ready-made and original multimedia components.

Learners must also have produced a prototype solution, but will not have made much use of it to identify and try out possible improvements.

For full marks in this band, the design must demonstrate some awareness of audience and purpose and take account of how the product will be distributed and used.

Learners must also have shown that they have made some improvements to the initial design as a result of prototyping, providing some explanatory comments.

**Mark band 2
(9-12 marks)**

To be eligible for mark band 2, learners must have produced detailed design documentation for a multimedia product that addresses all of the functional requirements and demonstrates sound awareness of audience and purpose. They must have:

- considered most of the key elements of multimedia product design
- chosen different types of multimedia components (ready-made and original) and combined them together to convey information.

Learners must also have shown that they made refinements to the initial design as a result of prototyping, providing some evaluative comments.

For full marks in this band, learners must have paid attention to how users will interact with the product (*What you need to learn* section 10.6). They must also have provided detailed comments evaluating each prototype in terms of how well it meets the specified requirements.

**Mark band 3
(13-16 marks)**

To be eligible for mark band 3, learners must have produced comprehensive design documentation for a multimedia product that addresses all of the functional requirements and is tailor-made for audience and purpose. They must have:

- given full consideration to all aspects of multimedia design, including interactivity and the user interface
- selected appropriate types of multimedia components (ready-made and original) and combined them effectively to convey information
- evaluated each prototype produced, in terms of fitness for purpose/audience.

For full marks in this band, learners must have produced a creative, quality product – something that stands out from the crowd! They must have involved others in evaluating prototypes and have shown clearly how feedback from test users was used to shape and refine the design.

Assessment evidence (c)

**Mark band 1
(0-9 marks)**

To be eligible for mark band 1, learners must have produced a working, multimedia product. They can have had some help/guidance to do so. The product may not meet all of the requirements, but it must demonstrate some appropriate use of facilities of the software.

Whilst working on the multimedia product, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, copyright, acknowledgement of sources.

For full marks in this band, the product must meet most of the requirements. Learners must also have produced some basic ‘getting started with ...’ instructions covering system requirements and installation procedures.

**Mark band 2
(10-14 marks)**

To be eligible for mark band 2, learners must have produced a fully working, multimedia product that meets the majority of the requirements of the functional specification. They will have needed only occasional prompting to do so. The solution must make good use of the facilities of the software. Learners must also have provided some 'getting started with ...' instructions.

Whilst working on the multimedia product, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have produced a product that is easy to use and is accompanied by detailed 'getting started with ...' instructions, enabling a competent user to install and use it.

**Mark band 3
(15-18 marks)**

To be eligible for mark band 3, learners must have independently produced a fully working, easy-to-use multimedia product that meets all of the requirements of the functional specification and makes full use of the facilities of the software. They must also have provided comprehensive 'getting started with ...' instructions, that would enable even a novice user to install and use the product.

Whilst working on the multimedia product, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must have made efficient use of the facilities of the software to produce an attractive solution that communicates effectively.

Assessment evidence (d)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have carried out some testing of individual aspects of the solution, such as interactivity features, links, robustness etc.

For full marks in this band, learners must show evidence of a simple test for most of the main elements of the solution.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must show evidence of a simple test for each of the main elements of the solution, demonstrating that it works in the manner intended. They must also have made some attempt to test the solution with other people.

For full marks in this band, learners must demonstrate that they adopted a systematic approach to testing making good use of feedback from test users.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must show that they adopted a thorough and systematic approach to testing and involved other people.

For full marks in this band, learners must have carried out sufficient testing and refinement to be confident that the solution as a whole works as intended in all anticipated circumstances and that other people can use it without assistance.

Assessment evidence (e)

Mark band 1 (0-7 marks)

To be eligible for mark band 1, learners must have made some meaningful evaluative comments about their solution, relating them to the requirements specified in the functional specification. They must also have made a sensible comment about their own performance.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have commented on the effectiveness of the solution.

Mark band 2 (8-11 marks)

To be eligible for mark band 2, learners must have produced a thoughtful evaluation of the final spreadsheet, identifying and offering some explanation for any shortcomings. They must have considered the effectiveness of the solution and made at least one suggestion for how it could be improved. They must also have assessed their own performance realistically.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have produced a considered evaluation, including a realistic assessment of their current skill level.

Mark band 3 (12-14 marks)

To be eligible for mark band 3, learners must have produced a well-rounded and critical evaluation of both the multimedia product and their own performance/skill level, drawing on feedback from others.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have identified some sensible ways of improving both the product and their own performance.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to the learners and gives precise details of what they must do.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Most of the marks available for this unit are for practical, hands-on activities, involving the development of a multimedia product.

Learners will need to have access to fully-featured multimedia authoring software.

Vocational context

This unit has a user focus. It is not essential that learners undertake work experience. However, learners will benefit from learning about industry practices in relation to the design and production of multimedia products, such as information points, web promotions, e-learning packages, games etc. A number of software producers such as Macromedia run online design workshops and seminars which learners might find useful.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a functional specification
- an initial design, plus selected prototypes showing how the multimedia product was developed and refined
- the final version of the multimedia product
- evidence of formative and summative testing
- 'getting started with' instructions for users
- an evaluation of the product and own performance.

Teaching and learning strategies

Learners are required to design and produce a fully working interactive multimedia product. The product must have a clear purpose and be sufficiently complex in nature to challenge learners' expertise and encourage them to develop new skills and techniques in order to produce a fully functional solution. Suitable products could include an e-learning package, a computer game, an interactive information point, a juke box, a web promotion etc.

Examining examples of multimedia products online such as subject tutorials, a revision site with a quiz style assessment, an e-book or an e-learning site will be beneficial in developing learners' understanding of how an interactive multimedia product may be used to enhance communication.

Functional specification

From a given set of requirements learners must produce a detailed functional specification which establishes exactly what the final multimedia product must do and can be used as a yardstick to measure the success of the project.

The project brief that learners are given must provide sufficient scope for them to be able to demonstrate their ability to design and produce interactive multimedia products. A collection of small unrelated tasks would not be appropriate. Learners should put themselves in the role of the end-user who has to produce a multimedia product as part of their job.

It is important that learners realise that it may be necessary to revise the specification as the solution progresses. However, the original purpose must always be kept in mind. It is easy to get carried away on an exciting project and change the specification drastically!

Product development and testing

Evidence of how the product develops must be submitted. This will include the initial design, prototypes at various stages and, of course, the finished product.

Managing prototypes and keeping evidence of feedback from users, and what changes will be made as a result, is a skill that learners will need to learn.

Learners will need to learn elements of multimedia design, for example, the rule of three in choosing colour and font, the need to develop a co-ordinated image throughout and how to add interactive elements to encourage user participation and enjoyment.

Video, sound, animation and graphics should only be included if they have a purpose not just because they are pretty!

The design of the user interface will require careful consideration.

Testing is a vital part of the process in order to provide a fully-working product. Learners must carry out formative testing throughout the development of the product as well as thorough summative testing at the end. Records of testing need to be kept together with evidence of the results of the tests.

The summative, or end testing, should be thorough and include testing links, navigation, interactive features, sound, video, animation etc.

Evaluation

This should assess the extent to which the final product meets the requirements identified in the functional specification. Learners should explain and justify any changes made to the original specification.

Learners also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal, learners should consider what else they need to know or be able to do and identify further training needs.

Links

Other units

This unit builds on the work learners did in *Unit 1: The Information Age* and *Unit 5: Web Development*.

Production of a multimedia product could be used as the focus for *Unit 8: Managing ICT Projects*.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers ideally with the following minimum specification (based on the Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024x768
 - sound output (16 bit soundcard, output through speakers/headphones)
 - sound input (microphone)
 - digital video camera
- printing facilities
- digital camera, scanner, tape recorder
- video camera (digital or webcam)
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - office software, eg Microsoft Office
 - web authoring, eg Macromedia Dreamweaver
 - graphics, eg Adobe Photoshop, CorelDraw, Macromedia Fireworks
 - animation, eg Macromedia Flash.
 - video editing software
 - sound editing software
 - image manipulation software.

Textbooks

Aho K (editor) – *Macromedia Studio MX Step-by-step* (Course Technology, 2005) ISBN 0619267097

Aho K (editor) – *Multimedia Projects* (Course Technology, 2002) ISBN 0619055146

Aho K et al – *Digital Design Curriculum Guide: Foundations of Web Design* (Course Technology, 2002) ISBN 0619055162

Chapman N and J – *Digital Multimedia, Third Edition* (John Wiley & Sons, 2009) ISBN 0470512164

Chasemore R – *Basic Paint Shop Pro 8* (Payne-Gallway, 2004) ISBN 1904467369

Elsom-Cook M – *Principles of Interactive Multimedia* (McGraw-Hill, 2001) ISBN 007709610X

Guy C and O'Byrne S – *Information and Communication Technology for Edexcel Applied A2: Single Award with CDROM* (Hodder Murray, 2006) ISBN 0340926511

Hart J – *The Art of the Storyboard, Second Edition* (Focal Press, 2007) ISBN 0240809602

Heathcote T – *Edexcel GCE In Applied ICT: AS Students' Book and CDROM* (Edexcel, 2006) ISBN 1903133815

Heller S and Drennan D – *The Digital Designer* (Watson-Guptill Publications, 1997) ISBN 0823013464

Mitra S – *Introduction to Multimedia Systems* (Academic Press, 2001) ISBN 0125004524

Popper F – *Art of the Electronic Age* (Thames & Hudson, 1997) ISBN 0500279187

Vaughan T – *Multimedia: Making It Work, Seventh Edition* (McGraw-Hill Osborne, 2007) ISBN 0072264519

Websites

Examples of multimedia products:

www.360degreevirtualtour.co.uk/new/article.php?id=109

www.360dof.com/360-virtual-tour-studio.htm

www.360spin.co.uk/demo/index_google.htm

Unit 11: Using Spreadsheet Software

Internally assessed

Introduction

In Unit 3 you used spreadsheet models to investigate alternatives and make decisions. You saw what a versatile and powerful decision making tool a spreadsheet can be. In this unit you will learn the skills and techniques needed to design and create technically complex spreadsheets yourself.

A decision based on flawed logic could have disastrous consequences! You will learn the importance of checking that any spreadsheets you create or use can be relied on to produce accurate information in all circumstances.

The 'garbage in, garbage out' maxim applies just as much to a spreadsheet as it does to any other data processing system. You will learn how to use data validation and other techniques to reduce the potential for data entry errors.

In order to get maximum return from any spreadsheets you create, you will learn how to incorporate 'future proofing' features which make it easier for you to implement modifications and extensions at a later date should you need to do so.

You will establish the functional requirements of the spreadsheet at the outset and carry out formative evaluation and testing throughout its development. You will learn the importance of seeking and making use of feedback from others to help you in your work.

Your work for this unit will culminate in the design, development and testing of a spreadsheet capable of analysing, interpreting and communicating complex data. You will need to work with a user to develop a set of user requirements that will enable you to demonstrate your competence.

The summative evaluation of your work for this unit will include a self-assessment of your current skill level and an indication of what else you need to know or be able to do in order to further enhance your ability to produce and use complex spreadsheets.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use advanced ICT skills on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the spreadsheet knowledge and skills you acquired in *Unit 3: The Knowledge Worker*.

What you need to learn

11.1 Spreadsheet applications

As you discovered in Unit 3, spreadsheets are used in all sorts of contexts for tasks involving the analysis and interpretation of complex numerical data, such as:

- modelling
- statistical analysis
- cost-benefit analysis
- simulation
- forecasting
- budgeting
- planning.

You will find it useful to begin your work for this unit by looking at and – if at all possible – getting hands-on experience of some real-world applications of spreadsheets. Whilst doing so, you should make a note of any good or less good design features you encounter and try to identify:

- the inputs into the system and the methods used to validate them
- the processing that takes place
- how information is presented.

11.2 Functional specification

You are very unlikely to produce a spreadsheet that completely fulfils all its objectives unless you are absolutely clear what these are.

You will learn the value of a functional specification, both in terms of explaining to others what it is you are aiming to achieve and helping to ensure that you never lose sight of your goals. You must be able to produce a functional specification at the outset, specifying:

- the context
- the nature of the problem
- the task(s) you want the spreadsheet to perform
- how you will judge the effectiveness of your solution.

The functional specification is not a static document. It is quite possible that once you begin work on a spreadsheet your understanding of what is required alters or becomes clearer.

You will learn the value of a functional specification, both in terms of explaining to others what it is you are aiming to achieve and helping to ensure that you never lose sight of your goals.

11.3 Spreadsheet design

Once you have a clear understanding of what it is you want to do, it is very tempting to rush to the computer immediately and start setting up the spreadsheet, without first spending time working on an initial design specification. This would be a mistake! Technically complex spreadsheets need to be planned carefully if they are to function correctly. Designing a solution involves making decisions about:

- processing
- the structure of the spreadsheet
- data entry and validation
- layout and presentation
- output
- future proofing
- testing.

There is almost certainly more than one way of meeting the requirements. You will need to experiment with alternative designs before finally deciding which one to choose.

The more expert you get at building spreadsheets the better you will be at producing detailed designs up front. However, at this stage you will probably find it easier to use an iterative approach to software development.

You will be familiar with this approach if you have studied *Unit 5: Web Development*. It involves producing a series of prototypes. Each prototype brings you that much closer to a final fully functional solution and helps clarify in your mind what it is you really want the product to do.

In this context, a prototype is a working, but incomplete, spreadsheet which can be used to:

- refine your initial design and try out alternatives
- test that the formulae are working properly and that the underpinning logic is correct
- check for ease of use
- test for robustness.

Prototyping enables you to interweave design, implementation and testing, rather than each of these being a distinct one-off stage of development.

11.4 Processing

When working on the design of your spreadsheet, you will need to consider what processing needs to happen and how this is to be achieved. There is a tendency to assume that the only processing a spreadsheet does involves calculations on data. This is not the case. You must learn that – in the context of spreadsheets – processing includes activities, such as:

- calculating
- merging data from different sources
- making comparisons
- sorting, grouping, filtering and pivoting data
- importing and exporting data.

11.5 Layout and presentation

A spreadsheet designed to handle complex data runs the risk of being very difficult to understand – even for the person who set it up. You must learn to make your spreadsheets as user friendly as possible by structuring the content appropriately and making effective use of available presentation and formatting features, such as:

- font size and style
- colours, borders and shading
- conditional formatting
- headers and footers
- graphics.

11.6 Data entry and validation

The output from a spreadsheet is only as good as the data that is entered. You must learn how to incorporate techniques for validating data input and trapping errors, such as:

- restricting data input to acceptable data values
- protecting cells by hiding and locking them
- using forms controls such as list boxes and drop-down menus to select data for entry
- automated data transfer from another sheet or application.

Ease of use is a key requirement for a spreadsheet, especially if other people besides you will be using it. You will learn how to design and create effective ways of entering data, including:

- using forms
- limiting the parts of a spreadsheet the user can change
- adding prompts or messages to remind users what needs entering where
- using buttons to initiate certain procedures.

11.7 Future proofing

It takes a long time to produce a fully functioning, complex spreadsheet. In order to get a reasonable return on the time and effort you have invested, you should aim to make your spreadsheets as ‘future proof’ as possible, so that they can easily be modified, extended or adapted to meet changing needs.

You must learn future proofing techniques, such as:

- allocating a specific area of the spreadsheet to store values which change frequently, eg the currency exchange rate, so that they can easily be updated without having to alter any of the formulae
- creating templates for frequently-used standard spreadsheet layouts
- documenting your spreadsheets by adding comments to explain their logic and any assumptions you have made
- locking and password protecting cells to prevent formulae being tampered with.

11.8 Presentation of results

The information output from a spreadsheet can be presented in a number of different ways on-screen, on paper, or exported to another application. You will learn how to present results in an appropriate, easy-to-read form by making use of presentation and formatting features, such as:

- page layout
- charts and graphs
- graphics
- animation
- colours, borders and shading.

11.9 Testing

Imagine the possible consequences if the spreadsheet used by a doctor to calculate the correct dosage of a drug has an undiscovered flaw in its logic! Even in situations less life threatening than this, if the output of a spreadsheet is going to be used as the basis for decision making it must be accurate and reliable.

One of the advantages of prototyping is that you can carry out formative testing as you develop your spreadsheets. However, you should also undertake summative testing when you think you have finished.

Summative testing involves asking questions, such as:

- does the solution meet all the requirements listed in the functional specification
- is the underlying logic of the spreadsheet correct
- do all the functions and formulae work correctly
- does the built-in validation prevent unacceptable data values from being entered
- can the spreadsheet cope with normal, extreme and abnormal data
- is the spreadsheet robust or can it be made to fail
- if appropriate, can other people use the spreadsheet without help.

It is essential to involve others in this process. You should also make use of any auditing tools available in the software you are using. Typically, such tools can identify errors in formulae and suggest corrections.

11.10 Documentation You may not be the only person who uses a spreadsheet you have produced. You will learn to create documentation for other end users providing information, such as:

- instructions on how to use the application
- examples of menus and data-entry forms
- the meaning of error messages that might appear
- troubleshooting strategies to try when things go wrong.

Your aim will be to provide enough information to enable other people to use the spreadsheet without assistance.

You will also learn how to produce technical documentation – such as formulae and functions used and test results – that is sufficiently detailed to enable another competent professional to fully understand how the spreadsheet works and be able to maintain and enhance it should you no longer be willing or able to do so.

11.11 Evaluation The starting point for an evaluation of any software development project is the functional specification which lists what the software has to do. The key question to answer is how well the spreadsheet solution meets the requirements.

Being able to assess your own performance on a project critically is also important. You must learn how to judge your performance in terms of what you did well and what you could have done better in order to determine your current level of competence, identify areas for improvement and further training needs.

11.12 ICT skills You must be able to use a range of spreadsheet tools and techniques for tasks, including:

- combining complex information and linking to other applications, eg exporting and importing data, linked objects
- organising data, eg linked sheets, look-up tables
- entering and editing data, eg absolute and relative cell referencing, inserting data into multiple cells simultaneously, using multiple worksheets
- formatting, eg conditional formatting, cell formats that match the data format
- using functions and formulae to solve complex problems, eg lookups, arguments, arrays, selection
- validating and checking data, eg using formulae to determine valid entries for cells
- analysing and interpreting data, eg pivot tables, data maps, adding messages to data
- presenting information, eg views, pivot table reports, different types of graphs and charts
- limiting access, eg hide and protect cells
- customising and automating, eg templates, macros, forms, menus.

11.13 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.

Assessment evidence

For this unit you will:

- design, produce, test and evaluate a solution to a complex problem involving the use of spreadsheet software.

Your eportfolio for this unit should include:

- (a) A functional specification that describes the problem and explains what the spreadsheet is required to do.
- (b) An initial design that:
 - satisfies the functional requirements
 - describes the data to be entered and the processing that is required
 - includes some measures to structure and validate data
 - uses functions and formulae to analyse complex data
 - considers screen layout and presentation, the user interface and presentation of results.

Plus evidence of your use of prototyping to improve and refine the design.

- (c) A fully-working spreadsheet solution that meets all the functional requirements, with supporting user and technical documentation.
 - (d) Evidence of formative and summative testing.
 - (e)* An evaluation assessing:
 - the spreadsheet solution
 - your own performance and current skill level.
 - *Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).
-

Assessment criteria – Unit 11 Using Spreadsheet Software

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 3)	<p>A functional specification that:</p> <ul style="list-style-type: none"> • briefly describes the problem • outlines what the spreadsheet must do, but not in sufficient detail to give a clear picture of what is required. <p>(0-2)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> • fully describes the problem • explains what the spreadsheet must do. <p>(3)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> • fully describes the problem • explains what the spreadsheet must do and specifies measurable success criteria. <p>(4)</p>	4

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO 1, 2, 3, 4)	<p>A design for a technically complex spreadsheet that:</p> <ul style="list-style-type: none"> • satisfies most of the functional requirements, but with little attempt at customisation or future proofing • briefly describes the data to be entered and the processing that is required • makes some attempt to structure and validate data • makes some appropriate use of functions and formulae to analyse complex data • gives some consideration to layout and presentation • has been developed and improved, making limited use of prototyping, with some explanatory comments at each stage. <p>(0-8)</p>	<p>A detailed design for a technically complex spreadsheet that:</p> <ul style="list-style-type: none"> • satisfies all of the functional requirements, with some attempt at customisation and future proofing • describes the data to be entered and the processing that is required • makes a good attempt to structure and validate data • makes good use of functions and formulae to analyse complex data • gives full consideration to layout, presentation and the user interface • has been developed and refined, making good use of prototyping, with some evaluative comments at each stage. <p>(9-12)</p>	<p>A comprehensive design for a technically complex spreadsheet that:</p> <ul style="list-style-type: none"> • satisfies all of the functional requirements and is fully customised including consideration of future proofing • fully describes the data to be entered and the processing that is required • makes a concerted attempt to structure and validate data • makes effective use of functions and formulae to analyse complex data • gives full consideration to layout, presentation and the user interface, demonstrating astute awareness of audience and purpose • has been developed and refined making effective use of prototyping, with evaluative comments at each stage showing how feedback was acted upon. <p>(13-16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3)	<p>A technically complex working spreadsheet – produced with some assistance – that:</p> <ul style="list-style-type: none"> meets most of the functional requirements makes appropriate use of some of the facilities of the software. <p>Plus outline documentation, providing some relevant information for other users and some technical information, giving some indication of how the solution works.</p> <p>Whilst working on the spreadsheet the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p>(0-9)</p>	<p>A technically complex fully working spreadsheet – produced with occasional prompting – that:</p> <ul style="list-style-type: none"> meets all the functional requirements makes good use of the facilities of the software. <p>Plus detailed documentation, providing relevant information for other users, and sufficient technical information to enable another competent professional to get an overview of how the spreadsheet works.</p> <p>Whilst working on the spreadsheet, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p>(10-14)</p>	<p>A technically complex, fully-working, efficient spreadsheet – produced independently – that:</p> <ul style="list-style-type: none"> meets all the functional requirements, communicates effectively and is easy to use makes full and effective use of the facilities of the software including automation of some common tasks.. <p>Plus comprehensive documentation, providing relevant information for other users, enabling them to use the spreadsheet without assistance, and sufficient technical information to enable another competent professional to understand how the spreadsheet works and be able to maintain it without assistance.</p> <p>Whilst working on the spreadsheet the learner adheres to relevant standard ways of working, independently.</p> <p>(15-18)</p>	18
(d) (AO 3, 4)	<p>Evidence of some limited formative and summative testing, but not sufficient to ensure that the underpinning logic is correct and that the spreadsheet works as intended under most normal conditions.</p> <p>(0-4)</p>	<p>Evidence of systematic formative and summative testing, sufficient to ensure that the underpinning logic is correct and that the spreadsheet works as intended under most normal conditions.</p> <p>(5-6)</p>	<p>Evidence of thorough and systematic formative and summative testing, involving others, sufficient to ensure that the underpinning logic is correct and that the spreadsheet works as intended under all normal conditions and can be used by others without assistance.</p> <p>(7-8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4) QWC (i-iii)	<p>Some evaluative comments assessing:</p> <ul style="list-style-type: none"> the extent to which the final spreadsheet meets the specified requirements, identifying any shortcomings the effectiveness of the solution their own performance throughout the project. <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p style="text-align: right;">(0-7)</p>	<p>A thoughtful evaluation assessing:</p> <ul style="list-style-type: none"> the extent to which the final spreadsheet meets the specified requirements, explaining any shortcomings the effectiveness of the solution, with some sensible suggestions for improvements their own performance throughout the project and current skill level. <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p style="text-align: right;">(8-11)</p>	<p>An well-rounded evaluation – incorporating feedback from others – critically assessing:</p> <ul style="list-style-type: none"> the extent to which the final spreadsheet meets the specified requirements, fully explaining any shortcomings the effectiveness of the solution, with some well-thought-out suggestions for enhancements their own performance throughout the project, current skill level and identifying areas for improvement. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p style="text-align: right;">(12-14)</p>	14
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

- Mark band 1
(0-2 marks)**
- To be eligible for mark band 1, learners must have made an attempt at describing the problem and outlining what is required of the spreadsheet solution. However, at this level the information is likely to be somewhat vague and incomplete.
- For full marks in this band, learners must have given enough information for the problem and requirements to be surmised – even if they are not explicitly stated.
- Mark band 2
(3 marks)**
- To be eligible for mark band 2, learners must have provided some background information and provided sufficient detail for the problem and requirements to be clear.
- Mark band 3
(4 marks)**
- To be eligible for mark band 3, learners must have produced a complete functional specification and specified measurable success criteria by which to judge the requirements.

Assessment evidence (b)

- Mark band 1
(0-8 marks)**
- To be eligible for mark band 1, learners must have produced outline design documentation for a technically complex spreadsheet that addresses most of the functional requirements. They must also have:
- identified most of the data to be entered and most of the processing requirements (although they are not expected to have given any details of how these will be achieved)
 - made some attempt to structure data, eg two worksheets with links between them and given some thought to data validation (although this is likely to be limited)
 - correctly used some formulae/functions to analyse complex data (although some aspects of the underpinning logic may be flawed)
 - given some thought to screen layout and presentation of results (although they are not expected to produce detailed storyboards up front).
- Learners must also have produced a prototype solution, but will not have made much use of it to identify and try out possible improvements.
- For full marks in this band, learners must have identified all the data to be entered, briefly described all the main processing requirements and given some thought to output. The underpinning logic of their spreadsheet must be sound. They must also have shown that they have made some improvements to the initial design as a result of prototyping, with some explanatory comments.

**Mark band 2
(9-12 marks)**

To be eligible for mark band 2, learners must have produced detailed design documentation for a technically complex spreadsheet that addresses all of the functional requirements and demonstrates some attempt at both customising the solution and future proofing. Learners must also have:

- described all of the data to be entered and the processing required, and given some thought to presenting the results
- structured the data with efficiency as a goal and included at least two sensible measures to validate data
- used formulae/functions to analyse complex data, based on correct logic
- designed appropriate layouts for screens, data-entry forms and output etc.

Learners must also have shown that they have made refinements to the initial design as a result of prototyping, with some evaluative comments.

For full marks in this band, learners must have thought about the user interface and included some features designed to make their spreadsheet solution easy to use. Learners must also have provided detailed comments evaluating each prototype in terms of how well it meets the specified requirements.

**Mark band 3
(13-16 marks)**

To be eligible for mark band 3, learners must have produced comprehensive design documentation for a technically complex spreadsheet that fully addresses all the functional requirements and is fully customised. It must include some future proofing features. Learners must also have:

- fully described the data to be entered and the processing that is required
- structured the data so as to avoid unnecessary duplication and maximise efficiency
- included a range of (at least four) appropriate measures to validate data and trap errors
- used formulae/functions to analyse complex data efficiently, based on correct logic
- designed appropriate layouts for screens, data-entry facilities, output etc, with ease of use and fitness for purpose in mind
- evaluated each prototype produced in terms of how well it meets the specified requirements.

For full marks in this band, learners must have produced a user interface with other users – besides themselves – in mind. It should provide some information for users and control what they can view and alter. Learners must also have involved others in evaluating prototypes and have shown clearly how feedback from test users was used to shape and refine the design.

Assessment evidence (c)

Mark band 1 (0-9 marks)

To be eligible for mark band 1, learners must have produced a working spreadsheet solution that is technically complex. They can have had some help/guidance to do so. The spreadsheet may not meet all of the requirements, but it must demonstrate some appropriate use of facilities of the software for common tasks such as entering data, organising and validating data, performing calculations and presenting information.

Whilst working on the spreadsheet, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, quality assurance, safe working.

For full marks in this band, the working solution must meet most of requirements.

Learners must have produced supporting documentation that gives some useful information for other users of the system together with an indication of some of the main technical aspects.

Mark band 2 (10-14 marks)

To be eligible for mark band 2, learners must have produced a fully working spreadsheet that is technically complex and meets all of the requirements of the functional specification. They may have needed occasional prompting to do so. The solution must make good use of the facilities of the software.

Whilst working on the spreadsheet, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have produced supporting documentation for other users, as well as sufficient technical information to give another competent professional a reasonable overview of the solution.

Mark band 3 (15-18 marks)

To be eligible for mark band 3, learners must have independently produced a fully-working solution that is technically complex and meets all of the requirements of the functional specification. The solution must make full and effective use of the facilities of the software and be easy to use.

Whilst working on the spreadsheet, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must have produced an efficient solution that includes some automation of common tasks. They must also have produced comprehensive documentation which would allow someone else to use the spreadsheet solution and another competent professional to fully understand how it works and be able to maintain it without assistance.

Assessment evidence (d)

Mark band 1 (0-4 marks)

To be eligible for mark band 1, learners must have carried out some testing of individual aspects of the solution, such as calculations, validation, data entry facilities etc, but they will have done little – if anything – to check that the underpinning logic is correct and that the solution as a whole works as intended.

For full marks in this band, learners must show evidence of a simple test for most of the main elements of the solution, demonstrating that it works in the manner intended.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must show evidence of a simple test for each of the main elements of the solution, demonstrating that it works in the manner intended. They must also have made some attempt to test the solution as a whole, including its underpinning logic.

For full marks in this band, learners' test plans/logs must demonstrate that they adopted a systematic approach to testing using a good range of data to test boundaries, normal and out of range data and illegal data.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners' test plans/logs must show that they adopted a thorough and systematic approach to testing and involved other people.

For full marks in this band, learners must have carried out sufficient testing and refinement to be confident that the solution as a whole works as intended in all anticipated circumstances, that the underpinning logic is correct and that other people can use it without assistance.

Assessment evidence (e)

**Mark band 1
(0-7 marks)**

To be eligible for mark band 1, learners must have made some meaningful evaluative comments about their solution, relating them to the requirements specified in the functional specification. They must also have made a sensible comment about their own performance.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have commented on the effectiveness of the solution.

**Mark band 2
(8-11 marks)**

To be eligible for mark band 2, learners must have produced a thoughtful evaluation of the final spreadsheet, identifying and offering some explanation for any shortcomings. They must have considered the effectiveness of the solution and made at least one suggestion for how it could be improved. They must also have assessed their own performance realistically.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have produced a considered evaluation, including a realistic assessment of their current skill level.

**Mark band 3
(12-14 marks)**

To be eligible for mark band 3, learners must have produced a well-rounded and critical evaluation of both the spreadsheet solution and made at least one suggestion for how it could be improved. They must also have assessed their own performance/skill level, drawing on feedback from others.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have identified some sensible ways of improving both the spreadsheet and their own performance current skill level.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to the learners and gives precise details of what they must do and what they must submit for assessment.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Most of the marks available for this unit are for practical, hands-on activities, involving the development of a spreadsheet product.

Learners will need to have access to fully featured spreadsheet software.

Vocational context

This unit has a user focus. It is not essential that learners undertake work experience. However, they will benefit from seeing and – ideally – gaining hands-on experience of a wide range of spreadsheet applications.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a functional specification
- an initial design
- selected prototypes showing how the spreadsheet was developed and refined
- the final version of the spreadsheet
- user and technical documentation
- evidence of formative and summative testing
- an evaluation of the spreadsheet solution and own performance/current skill level.

Teaching and learning strategies

Learners are required to design and produce a complex spreadsheet. It must have a clear purpose and be sufficiently complex in nature to challenge learners' expertise and encourage them to develop new skills and techniques in order to produce a fully-functional solution.

What constitutes a complex spreadsheet?

A complex spreadsheet is likely to include features, such as a start-up screen, multiple related sheets with macronavigation, validated forms controls for input, date functions, combination functions and formulae, statistical analysis functions and facilities, eg pivot tables and charts, scenarios and scenario summary reports.

Learners will need to develop and practise their spreadsheet skills before tackling the final spreadsheet project.

Functional specification

From either, preferably, an end-user client or, if necessary, a provided outline of a situation, learners must produce a detailed functional specification which defines the problem to be solved and establishes exactly what the final spreadsheet must do. The functional specification should also be able to and can be used as a yardstick to measure the success of the project.

If learners are to be given a project brief, it must provide sufficient scope for each of them to be able to demonstrate their ability to design and produce individual, and different, complex spreadsheets. A collection of small unrelated tasks would not be appropriate. Learners should put themselves in the role of end-user and create the spreadsheet for their own use to help them carry out their job.

It is important that learners realise that it may be necessary to revise the specification as the solution progresses. However, the original purpose must always be kept in mind.

Product development and testing

Evidence of how the spreadsheet develops must be submitted. This will include the initial design, prototypes at various stages and, of course, the finished product.

Managing prototypes and keeping evidence of feedback from users, and what changes will be made as a result, is a skill that learners will need to learn.

Testing is a vital part of the development process and should include testing of formulae, input facilities, data validation, formulae, protection etc. Learners should carry out formative testing throughout the development of the spreadsheet as well as thorough summative testing at the end. Records of testing need to be kept together with evidence of the results of the tests.

Evaluation

This should assess the extent to which the final spreadsheet meets the requirements identified in the functional specification. Learners should explain and justify any changes made to the original specification.

Learners also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal they should consider what else they need to know or be able to do and identify further training needs.

Links

This unit builds on the spreadsheet modelling skills developed in *Unit 3: The Knowledge Worker*.

Production of a complex spreadsheet model could be used as the focus for *Unit 8: Managing ICT Projects*.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computer ideally with the following minimum specification (based on the Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024 x 768
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- Windows XP operating system or equivalent
- software
 - spreadsheet, eg Microsoft Excel.

Textbooks

Edwards J S and Finlay P N – *Decision Making with Computers: The Spreadsheet and Beyond* (FT Prentice Hall, 1997) ISBN 0273621289

Heathcote P M – *Successful ICT Projects in Excel* (Payne-Gallway, 2002) ISBN 1903112710

Unit 12: Customising Applications

Internally assessed

Introduction

You already have considerable experience of using generic applications such as word processing, presentation, database and spreadsheet software. As you know, applications such as these provide a wealth of functionality – more than enough to meet most users' requirements. Nevertheless, there are occasions when the software just will not do exactly what you want.

In this unit you will learn how to use an event-driven programming language such as Visual Basic for Applications (VBA) to enhance the existing functionality of applications software, enabling you to create applications with more scope and flexibility than is possible using ready-made macros, forms etc.

Your work for this unit will culminate in the design, development and testing of a custom solution to a problem requiring the use of either database or spreadsheet software, with added functionality provided by an event-driven programming language.

The summative evaluation of your work for this unit will include a self-assessment of your current skill level and an indication of what else you need to know or be able to do in order to further enhance your competence.

This is a user-focused unit. The knowledge and skills developed in this unit are particularly relevant to those who use advanced ICT skills on a daily basis at work or at school/college for personal, social and work-related purposes.

Recommended prior learning

This unit builds on the knowledge and skills of software applications that you have acquired throughout the course. It is recommended that you study *Unit 7: Using Database Software* before starting this unit.

What you need to learn

12.1 Functional specification

Going beyond the built-in features of an application is not a step to be taken lightly! It can be a time-consuming activity and should be undertaken only if you are certain that the problem you have identified cannot be solved using the options already available in the software.

The first step, then, is to investigate the problem thoroughly and produce a functional specification, outlining:

- the context
- the nature of the problem
- what the custom solution is required to do
- how the success of the custom solution can be measured.

You will learn the value of a functional specification, both in terms of explaining to others what it is you are aiming to achieve and helping to ensure that you never lose sight of your goals.

12.2 The need to code

A decision to write your own code should not be taken lightly. You should first investigate ways of meeting the requirements using the built-in facilities offered by the applications software, such as macros, wizards and functions. Using a ready-made facility is almost always quicker than resorting to coding.

Nevertheless, having weighed up the alternatives, there are a number of reasons why you may decide that the best or – in some cases – the only way to solve the problem is to resort to coding. This might be to:

- extend the functionality of the software
- save time and effort by improving the performance and efficiency of an application
- provide enhanced security for sensitive information over and above the built-in security features provided by the applications software
- automate complex tasks
- add finesse to a solution
- facilitate data sharing between applications.

12.3 Objects, control properties and events

Adding functionality to an application such as a database or a spreadsheet involves designing and writing routines in an event-driven language. Event-driven languages like these are object oriented.

You will learn about objects, properties of objects and different types of objects, including:

- forms
- combo boxes
- buttons.

You will also learn about the events associated with objects.

12.4 Designing routines

You cannot simply launch into producing a custom solution to a problem without doing some spade work first. You need to spend a considerable amount of time working on a detailed design specification.

You will use data modelling techniques to organise and structure the data that will be used by the application, so as to avoid unnecessary data duplication and maximise efficiency. You will be expected to normalise data to third normal form where appropriate.

You will need to decide how many routines are required and what each will do. You will learn how to use structure diagrams and/or flow charts to produce detailed process specifications.

The more expert you get at writing programs the better you will be at producing detailed designs up front. However, at this stage you will probably find it easier to use an iterative approach to software development. This involves producing a series of prototypes. In this context, a prototype is a working, but incomplete, solution which can be used to:

- improve and refine your initial design and try out alternatives
- test that your routines are working properly and that the underpinning logic is correct
- check for ease of use
- test for robustness
- get feedback from others.

Prototyping enables you to interweave design, implementation and formative testing, rather than each of these being a distinct one-off stage of development. Each prototype you produce will bring you that much closer to a final fully-functional solution and will help clarify in your mind what it is you really want the software to do. You may find it necessary to make amendments to the functional specification as a result.

12.5 Programming structures

You should learn the characteristics and purposes of the following programming structures and know when and how to use them in:

- iteration
- while and until loops
- for.. next loops
- selection
- if ..then.. else
- case
- sub-programs
- sub routines
- functions
- parameter passing.

You will also learn when and how to use nested structures, such as loops within loops, selections within selections, loops within selections etc.

12.6 Human computer interface

Ease of use is a key requirement for any software solution, especially if other people besides you will be using it. You will learn how to create effective, user-friendly, data-entry forms.

In order to do so, you will need to know about aspects of form design, such as:

- properties of forms
- positioning of objects
- fields and labels.

You must learn how to incorporate into forms techniques for validating data input and trapping errors.

12.7 Programming and the database

You will learn how to write programming routines in conjunction with database software to carry out activities, such as:

- handling database objects and controls
- accessing tables
- modifying forms
- modifying reports
- validating/verifying data

searching tables and external files sequentially in order to locate and amend specific information.

12.8 Programming and the spreadsheet

You will learn how to write programming routines in conjunction with spreadsheet software to carry out activities, such as:

- handling spreadsheet objects
- manipulating a worksheet or a cell
- modifying charts and graphs
- searching worksheets and external files sequentially in order to locate and amend specific information.

12.9 Testing

One of the advantages of prototyping is that you can carry out formative testing as you develop your solution. Nevertheless, it is equally important to undertake summative testing when you think you have finished.

You will learn how to devise a test plan and produce test data to check that each routine works as intended and that the custom solution as a whole functions correctly under all conditions.

It is important to involve other people in the testing process, both to identify errors you may have overlooked and to ensure that the end product is easy to use.

12.10 Program documentation

You may not be the only person who uses a custom solution that you have produced. You will learn to create documentation for other end users, providing information, such as:

- instructions on how to use the application
- examples of menus and data-entry forms
- the meaning of error messages that might appear
- troubleshooting strategies to try when things go wrong.

Your aim will be to provide enough information to enable other people to use the software without assistance.

You will also provide technical documentation – including commented listings, clear process specifications and test results – that is sufficiently detailed to enable another competent professional to fully understand how the solution works and to be able to maintain and enhance it should you no longer be willing or able to do so.

12.11 Evaluation

The starting point for an evaluation of any software development project is the functional specification which describes what the solution has to do. The key question to ask yourself is to what extent the custom solution you have produced meets the stated requirements. You should also consider whether the use of coding was justified and whether the same functionality could have been achieved by using built-in features of the applications software.

Being able to assess your own performance on a project critically is also important. You must learn how to judge your performance in terms of what you did well and what you could have done better in order to determine your current level of competence and identify areas for improvement.

12.12 Programming skills

In order to produce efficient program code using an event-driven language you must be able to use a range of programming tools and techniques, including:

- constants, variables and arrays
- selection of appropriate types of loops (pre-condition, post-condition, fixed number of iterations)
- selection processes
- routines and functions
- parameter passing
- input/output.

12.13 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly

- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will:

- design, produce, test and evaluate a working solution to a problem involving the use of applications software enhanced by programmed events.

Your eportfolio for this unit should include:

- (a) A functional specification that describes the problem to be solved and explains what the custom solution is required to do.
- (b) An initial design that:
 - satisfies the functional requirements
 - uses appropriate data structures
 - responds appropriately to events
 - identifies the functions to be programmed, using diagrams to show the structure of each
 - considers form design.

Plus evidence of your use of prototyping to improve and refine the design.
- (c) A fully-working custom solution that meets all the functional requirements, with supporting user and technical documentation including full macro/code listings.
- (d) Evidence of formative and summative testing.
- (e)* An evaluation assessing:
 - the custom solution
 - your own performance and current skill level and identifying areas for improvement.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 12: Customising Applications

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 3)	<p>A functional specification that:</p> <ul style="list-style-type: none"> • briefly describes the problem • outlines what the custom solution must do, but not in sufficient detail to give a clear picture of what is required. <p>(0-2)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> • fully describes the problem • explains what the custom solution must do. <p>(3)</p>	<p>A functional specification that:</p> <ul style="list-style-type: none"> • fully describes the problem • explains what the custom solution must do and specifies measurable success criteria. <p>(4)</p>	4
(b) (AO 1, 2, 3, 4)	<p>A design for a custom solution that:</p> <ul style="list-style-type: none"> • satisfies most of the functional requirements • gives limited consideration to the need to structure data • responds appropriately to some events • identifies the functions to be programmed • gives limited consideration to some aspects of form design • has been developed and improved, making limited use of prototyping, with some explanatory comments at each stage. <p>(0-8)</p>	<p>A detailed design for a custom solution that:</p> <ul style="list-style-type: none"> • satisfies the majority of the functional requirements • gives some consideration to the need to structure data appropriately in order to control data duplication • responds appropriately to events • describes the functions to be programmed, using diagrams to give a breakdown of the structure of each • gives full consideration to most aspects of form design • has been developed and refined, making good use of prototyping, with some evaluative comments at each stage. <p>(9-12)</p>	<p>A comprehensive design for a custom solution that:</p> <ul style="list-style-type: none"> • satisfies all the functional requirements, with some ‘finesse’ • gives full consideration to the need to structure data appropriately in order to control data duplication and maximise efficiency • responds effectively to events • describes in detail the functions to be programmed, using diagrams to provide a detailed breakdown of the structure of each • gives full consideration to all aspects of form design • has been developed and refined making effective use of prototyping, with evaluative comments at each stage showing how feedback was acted upon. <p>(13-16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 3)	<p>A working custom solution – produced with some assistance – that:</p> <ul style="list-style-type: none"> meets most of the functional requirements demonstrates some appropriate use of programming structures. <p>Plus outline documentation, providing some relevant information for other users and some technical information, giving an indication of how the solution works.</p> <p>Whilst working on the custom solution the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(0-9)</p>	<p>A fully working custom solution – produced with occasional prompting – that:</p> <ul style="list-style-type: none"> meets the majority of the functional requirements demonstrates appropriate use of programming structures uses a sequential search to locate information. <p>Plus detailed documentation, providing relevant information for other users, and sufficient technical information to enable another competent professional to get an overview of how the solution works.</p> <p>Whilst working on the custom solution, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(10-14)</p>	<p>An efficient, fully working custom solution – produced independently – that:</p> <ul style="list-style-type: none"> meets all the functional requirements and is easy to use demonstrates effective use of programming structures, including some complex structures amends information located using a sequential search. <p>Plus comprehensive documentation, providing relevant information for other users, enabling them to use the application without assistance, and sufficient technical information to enable another competent professional to understand how the solution works and be able to maintain it without assistance.</p> <p>Whilst working on the custom solution, the learner adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(15-18)</p>	18
(d) (AO 3, 4)	<p>Evidence of some limited formative and summative testing, for each function identified in (b), but not sufficient to guarantee that the custom solution as a whole works as intended under most normal conditions.</p> <p style="text-align: right;">(0-4)</p>	<p>Evidence of systematic formative and summative testing sufficient to ensure that the custom solution as a whole works as intended under most normal conditions.</p> <p style="text-align: right;">(5-6)</p>	<p>Evidence of thorough and systematic formative and summative testing, involving others, sufficient to ensure that the custom solution works as intended under all normal conditions and can be used by others without assistance.</p> <p style="text-align: right;">(7-8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4) QWC (i-iii)	<p>Some evaluative comments assessing:</p> <ul style="list-style-type: none"> how well the final custom solution meets the specified requirements the effectiveness of the solution their own performance. <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p style="text-align: right;">(0-7)</p>	<p>An evaluation assessing:</p> <ul style="list-style-type: none"> how well the final custom solution meets the specified requirements, identifying any weaknesses the effectiveness of the solution, with some justification for the use of coding their own performance and current skill level. <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p style="text-align: right;">(8-11)</p>	<p>An evaluation – incorporating feedback from others – critically assessing:</p> <ul style="list-style-type: none"> how well the final custom solution meets the specified requirements, identifying any weaknesses and suggesting improvements the effectiveness of the solution, fully justifying the use of coding their own performance, current skill level and identifying areas for improvement. <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p style="text-align: right;">(12-14)</p>	14
			Total marks	60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-2 marks)

To be eligible for mark band 1, learners must have made an attempt at describing the problem and outlining what is required of the custom solution. However, at this level the information is likely to be somewhat vague and incomplete

For full marks in this band, learners must have given enough information for the problem and requirements to be surmised – even if they are not explicitly stated.

Mark band 2 (3 marks)

To be eligible for mark band 2, learners must have provided some background information and provided sufficient detail for the problem and requirements to be clear.

Mark band 3 (4 marks)

To be eligible for mark band 3, learners must have produced a complete functional specification and specified measurable success criteria for each requirement.

Assessment evidence (b)

Mark band 1 (0-8 marks)

To be eligible for mark band 1, learners must have produced outline design documentation for a custom solution that addresses most of the functional requirements and makes some appropriate use of coding to respond to events. They must also have:

- made some attempt to structure data, eg appropriate use of a 1-many relationship between two entities in a database or two worksheets in a spreadsheet with links between them
- listed all the functions to be programmed (although they are not expected to have given any details of how they will work)
- made some attempt to design input forms, eg using storyboards.

Learners must also have produced a prototype solution, but will not have made much use of it to identify and try out possible improvements.

For full marks in this band, learners must have briefly described each of the functions to be programmed and have shown that they have made some improvements to the initial design as a result of prototyping, with some explanatory comments.

**Mark band 2
(9-12 marks)**

To be eligible for mark band 2, learners must have produced detailed design documentation for a custom solution that addresses the majority of the functional requirements and makes appropriate use of coding to respond to events. They must also have:

- structured the data so as to avoid unnecessary duplication
- identified and described each of the functions to be programmed
- produced detailed designs for each form that is needed.

Learners must also have shown that they have made refinements to the initial design as a result of prototyping, with some evaluative comments.

For full marks in this band, learners must have used some diagrams to give an overview of how functions will work. They must also have provided detailed comments evaluating each prototype in terms of how well it meets the specified requirements.

**Mark band 3
(13-16 marks)**

To be eligible for mark band 3, learners must have produced comprehensive design documentation for a custom solution that fully addresses all of the functional requirements, and makes effective use of coding to respond to events. The design must show some finesse/elegance. Learners must also have:

- structured the data so as to avoid unnecessary duplication and maximise efficiency
- produced detailed designs for each of the functions to be programmed, using diagrams to give a complete breakdown
- produced detailed designs for each form that is needed that show sound awareness of key aspects of form design, eg ease of use, fitness for purpose, data validation and error trapping
- evaluated each prototype produced in terms of how well it meets the specified requirements.

For full marks in this band, learners must have produced detailed designs for each form that is needed that show sound awareness of all aspects of form design and have considered the needs of end users other than themselves. They must also have involved others in evaluating prototypes and have clearly shown how feedback from test users was used to shape and refine the final design.

Assessment evidence (c)

**Mark band 1
(0-9 marks)**

To be eligible for mark band 1, learners must have produced a working solution. They can have had some help/guidance to do so. The solution may not meet all of the functional requirements, but must use both iteration and selection.

Whilst working on the custom solution, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, quality assurance, safe working.

For full marks in this band, the working solution must meet most of the requirements. In addition, learners must have produced supporting documentation that gives some useful information for other users.

**Mark band 2
(10-14 marks)**

To be eligible for mark band 2, learners must have produced a fully working solution that meets the majority of the requirements of the functional specification. The solution must use different types of selection and iteration appropriately, as well as a sequential search.

Whilst working on the custom solution, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have used some complex programming structures and produced supporting documentation for other users, as well as sufficient technical information to give another competent professional a reasonable overview of the solution.

**Mark band 3
(15-18 marks)**

To be eligible for mark band 3, learners must have independently produced a fully working solution that meets all of the requirements of the functional specification and is easy to use. The solution must use some complex program structures and amend information located using a sequential search.

Whilst working on the custom solution, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must produce comprehensive documentation which would allow someone else to use the custom solution and another competent professional to fully understand how it works and be able to maintain it without assistance.

Assessment evidence (d)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have carried out some testing of most of the functions identified in (b), but they will have done little – if anything – to check that the solution as a whole works as intended.

For full marks in this band, learners must show evidence of a simple test for each function, demonstrating that it works in the manner intended.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must show evidence of a simple test for each function, demonstrating that it works in the manner intended. They must also have made some attempt to test the solution as a whole.

For full marks in this band, learners' test plans/logs must demonstrate that they adopted a systematic approach to testing the major functions of the application, using a good range of data to test boundaries, normal and out of range data and illegal data.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners' test plans/logs must show that they adopted a thorough and systematic approach to testing and involved other people.

For full marks in this band, learners must have carried out sufficient testing and refinement to be confident that the solution as a whole works as intended in all anticipated circumstances and that other people can use it without assistance.

Assessment evidence (e)

Mark band 1 (0-7 marks)

To be eligible for mark band 1, learners must have made some relevant evaluative comments about their custom solution, relating them to the requirements specified in the functional specification. They must also have made a sensible comment about their own performance.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have commented on the effectiveness of their coding and reach some conclusion about whether or not the use of coding was the best way to meet the requirements.

Mark band 2 (8-11 marks)

To be eligible for mark band 2, learners must have produced a well-rounded evaluation, identifying both strengths and weaknesses of the custom solution and their own performance/skill level.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have considered alternative solutions and justified the use of coding.

Mark band 3 (12-14 marks)

To be eligible for mark band 3, learners must have produced a well-informed and critical evaluation, drawing on feedback from others.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have fully justified the use of coding and identified some sensible ways of improving both the custom solution and their own performance.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Recommended prior learning

This unit focuses on extending the functionality of database or spreadsheet software. Learners will only be in a position to know when this is necessary and appropriate if they have a thorough understanding of the scope and limitations of these applications. *Units 2 and 3* will have given them an overview of the software. However, they will need to know more than this if they are to tackle this unit effectively. Learners will find it advantageous to study Unit 7 beforehand, since it will give them the necessary in-depth knowledge of database software. Double Award learners, who want to focus on producing custom solutions using spreadsheets, would be well advised to study Unit 11 first.

Assessment requirements

The *Assessment evidence* section is addressed to learners and gives precise details of what they must do.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Most of the marks available for this unit are for practical, hands-on activities, involving the development of a custom solution.

Learners will need to be taught basic programming techniques and the fundamentals of event-driven programming. They will also need to be shown the interface between programmed events and the host application, for example using VBA within Access or Excel.

This unit has been included for those learners taking the Advanced Level GCE (Single Award) who want to develop some programming skills in order to enhance the functionality of existing applications software. It has an end-user focus. Unit 14, on the other hand – which is available only to learners taking the Advanced Level GCE (Double Award) – teaches learners how to develop whole programs from scratch in the context of producing software for others to use.

Vocational context

This unit has a user focus. It is not essential that learners undertake work experience. However, they will benefit from seeing and – ideally – gaining hands-on experience of a wide range of custom solutions.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

A detailed technical specification for eportfolios for this qualification will be published on the Edexcel website.

The following evidence should appear in the eportfolio for this unit:

- a functional specification
- an initial design, plus selected prototypes, with evaluative comments
- the final version of the customised solution
- user and technical documentation including full code/macro listings
- evidence of formative and summative testing
- an evaluation of the solution and own performance/current skill level.

Teaching and learning strategies

Learners need to develop their programming skills along with their application skills and should be provided with a number of problems for which a custom solution might be appropriate, eg situations where the host application does not provide a solution, or if it does the solution is 'messy'.

Examples of suitable problems

- A database will not let you delete a record which has related records in other tables. Coding will allow you to link related records to other masters. For instance if a sales executive leaves you may wish to assign their customers to other sales staff before you delete their record.
- Clicking a command button to subtract one from a stock held value in a stock control system is a lot easier than typing the new value in!
- A job requires that applicants must have some attributes or qualifications and should ideally have others. Using routines in conjunction with database software, you could list the applicants in order of their suitability.
- If you were in charge of a company car database you may wish, on the first Monday of each month, to send letters to those who need to replace their cars, those whose cars are due for a service and those who haven't returned their expenses yet. Using coding, you could check the day and date when the system starts up and automatically produce the letters if it is Monday and the day of the month is less than seven.

- You may wish to access a database from a spreadsheet. If, for example, an accountant wants to use data from a stock control database the chances are it will not be in exactly the format they need. Coding will help.

Learners must realise that resorting to coding is a last resort. Wherever possible built-in features such as macros or functions should be used to provide the required functionality.

Learners should be encouraged to follow a structured systems development process, involving investigation and analysis of the problem, design and implementation of the solution. They should be shown structure diagram techniques to plan their routines.

Functional specification

From an outline of a situation which will be provided, learners must produce a functional specification which defines the problem to be solved and establishes exactly what the final custom solution must do. The functional specification should be able to be used as a yardstick to measure the success of the project.

If learners are given a project brief it must provide sufficient scope for each of them to be able to demonstrate their individual programming ability to the full. It must allow them to show their mastery of iteration and selection routines, as well as their ability to search and amend data. It must be a requirement that learners normalise/classify data, eg requiring related tables or linked sheets. A collection of small unrelated tasks would not be appropriate.

Learners are not expected to tackle projects requiring both spreadsheet and database programming as part of their solution.

Learners should put themselves in the role of end user and should customise the application first and foremost for their own use to help them carry out their job. However, the outline should make clear that other users may need to use the software and that someone else may eventually take over its maintenance.

Product development and testing

Evidence of how the custom solution develops must be submitted. This will include the initial design, prototypes at various stages and, of course, the finished product.

Managing prototypes and keeping evidence of feedback from users, and what changes will be made as a result, is a skill that learners will need to learn.

Learners need to understand the importance of testing both individual components of the system and the system as a whole. They should test the system using legal and illegal data and extremes of data.

User and technical documentation must be provided. It should be detailed enough to enable another user to use the software and another competent professional to understand the solution and be able to maintain it.

Evaluation

Learners need to determine how well the custom solution meets the requirements identified in the functional specification. They should identify, explain and justify any changes made to the original specification. They should be encouraged to assess the effectiveness of the coding and to justify the use of coding rather than some alternative method of solving the problem.

Learners also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal they should consider what else they need to know or be able to do and identify further training needs.

Links

Other units

Learners who take this unit must have a good grasp of applications software, particularly databases and spreadsheets. *Unit 2: The Digital Economy* and *Unit 7: Using Database Software* provides the necessary grounding in DBMS application software. *Unit 3: The Knowledge Worker* provides an introduction to spreadsheet software. Learners taking the Advanced Level Double Award might also wish to study *Unit 11: Using Spreadsheet Software*. There are also close links between this unit and *Unit 14: Programming*, which focuses on the production of entirely bespoke solutions rather than the hybrid approach adopted here.

Production of a custom solution could be used as the focus for *Unit 8: Managing ICT Projects*.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Equipment

Learners will need access to:

- desktop/laptop computers ideally with the following minimum specification (Becta workstation specification 2/10/03):
 - 256 MB memory
 - 1.7Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - UK keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024 x 768
 - sound output (16 bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- Windows XP operating system or equivalent
- software
 - spreadsheet, eg Microsoft Excel
 - database, eg Microsoft Access.

Textbooks

Aitkin P – *Office XP Development with Visual Basic for Applications* (Prentice Hall, 2001) ISBN 0130654175

Bullen S – *Excel 2002 VBA Programmer's Reference* (John Wiley & Sons Limited, 2003) ISBN 0764543717

Cardoza P – *Access 2003 VBA Programmer's Reference* (John Wiley & Sons, 2004) ISBN 0764559036

Day A and Heathcote P M – *Tackling Computer Projects in Access with VBA* (Payne-Gallway, 200) ISBN 1904467539

Edwards J S and Finlay P N – *Decision Making with Computers: The Spreadsheet and Beyond* (FT Prentice Hall, 1997) ISBN 0273621289

Gosnell D – *Beginning Access 2003 VBA* (John Wiley & Sons, 2004) ISBN 0764556592

Heathcote P M – *Successful IT Projects in Excel* (Payne-Gallway, 2002) ISBN 1903112710

Jackson M and Staunton M – *Advanced Modelling in Finance Using Excel and VBA* (John Wiley & Sons, 2001) ISBN 0471499226

Shepherd R – *Excel VBA Macro Programming* (McGraw Hill Osborne, 2004) ISBN 0072231440

Vine M – *Microsoft Access VBA Programming for the Absolute Beginner* (Delmar, 2007) ISBN 1598633937

Unit 13: Web Management

Internally assessed

Introduction

The work of the ICT practitioner does not stop with the official handover of a website to a client. If it is to be successful, an organisation's website needs to be properly managed and kept up to date and interesting. In this unit you will learn what is involved in managing and monitoring the performance of a site once it has been published on the web and is accessible to a wide audience.

You will investigate different types of web hosts and the services they offer and learn how to upload website files to a web server.

There is no point in having a website if no one can find it. Most people use search engines to find information they need on the web. You will learn how to optimise a site for search engines and will explore other techniques that can be used to attract visitors to a site and keep them coming back.

In Unit 5, you developed a static 'brochure' website for a business client. In this unit you may wish to continue working on this site to improve its functionality by adding an e-marketing upgrade. Once the site is published, you will carry out and document routine maintenance activities and site reviews. You will monitor and assess site performance using statistics and user feedback.

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

This unit builds on the knowledge and skills you have acquired in *Unit 2: The Digital Economy*. You should have completed *Unit 5: Web Development* before attempting this unit.

What you need to learn

13.1 Web hosting

Once a website has been approved by the client, it can be published on the web for the whole world to see. In order for a site to be accessible on the web, it must be hosted on a web server. The function of a web server is to store the files making up a website and deliver them on request to web browsers.

A large number of companies offer web hosting services. You need to be able to select the most appropriate package for a particular client by weighing up factors, such as:

- amount of space provided
- number of email accounts provided
- performance (availability, access speeds, backup)
- log analysis tools provided
- support for PHP and MySQL
- security features
- customer support
- additional services.

Every web page has a unique address known as the Uniform Resource Locator (URL). The domain name within the URL is the name of the website.

You will learn how to use file transfer protocol (FTP) software to upload files to and download files from a remote web server. You will learn about different options, including:

- stand-alone FTP packages
- web-based FTP facilities
- web browser FTP capabilities
- uploading directly from web authoring packages.

13.2 Promoting a website

There is little point spending time and money creating a website that nobody visits! One of the key functions of web management is to ensure that a site has as many 'hits' as possible. This involves getting into the rankings of top search engines such as Google and Yahoo. As well as finding out how to do this, you will learn techniques to optimise websites for search engines, including:

- inserting title, description and keyword tags into the html code
- inserting 'invisible text' – keywords the same colour as the background
- using 'crawler friendly' features such as CSS mouse roll-overs and drop-down menus that do not prevent search engine spiders finding information on a site.

You will also learn about other ways of marketing a website, including:

- advertising on search engine sites which offer banner or pay-per-click adverts, such as Google's Adwords system
- finding and exchanging links with related websites
- cross-marketing using traditional media, eg letterheads, brochures, magazines and company vehicles.

13.3 Site maintenance

Keeping a website up to date and functioning effectively on the web, day and night, 24 x 7 is the responsibility of the web manager. You need to know what this entails. You will gain practical experience of some essential site maintenance tasks, including:

- updating and managing content
- maintaining site integrity
- repairing broken links
- checking external links
- monitoring performance
- implementing upgrades.

You will learn the importance of keeping an ongoing record of any changes that are made to a site in a site history and of maintaining an accurate, up-to-date site map.

In addition to routine maintenance, a web manager must also carry out regular reviews of a site to check that it complies with current legal requirements, covering:

- accessibility
- data protection
- privacy and electronic communications.

You must be aware of relevant legislation so as to be able to give advice on matters relating to compliance. You will also be expected to conduct accessibility and standard reviews of websites.

13.4 Site performance

One of the tasks of the website manager is to monitor site performance – sites that take too long to load are never going to be popular. You need to identify factors which affect performance, such as:

- site structure
- size and type of graphics
- inclusion of add-on features.

You will learn to judge between the extra functionality these features offer and the effect they may have on performance.

You will also learn how to monitor the popularity of a site, including:

- how many hits it receives
- which pages are viewed most often
- who is visiting and how long they stay on the site
- what visitors think of the site.

There are a number of tools available to help with this task, including:

- hit counters
- guest books/forums
- statistics services.

You will learn how to analyse information on site performance and use it to make informed recommendations for future improvements.

13.5 E-marketing

A website is not a static entity. Sooner or later, additional features will be required.

The website you built in Unit 5 had only limited functionality. In this unit you will be expected to plan, design, implement and test an upgrade which will enable information about visitors to the site to be gathered and used for e-marketing purposes.

You will investigate different methods of achieving this, such as:

- off-the-shelf email publishing software that integrates into a website
- creating a data entry form on the site linked to a database or an email response facility
- setting up a free user group.

You will also need to consider ways in which visitors can be persuaded to use this feature:

- what incentive is there for them to divulge information about themselves
- how easy is it for them to do so.

Gathering visitor information is only the first step. You will be expected to demonstrate how it can be used effectively for emarketing purposes, such as mailshots and promotions, whether electronic or paper based.

It is imperative that the additional functionality provided by such an upgrade complies with relevant legislation.

13.6 Web forms

Getting visitors to fill in forms is an efficient way of receiving feedback about the site and gathering e-marketing information.

You will learn how to design and create forms using form objects, such as:

- check boxes
- radio buttons
- drop-down menus
- text fields.

A form is only an interface. It works in conjunction with a form handler which does something useful with the data it collects. You will learn how to link forms to form handlers using a standards script, such as:

- form-to-email
- form to database
- form to text file.

13.7 ICT skills

In order to successfully manage and maintain websites you must be able to use ICT tools and techniques to carry out tasks, such as:

- uploading files to and downloading files from a web server
- updating web pages
- testing the accessibility of a website
- monitoring website performance
- checking for and repairing broken links
- optimising a website for search engines
- analysing visitor statistics
- creating forms to capture visitor information from a website
- producing targeted mailshots using information collected from a website.

13.8 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.

Assessment evidence

For this unit you will:

- investigate the services offered by web hosting companies and select an appropriate provider/package to host the updated site; upload the site to a web server and test its functionality (Assessment evidence a)
- investigate measures that can be taken to maximise the number of visitors to the site and implement at least two of them (Assessment evidence b)
- select, design, implement and test an appropriate method of collecting visitor information for e-marketing purposes from the website (Assessment evidence c)
- carry out routine site maintenance activities over a period of time and conduct a review of accessibility and compliance with current legal requirements (Assessment evidence d)
- evaluate the current performance of the website and your own performance as a web manager (Assessment evidence e).

Your eportfolio for this unit should include:

- (a) A report for the client explaining the need for a web hosting service, justifying your choice of supplier and describing the services it provides to meet the client needs.
Evidence that you have uploaded the site to a web server and tested it thoroughly to ensure full functionality.
- (b) Notes describing and evaluating at least five measures that can be taken to attract visitors to the site.
Evidence that you have successfully implemented at least two of them, plus an evaluation of their effectiveness.
- (c) Notes describing and justifying your chosen method of capturing visitor information for e-marketing purposes from the website.
Evidence that you have designed, implemented and tested your chosen solution online.
- (d) Technical documentation providing information about the website, including a copy of the final site, an assessment of its accessibility and compliance with current legal requirements and a description of important hidden coded features, such as CSS rollovers, form response code etc.
- (e)* An evaluation assessing
 - the current performance of the site, with a suggestion for improving performance, together with details of how this can be achieved
 - the strengths and weaknesses of your own performance, identifying areas for improvement.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 13: Web Management

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 1, 2, 4)	<p>A report:</p> <ul style="list-style-type: none"> outlining the need for a web hosting service giving a brief description of the services provided by the chosen supplier. <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> uploaded website files to a web server, with some assistance carried out some testing, though not sufficient to ensure that the site is fully functional. <p>(0-6)</p>	<p>A report for the client:</p> <ul style="list-style-type: none"> explaining the need for a web hosting service justifying the choice of provider against the client's needs. <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> uploaded website files to a web server carried out sufficient online testing to ensure that the site functions as intended. <p>(7-9)</p>	<p>A report for the client:</p> <ul style="list-style-type: none"> clearly explaining the need for a web hosting service fully justifying the choice of provider against the client's needs. <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> uploaded files to a web server carried out thorough online testing to ensure that the site functions as intended and is easy for someone else to use. <p>(10-12)</p>	12
(b) (AO 1, 3, 4)	<p>Notes outlining at least five measures that could be taken to maximise the number of visitors to the website.</p> <p>Plus evidence showing that the learner implemented at least two of them, with some comments about their possible effectiveness.</p> <p>(0-5)</p>	<p>Notes describing at least five measures that could be taken to maximise the number of visitors to the website.</p> <p>Plus evidence showing that the learner implemented at least two of them, with some assessment of their effectiveness.</p> <p>(6-8)</p>	<p>Notes evaluating at least five measures that could be taken to maximise the number of visitors to the website.</p> <p>Plus evidence showing that the learner implemented at least two of them, with a critical assessment of their effectiveness.</p> <p>(9-10)</p>	10

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 1, 2, 3, 4)	<p>Notes outlining the chosen method of capturing visitor information and its use for e-marketing purposes, identifying possible legal considerations.</p> <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> implemented the chosen solution carried out some limited testing. <p>(0-8)</p>	<p>Notes describing the chosen method of capturing visitor information and its use for e-marketing purposes, identifying legal considerations.</p> <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> designed and implemented the chosen solution carried out sufficient testing to be satisfied that it functions as intended. <p>(9-12)</p>	<p>Notes justifying the chosen method of capturing visitor information and its use for e-marketing purposes, identifying legal considerations.</p> <p>Plus evidence showing that the learner:</p> <ul style="list-style-type: none"> designed and implemented the chosen solution carried out thorough testing to be satisfied that it functions as intended and is easy for someone to use. <p>(13-16)</p>	16
(d) (AO 1, 3)	<p>Technical documentation providing some useful information about the site, including the final site and a brief assessment of its accessibility and compliance with current legal requirements.</p> <p>Plus evidence to show that the learner updated and managed content and carried out occasional routine site maintenance over a minimum period of 8 weeks.</p> <p>Whilst managing the website, the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p>(0-7)</p>	<p>Technical documentation providing detailed information about the site, including the final site and an in-depth assessment of its accessibility and compliance with current legal requirements.</p> <p>Plus evidence to show that the learner updated and managed content and carried out regular routine site maintenance over a minimum period of 8 weeks.</p> <p>Whilst managing the website, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p>(8-11)</p>	<p>Technical documentation providing comprehensive information about the site, including the final site and a critical, in-depth assessment of its accessibility and compliance with current legal requirements.</p> <p>Plus evidence to show that the learner updated and managed content, monitored performance and carried out regular routine site maintenance over a minimum period of 8 weeks.</p> <p>Whilst managing the website, the learner adheres to relevant standard ways of working, independently.</p> <p>(12-14)</p>	14

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 3, 4) QWC (i-iii)	<p>Evaluative comments:</p> <ul style="list-style-type: none"> assessing the current performance of the website suggesting one way of enhancing performance, with an indication of how this can be achieved. <p>Plus some sensible comments about own performance as a web manager.</p> <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p style="text-align: right;">(0-4)</p>	<p>An evaluation, making some use of site statistics:</p> <ul style="list-style-type: none"> assessing the current performance of the website suggesting one way of enhancing performance, with a explanation of how this can be achieved. <p>Plus an assessment of the strengths and weaknesses of own performance as a web manager.</p> <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p style="text-align: right;">(5-6)</p>	<p>A critical evaluation, making full use of site statistics:</p> <ul style="list-style-type: none"> assessing the current performance of the website suggesting one way of improving performance, with a detailed explanation of how this can be achieved. <p>Plus an assessment of the strengths and weaknesses of own performance as a web manager, identifying areas for improvement.</p> <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p style="text-align: right;">(7-8)</p>	8
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-6 marks)

To be eligible for mark band 1, learners must produce a report explaining the need for a web hosting service, identifying the choice of provider with an outline of services provided and including evidence of website files once uploaded.

For full marks in this band, learners must include evidence of some testing to check the functionality of the website once uploaded.

Mark band 2 (7-9 marks)

To be eligible for mark band 2, learners must have produced a report for the client explaining the need for a web hosting service, identifying the choice of provider with a description of services provided and including evidence of the process by which the files were uploaded and of some testing once the site is uploaded.

For full marks in this band, learners must justify their choice of web hosting service against the client's needs and have carried out sufficient online testing to ensure the site functions as intended.

Mark band 3 (10-12 marks)

To be eligible for mark band 3, learners must have produced a report for the client explaining the need for a web hosting service, fully justifying the choice of provider against the client's needs, with a description of services provided and including evidence of the process by which the files were uploaded and of thorough online testing to ensure that the site functions as intended.

For full marks in this band, learners must include evidence of thorough testing for both functionality and ease of use.

Assessment evidence (b)

Mark band 1 (0-5 marks)

To be eligible for mark band 1, learners must have produced notes outlining at least five measures that can be taken to maximise the number of visitors to the website, and provided evidence of the implementation of at least two of them.

For full marks in this band, learners must have commented on the possible effectiveness of each of the measures implemented.

Mark band 2 (6-8 marks)

To be eligible for mark band 2, learners must have described five measures that could be taken to maximise the number of visitors to the website and provided evidence of the implementation of two of them, commenting on their possible effectiveness.

For full marks in this band, learners must have assessed the effectiveness of each measure during implementation.

Mark band 3 (9-10 marks)

To be eligible for mark band 3, learners must have described and evaluated five measures that could be taken to maximise the number of visitors to the website and provided evidence of the successful implementation of at least two of them, with some assessment of their effectiveness during implementation.

For full marks in this band, learners must have critically assessed the effectiveness of each measure.

Assessment evidence (c)

Mark band 1 (0-8 marks)

To be eligible for mark band 1, learners must have given an outline of the chosen method of capturing customer data and its use for e-marketing purposes and have implemented it.

For full marks in this band, learners must have carried out some summative testing and identified possible legal considerations.

Mark band 2 (9-12 marks)

To be eligible for mark band 2, learners must have described the chosen method of capturing customer data and its use for e-marketing purposes, and have provided evidence of the design, implementation and testing of the chosen method, and identified possible legal considerations.

For full marks in this band, the solution must function as intended, be fit for purpose and comply with some of the legal requirements identified.

Mark band 3 (13-16 marks)

To be eligible for mark band 3, learners must have described and justified the chosen method of capturing customer data and its use for e-marketing purposes and have designed, implemented and thoroughly tested a solution that is fit for purpose and complies with legal requirements.

For full marks in this band, learners must have tested the solution for ease of use, probably by means of user feedback.

Assessment evidence (d)

Mark band 1 (0-7 marks)

To be eligible for mark band 1, learners must have produced some technical documentation – including the final website, a site map and history – demonstrating management of the website over a minimum period of 8 weeks. They must also have made some attempt to assess the site's accessibility and compliance with current legal requirements.

Whilst managing the website, learners will have needed frequent reminders to adhere to relevant standard ways of working, eg file management, copyright, acknowledgement of sources.

For full marks in this band, learners must have documented every update to the site and produced a brief assessment of its accessibility and compliance with current legal requirements.

Mark band 2 (8-11 marks)

To be eligible for mark band 2, learners must have produced detailed technical documentation demonstrating management of the website over a minimum of 8 weeks – with all updates fully documented. They must also have conducted an in-depth assessment of the site's accessibility and compliance with current legal requirements.

Whilst managing the website, learners will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, learners must have used tools to review accessibility.

**Mark band 3
(12-14 marks)**

To be eligible for mark band 3, learners must have produced comprehensive technical documentation, demonstrating effective management of the website over a minimum of 8 weeks, including ongoing testing and monitoring of site performance. They must also have used accessibility tools to conduct accessibility reviews and made sure that the site complies with legal requirements.

Whilst managing the website, learners will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. They will have adhered to them without being reminded.

For full marks in this band, learners must have taken steps to improve the web site to ensure that the site conforms to accessibility requirements.

Assessment evidence (e)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have produced some relevant evaluative comments about the performance of the site and suggested one way that it could be improved. They must also have made a sensible comment about their own performance as a web manager.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, learners must have given a clear indication of how the suggested improvement in site performance could be achieved.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must have produced a well-rounded evaluation, assessing the performance of the site, suggesting one way of improving its performance and explaining how this can be achieved. They must also have assessed the strengths and weaknesses of their own performance as a web manager.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, learners must have used site statistics to measure the performance of the site and identify areas for improvement

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must have critically evaluated both the performance of the site – using site statistics – and their own performance as a web manager. They must have suggested a way of improving site performance and fully explained how this can be achieved.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, learners must have identified some sensible ways of improving their own performance.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to the learners and gives precise details of what they must do.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Two thirds of the marks available for this unit are for practical, hands-on activities related to the management and upgrading of the website.

Learners will need to use web authoring software for this task.

Vocational context

This unit has a practitioner focus. Ideally, learners should be given an opportunity to see firsthand the work of a web master managing a large site.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft Internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for onscreen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

The following evidence should appear in the eportfolio for this unit:

- a report explaining the need for a web hosting service etc
- evidence of uploading the site to a web server and of testing that the site functions as intended
- notes describing/evaluating measures that can be taken to attract visitors to the site, plus evidence of the implementation of two of them
- notes describing/justifying the chosen method of capturing visitor information for e-marketing purposes, plus evidence of design, implementation and testing of the chosen solution
- technical documentation, including a copy of the final site, demonstrating site maintenance over a period of time, plus an assessment of the site's accessibility and compliance with legal requirements.
- an evaluation of the site's performance and own performance.

Teaching and learning strategies

This unit builds on the work learners did in *Unit 5: Web Development*. Learners may decide to work with the website they developed in that unit or design and implement a completely different website.

Web hosting

Although, ideally, learners should have the opportunity to use a web host to publish the website on the web, it may be more practical for them to put their site on an internal web server. However, techniques implemented to promote the site must reflect this restricted audience.

Site history

A tabular format, including date, action taken and a screen shot of the change, is ideal for this purpose.

Accessibility review

An accessibility review should consider aspects, such as:

- Do all images have alt tags?
- Is there a 'text only' version and how is it implemented (preferably through css)?
- Is there a mechanism for people with poor/restricted eyesight etc?
- How will the site material react to a text to speech reader?

Learners should be encouraged to use accessibility tools such as W3C, The Wave, Bobby and Cynthia Says to expose inaccessible parts of their site.

Site performance

Recommendations for improving the site could include placement of graphics in an images folder with a common path from all parts of the site to maximise buffering; reuse of graphics to maximise buffering, eg replacement of image-based menus based on JavaScript/VB Script with css based menus.

Learners should also analyse how well the site works and how it can be improved with different browsers (Mozilla, NN7, Opera, IE6 etc).

E-marketing upgrade

The upgrade to the site learners carry out in this unit follows on from the work they did in Unit 5 where they were asked to propose ways of enhancing the functionality of the site.

There are a number of ways of implementing this upgrade and learners aiming to achieve high marks will produce a good user interface and come up with innovative ideas for encouraging customers to use the facility.

One solution might be to store details in a database and use mail merge facilities to produce a targeted mailshot.

Links

Other units

This unit builds on the work learners did in *Unit 5: Web Development*.

Skills Framework for the Information Age, (SFIA), October 2003

The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:

Strategy and planning

- Business/IS strategy and planning – business process improvement

Development and implementation

- Systems development – business analysis
 - Systems development – systems design
 - Systems development – programming/software development
 - Systems development – systems testing
 - Human factors – media creation
-

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

- Textbooks**
- Austin B – *Web Page Design, Third Revised Edition* (Computer Step, 2003) ISBN 1840782536
 - Heathcote R S U – *Successful ICT Projects in FrontPage 2000* (Payne-Gallway, 2005) ISBN 1903112281
 - Smith – *Get into Bed with Google* (Infinite Ideas Limited, 2008) ISBN 1905940491
 - Warner J – *Dreamweaver CS3 for Dummies* (John Wiley & Sons, 2007) ISBN 0470114908
 - Williams R and Tollett J – *The Non-Designer's Web Book, Third Edition* (Peachpit Press, 2005) ISBN 0321303377
 - Zeldman J – *Designing with Web Standards* (Peachpit Press, 2006) ISBN 0321385551
- Software**
- Gonzalez J – Training CD – *Macromedia Dreamweaver 8* (VTC, 2005) ASIN B000EHP356
- Websites**
- www.cynthiasays.com – online accessibility tool
 - www.grantasticdesigns.com/tips.html – design tips
 - www.w3.org/WAI – accessibility guidelines
 - wave.webaim.org – online accessibility tool
 - www.webpagethatsuck.com – examples of poor webpage design
-

Introduction

Programming has come a long way from the mid-20th century when people produced programs in machine code or binary, the only language that computers understand. Today most programs are written in high-level languages, which have more in common with natural language than machine code.

Many modern high-level programming languages such as Visual Basic and Delphi are event-driven. These languages have a rich visual interface and respond to events such as clicking a button, selecting an item from a list box and tabbing out of a text box, in contrast to non-visual languages where the user normally interacts with the program only through the keyboard.

You will be familiar with the Graphical User Interface (GUI) associated with event-driven programs. You make use of it all the time when using the operating system or application programs such as word processing and spreadsheets. You will learn how to set the properties of objects such as forms, combo boxes and buttons.

Some commercial programs are extremely complex, taking hundreds of people many months, or even years, to produce. However, the essential features of a programming language do not take too long to learn. In this unit, you will learn how to write reasonably complex programs in a visual event-driven language such as Visual Basic, Visual C++ or Delphi.

You will learn that there are a number of stages involved in program development including a clear program specification stating what the client requires the program to do, design, coding of the program itself, testing, documentation for both the client and for other programmers and, finally, evaluation to see if the program meets the requirements of the client and to assess the efficiency of the implementation.

Your work for this unit will culminate in the development, testing, documentation and evaluation of one or more programs to meet specified client requirements.

This is a practitioner-focused unit. The knowledge and skills developed in this unit are particularly relevant to those considering working in the ICT industry or having an ICT role in a company.

Recommended prior learning

No specific prior learning is recommended for this unit. However, some of the software development concepts covered in *Unit 5: Web Development could be useful*.

What you need to learn

14.1 Program specification

The program specification sets out the functional requirements of the software, ie exactly what it must do. In real-life projects this will be drawn up after lengthy consultations with the client. It is essential that you, as the programmer, ensure that the specification is accurate and sufficiently detailed.

The program specification concentrates on the outputs that the program should produce and the inputs needed in order to produce them. It is up to the programmer to decide what processing is required. This is not part of the program specification.

14.2 Program design

Once you have a clear program specification, you will know what inputs and outputs are required and it can be very tempting to start coding immediately. However, there are many questions to be answered to ensure that your solution fully meets the client's requirements.

You will learn how to produce detailed program designs for programs that establish:

- the purpose, layout and content of any output, both printed reports and onscreen displays
- all the data that needs to be input
- validation procedures for input data
- data structures needed to store the data
- the purpose, layout and content of forms
- the controls needed on each form for it to function correctly
- navigation routes through the program
- the various events that will occur in the program and what processing should be done in each event.

14.3 Coding

Once you have a design for your program you will be ready to start coding. You will need to use a text editor to write the high level code in your chosen language. A compiler will translate the high level code you write into machine code that the computer can understand and run. Most modern visual languages provide an integrated development environment (IDE) through which you can write, compile and run programs.

Although there are many different programming languages, there are a number of concepts common to them all and you need to be able to apply them by using the syntax of your chosen language. These concepts include:

- declaring variables and constants
- data types
- scope of variables – local and global
- operators
- assignment
- arithmetic operators
- relational operators
- logical operators

- selection
 - if statement
 - case statement
- repetition
 - for loop
 - while loops
- data structures
 - arrays
 - records
- built-in functions.

You need to know how to use a range of basic form controls and how to set their properties and use their methods and events as appropriate. The controls you will learn about include:

- labels
- text boxes
- buttons
- combo boxes
- list boxes
- option (radio) buttons
- check boxes.

Your IDE may provide other controls which you might wish to use if appropriate.

In an event-driven language the code is naturally divided up into modules or subroutines. These are the event handlers of the various controls on your forms.

You will learn how to write your own subroutines and how to pass parameters by value and by reference to these subroutines.

Part of the art of writing good code is to ensure it is as easy as possible to read. You will learn how to:

- write comments in code to explain the purpose of event handlers, variables, loop controls etc.
- use meaningful identifiers for variables
- indent code in a consistent and acceptable way.

14.4 Debugging

A bug is an error in the code which may prevent the program from running properly. There are three main types of error:

- syntax errors are caused by incorrect use of the language and are usually found by the compiler
- run-time errors cause the program to stop running and the offending line of code may be pinpointed by the IDE
- logic errors come from mistakes in the logic of your code. Examples include using the wrong logical operator (eg AND instead of OR).

Syntax errors are usually found by the compiler and run-time errors may be found by the IDE. Logic errors result in incorrect output but do not cause the program to stop running. The purpose of debugging is to find and correct logic errors.

You need to know how to use basic debugging tools including:

- stepping through code
- putting breakpoints in your code
- putting 'watches' on variables and expressions to inspect their changing values as the program runs.

14.5 Testing

Testing is about demonstrating that the coded solution meets all the requirements of the program specification and design.

You will learn how to identify the various paths through a piece of code and how to select acceptable, extreme and erroneous sample data to test these paths.

You will learn how to design a test plan and provide documentary evidence that you have carried it out. Each test in a test plan should state:

- the test number
- which subroutine the test relates to
- the purpose of the test
- the data which is used for the test
- the expected outcome of the test
- the actual outcome of the test.

Documentary evidence is likely to consist of screenshots of the actual outcomes of the tests and these should be cross-referenced back to the test plan.

14.6 User documentation

Often end-users have only basic computing skills and do not understand technical language. They will need instructions to show them how to use and get the most out of programs.

You will learn how to produce user guides in simple, non-technical language providing information, such as:

- the hardware and software needed to run the program
- how to install, load and quit the program
- how to use the program
- what to do if the program does not function as expected.

14.7 Technical documentation

Technical documentation is for other programmers. In real-life projects the code will almost certainly need to be modified and extended over time as user needs change. Very often, the programmers who write the new code are not those who wrote the original code. They need detailed documentation to help them understand how the program works.

Some aspects of technical documentation relate to the way code is written. These are features that make the code as easy to understand as possible, and have been mentioned in section 14.3:

- meaningful identifiers
- correct and consistent indentation
- useful comments in code.

Other information that should be included in technical documentation, includes:

- a list of all variables used and their purpose
- a list of all the events and the task(s) performed by each
- a list of any user-defined subroutines used, stating their purpose and any parameters they require
- an explanation of how particularly complex parts of the program work (if this is not covered by comments in the code).

14.8 Evaluation

You will learn to evaluate programs from two viewpoints: the end user and the programmer.

From the user's viewpoint, you should consider the following:

- how well the program meets their requirements, ie the original program specification
- how easy it is to use
- possible improvements to the interface.

From the programmer's viewpoint, you should consider the following:

- the efficiency of the code, eg use of selection and repetition structures, local and global variables, parameters
- the efficiency of the data storage, eg use of numeric data types, array sizes
- coding that does not work as intended.

14.9 ICT skills

In order to produce efficient program code you must be able to use a range of tools and techniques, such as the programming concepts described in Section 14.3 and the features for debugging code described in Section 14.4.

14.10 Standard ways of working

Whilst working on this unit, you will be expected to use ICT efficiently, legally and safely. You must adhere to standard ways of working, including:

- file management
 - saving work regularly
 - using sensible filenames
 - setting up directory/folder structures to organise files
 - making backups
 - choosing appropriate file formats
 - limiting access to confidential or sensitive files
 - using effective virus protection
 - using 'readme' files where appropriate to provide technical information, eg system requirements
- personal effectiveness
 - selecting appropriate ICT tools and techniques
 - customising settings
 - creating and using shortcuts
 - using available sources of help
 - using a plan to help you organise your work and meet deadlines
- quality assurance
 - using spell check, grammar check and print preview
 - proofreading
 - seeking views of others
 - authenticating work
- legislation and codes of practice
 - acknowledging sources
 - respecting copyright
 - avoiding plagiarism
 - protecting confidentiality
- safe working
 - ensuring that hardware, cables, seating etc are positioned correctly
 - ensuring that lighting is appropriate
 - taking regular breaks
 - handling and storing media correctly
 - standard programming conventions
 - meaningful identifiers for variables etc
 - sensible indentation in code
 - comments within the program listing to explain the code

- eportfolio
 - creating an appropriate structure for an eportfolio
 - collecting together all the required information, converting files to an appropriate format if necessary
 - authenticating your work
 - providing a table of contents, using hyperlinks to locate information easily
 - testing for size, compatibility and ease of use, making sure that the eportfolio conforms to the technical specification.
-

Assessment evidence

For this unit you will:

design, implement, test, document and evaluate one or more programs to meet a given set of user requirements.

Your eportfolio for this unit should include:

- (a) A copy of the program specification you are working toward.
 - A program design, specifying
 - input data and validation procedures
 - data structures
 - forms (purpose, layout and content)
 - printed output (purpose, layout and content)
 - navigation routes
 - events and associated processing.
- (b) The finished program as code and a run-time version.
- (c) A test plan that includes a range of planned tests and their outcomes, giving details of action taken as a result of testing.
- (d)* Program documentation including
 - a user guide explaining to end users how to install, load, use and quit the program
 - a technical guide for use by other programmers.
- (e) A summative evaluation of the solution, assessing
 - how well it meets the specification
 - how easy it is to use
 - the efficiency of the data storage and program code.

*Opportunity for learners to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria – Unit 14: Programming

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO 2, 3)	<p>A design that:</p> <ul style="list-style-type: none"> identifies the data to be inputted and the data structures required briefly describes the purpose, layout and content of forms and printed output lists the events to be handled includes a diagram giving an indication of the navigation for the program. <p>(0-7)</p>	<p>A detailed design that:</p> <ul style="list-style-type: none"> describes the data to be inputted and the associated validation procedures identifies the data structures required describes the purpose, layout and content of forms and printed output lists the events to be handled, briefly describing the processing associated with each includes a diagram showing the navigation for the program. <p>(8-11)</p>	<p>A comprehensive design that:</p> <ul style="list-style-type: none"> describes the data to be inputted and associated validation procedures and the data structures required fully describes the purpose, layout and content of forms and printed output lists the events to be handled, fully describing the processing associated with each includes a diagram clearly showing the navigation for the program. <p>(12-14)</p>	14

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO 1, 3)	<p>A working program that:</p> <ul style="list-style-type: none"> meets some of the requirements of the functional specification makes some appropriate use of form controls, event procedures and selection and repetition. <p>Whilst working on the program the learner adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(0-10)</p>	<p>A fully working program that:</p> <ul style="list-style-type: none"> meets most of the requirements of the specification makes appropriate use of form controls, event procedures, selection and repetition, local and global variables demonstrates some use of general procedures. <p>Whilst working on the program, the learner adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(11-15)</p>	<p>A fully working program that:</p> <ul style="list-style-type: none"> meets all of the requirements of the specification makes effective use of form control, event procedures, selection and repetition, local and global variables, general procedures and parameter passing demonstrates careful consideration of program design principles, including the user interface. <p>Whilst working on the program the learner adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(16-20)</p>	20

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO 3, 4)	<p>A test plan – with evidence of its use to test most of the subroutines – using acceptable, extreme and erroneous data.</p> <p>Plus an indication of action taken as a result of errors identified by testing.</p> <p>(0-6)</p>	<p>A detailed test plan – with evidence of its use to test all of the subroutines and the final program, including some of the routes through the program – using acceptable, extreme and erroneous data.</p> <p>Plus details of the action taken as a result of errors identified by testing.</p> <p>(7-9)</p>	<p>A comprehensive test plan – with evidence of its use to test all of the subroutines and the final program, including most of the routes through the program – using acceptable, extreme and erroneous data.</p> <p>Plus details of the action taken as a result of errors identified by testing to ensure that the program is robust.</p> <p>(10-12)</p>	12
(d) (AO 3, 4) QWC (i-iii)	<p>A user guide – using non-technical language – that provides some useful information for a non-specialist user.</p> <p>Plus a basic technical guide for use by other programmers, giving an indication of how the program works.</p> <p>The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.</p> <p>(0-4)</p>	<p>A detailed user guide – using non-technical language – that identifies the hardware and software needed to run the program, and explains how to install, load, use and quit the program.</p> <p>Plus a detailed technical guide for use by other programmers, enabling them to get an overview of how the program works.</p> <p>The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.</p> <p>(5-6)</p>	<p>An easy-to-use user guide – using non-technical language – that identifies the hardware and software needed to run the program and clearly explains how to install, load, use and quit the program.</p> <p>Plus a comprehensive technical guide for use by other programmers, providing enough information to enable another competent programmer to fully understand how the solution works and be able to maintain it without assistance.</p> <p>The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.</p> <p>(7-8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO 4)	<p>Some evaluative comments considering:</p> <ul style="list-style-type: none"> the extent to which the program meets the specification how easy it is to use. <p>(0-3)</p>	<p>An evaluation assessing:</p> <ul style="list-style-type: none"> how well the program meets the specification, identifying any weaknesses the efficiency of the solution how easy it is to use. <p>(4-5)</p>	<p>An evaluation – incorporating feedback from others – critically assessing:</p> <ul style="list-style-type: none"> how well the program meets the specification, identifying any weaknesses and suggesting some improvements the efficiency of the solution how easy it is to use, making some suggestions for improving the interface. <p>(6)</p>	6
Total marks				60

(For AO performance descriptions see page 291.)

Assessment guidance

The guidance should be used within the context of a 'best fit' approach within the band. (See the section *Applying the mark bands* for further guidance.)

Assessment evidence (a)

Mark band 1 (0-7 marks)

To be eligible for mark band 1, learners must have produced a program design that satisfies most of the requirements of the program specification and includes:

- the layout and content of each form
- the layout and content of printed output
- a navigation diagram for the program
- identification of the data that needs to be input and most of the data structures needed
- a list of events.

For full marks in this band, learners must have given the purpose of each form and identified all of the data structures needed.

Mark band 2 (8-11 marks)

To be eligible for mark band 2, learners must have produced a program design that satisfies the requirements of the program specification and includes:

- the purpose, layout and content of each form
- the purpose, layout and content of printed output
- a navigation diagram for the program
- identification of the data that needs to be input and a description of the data structures needed
- a list of events.

For full marks in this band, learners must have included an explanation of how input data will be validated.

Mark band 3 (12-14 marks)

To be eligible for mark band 3, learners must have produced a detailed program design that satisfies the requirements of the program specification and includes:

- the purpose, layout and content of each form
- the purpose, layout and content of printed output
- a navigation diagram for the program
- identification of the data that needs to be input, a description of how each item will be validated and of all of the data structures needed
- a list of events in the program with details of the processing for some of them.

For full marks in this band, learners must have identified the processing that will be done in each event.

Assessment evidence (b)

Mark band 1 (0-10 marks)

To be eligible for mark band 1, learners must have produced a working program that meets some of the requirements of the specification and demonstrates some use of:

- controls on forms
- event procedures
- selection and repetition.

To gain full marks in this band, learners must have demonstrated some appropriate use of controls, selection and repetition.

Mark band 2 (11-15 marks)

To be eligible for mark band 2, learners must have produced a fully working program that meets most of the requirements of the specification and demonstrates appropriate use of:

- controls on the forms
- event procedures
- selection and repetition
- local and global variables.

For full marks in this band, learners must have demonstrated some use of general procedures.

Mark band 3 (16-20 marks)

To be eligible for mark band 3, learners must have produced a fully working program that meets all of the requirements of the specification and demonstrates effective use of:

- controls on forms
- selection and repetition
- local and global variables
- event and general procedures
- parameter passing.

For full marks in this band, learners must have demonstrated careful consideration of program design principles, including the user interface.

Assessment evidence (c)

Mark band 1 (0-6 marks)

To be eligible for mark band 1, learners must have provided evidence of testing to include:

- a test plan
- testing, using the plan, of most procedures and the program as a whole, using acceptable, extreme and erroneous data.

For full marks in this band, learners must have outlined the action taken as a result of testing.

**Mark band 2
(7-9 marks)**

To be eligible for mark band 2, learners must have provided evidence of extensive testing to include:

- a test plan
- testing, using the plan, of all procedures and the program as a whole using acceptable, extreme and erroneous data
- action taken as a result of testing.

For full marks in this band, evidence must include the testing of alternative routes through the program.

**Mark band 3
(10-12 marks)**

To be eligible for mark band 3, learners must have provided evidence of comprehensive testing to include:

- a test plan to include testing acceptable, extreme and erroneous data
- testing, using the plan, of all procedures and the program as a whole, including most possible routes through the program using acceptable, extreme and erroneous data
- action taken as a result of testing.

For full marks in this band, learners must have provided evidence of testing of all possible routes through the program to ensure that the program is robust.

Assessment evidence (d)

**Mark band 1
(0-4 marks)**

To be eligible for mark band 1, learners must have produced:

- a user guide that identifies the hardware and software needed to run the program and explains how to install, load, use and quit the program
- a technical guide including program listings with suitable comments.

The learner uses everyday language and the response lacks clarity and organisation. Spelling, punctuation and the rules of grammar are used with limited accuracy.

For full marks in this band, the user guide must use appropriate non-technical language that enables an end-user to use the program unaided.

**Mark band 2
(5-6 marks)**

To be eligible for mark band 2, learners must have produced:

- a user guide – using non-technical language – that identifies the hardware and software needed to run the program and explains how to install, load, use and quit the program to enable an end-user to use the program
- a detailed technical guide – including program listings – in an easy-to-follow format with suitable comments, a list of variables and event procedures.

The learner uses some specialist terms and the response shows some focus and organisation. Spelling, punctuation and the rules of grammar are used with some accuracy.

For full marks in this band, the technical guide must explain the purpose of each of the variables and event procedures.

**Mark band 3
(7-8 marks)**

To be eligible for mark band 3, learners must have produced:

- an easy-to-use user guide, using non-technical language, that identifies the hardware and software needed to run the program and explains how to install, load, use and quit the program, to enable an end-user to use the program unaided
- a detailed technical guide including program listings in an easy-to-follow format with suitable comments, a description of the purpose of each of the variables and event procedures.

The learner uses appropriate specialist terms consistently and the response shows good focus and organisation. Spelling, punctuation and the rules of grammar are used with considerable accuracy.

For full marks in this band, the technical guide must be comprehensive and provide all the information needed by a programmer who needs to develop or modify the program.

Assessment evidence (e)

**Mark band 1
(0-3 marks)**

To be eligible for mark band 1, learners must have produced evaluative comments considering:

- how well the program meets the specification
- how easy it is for someone to use.

For full marks in this band, learners must have commented on ways that the program might be improved.

**Mark band 2
(4-5 marks)**

To be eligible for mark band 2, learners must have produced an evaluation considering:

- how well the program meets the specification
- how easy it is for someone to use
- ways in which the program might be improved.

For full marks, learners must have considered the quality of the user and technical documentation.

**Mark band 3
(6 marks)**

To be eligible for mark band 3, learners must have produced an evaluation considering:

- how well the program meets the specification
- how easy it is for someone to use
- ways in which the program might be improved
- the quality of the user and technical documentation
- the efficiency of the final program including data structures.

(See the section *Applying the mark bands* for further guidance.)

Delivering this unit

General information

Assessment requirements

The *Assessment evidence* section is addressed to the learners and gives precise details of what they must do.

The *Assessment criteria grid*, on the other hand, is addressed to the assessor and defines the quality of output required for each mark band. Whilst the requirements remain the same across the mark bands, performance is differentiated by the quality of the learner's response, eg level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation etc.

The *Assessment guidance* section provides further information to help assessors determine which mark band a piece of work falls into and how to award marks within that band.

Balance of theory and practical work

Most of the marks available for this unit are for practical, hands-on activities, involving the development of a program or programs to meet a given set of user requirements.

Learners will need to be taught how to write programs in an event-driven, object-oriented language such as Visual Basic or C++.

Vocational context

This unit has a practitioner focus. Ideally, learner should be given the opportunity of seeing how programmers go about designing and producing software solutions.

Standard ways of working

To be eligible for mark band 1, learners must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, learners must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Learners will be expected to present their evidence for this unit in an eportfolio. The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft internet Explorer version 5 or Netscape Navigator version 5 and be in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

Acceptable file formats for eportfolio content are likely to be PDF for paper-based publications, jpg or png for images, html for on-screen publications and swf (Flash movie) for presentations, but may be revised to take account of future developments.

The following evidence should appear in the eportfolio for this unit:

- a copy of the program specification learners are working toward
- design documentation
- the finished program as code and a run-time version(or programs)
- the test plan with evidence of testing
- a user guide
- a technical guide
- an evaluation.

Learners must be clear about the distinction between file formats appropriate for product creation and read-only file formats appropriate for viewing. They will need access to suitable conversion software, eg a PDF converter.

Teaching and learning strategies

Program specification

The project brief that learners are given must provide sufficient scope for them to be able to demonstrate their programming ability to the full. It must allow them to show their understanding of the uses of variables and constants, both local and global, their mastery of iteration and selection routines, use of appropriate data structures, including arrays and records.

The solution should normally only require learners to produce one program. If two or more programs are written they must relate to the same scenario. A collection of small unrelated tasks would not be appropriate. Learners should put themselves in the role of practitioner producing software for use by other people.

Program constructs

Learners must be able to use both pre- and post-condition loops. They do not need to have mastered file handling, but learners may use them in their solutions if they know how to. However there is no extra credit for doing so.

Use of parameter is allocated marks only in mark band 3, since these are tough concepts.

Using ready-made items

Learners can use pre-existing code snippets as part of their final solution providing they acknowledge sources. However, they must produce sufficient code of their own to demonstrate competence.

Links

Other units

The work learners have covered on databases and spreadsheets in *Unit 2: The Digital Economy*, *Unit 3: The Knowledge Worker*, *Unit 7: Using Database Software* and *Unit 11: Using Spreadsheet Software* will have introduced them to the concept of data types. Database tables are made up of fields and records; these concepts are important in programming when storing structured data.

Learners may also have had some experience of program code through work in other units. For example they may have recorded and edited spreadsheet macros in Units 3 and 11, or perhaps have looked at HTML and JavaScript in *Unit 5: Web Development*.

Unit 12: Customising Applications shows learners how they can use program code to extend and customise software applications. It has a user, rather than a practitioner focus, but both units are likely to be popular with learners who are interested in software development.

Skills Framework for the Information Age, (SFI), October 2003

The IT practitioner knowledge and skills covered in this unit map to SFIA, Areas of Competence:

Development and implementation

- Systems development – systems design
- Systems development – programming/software development
- Systems development – systems testing.

Resources

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Textbooks

Christopher D – *Computing Projects in Visual Basic* (Payne-Gallway, 2000) ISBN 1 903112338

Christopher D – *Computing Projects in Visual Basic.NET* (Payne-Gallway, 2003) ISBN 1903112915

Holmes A – *Learning to Use Visual Basic for Standard Grade* (Heinemann, 2003) ISBN 0 435454056

Assessment information

Assessment Objectives (AO) and weightings

There are four Assessment Objectives for GCEs in Applied ICT. They detail the knowledge, skills and understanding that learners are required to demonstrate.

For this qualification, the weightings for each Assessment Objective are given below.

Assessment Objectives		Weighting				
		AS	A2	Advanced GCE (Single)	AS (Double)	Advanced GCE (Double)
AO1	ICT Capability Learners demonstrate practical capability in applying ICT	30%	27%	28%	30%	28%
AO2	Knowledge and Understanding Learners demonstrate knowledge and understanding of ICT systems and their roles in organisations and society	26%	13%	20%	25%	22%
AO3	ICT Problem Solving Learners apply knowledge, skills and understanding to produce solutions and solve ICT problems	28%	30%	29%	30%	28%
AO4	Evaluation Learners evaluate: <ul style="list-style-type: none"> • ICT solutions • their own performance. 	16%	30%	23%	15%	22%

Relationship of Assessment Objectives to units

Unit	AO1 (%)	AO2 (%)	AO3 (%)	AO4 (%)
1	37	30	18	15
2	23	43	18	16
3	29	5	49	17
4	27	23	35	15
5	37	30	18	15
6	27	21	37	15
7	32	16	33	19
8	18	11	32	39
9	11	49	21	19
10	30	12	25	33
11	30	12	25	33
12	30	12	25	33
13	30	12	25	33
14	30	12	25	33

External assessment

The following AS unit will be externally assessed:

Unit 3: The Knowledge Worker

- Assessment will be by examination
- The examination will be computer mediated.
- Learners will work under supervision on a problem solving assignment set by Edexcel
- The duration of the examination will be two and a half hours. Printing and assembling student work for submission must be completed within this time allocation
- The assessment for this unit will be available to learners in the January and June examination series.

The following A2 units will be externally assessed:

Unit 7: Using Database Software

- Assessment will be by examination
- The examination will be computer-mediated
- Learners will work under supervision on a database assignment set by Edexcel
- They are expected to spend no more than 10 hours working on the assignment. Printing and assembling student work for submission must be completed within this time allocation
- The assessment for this unit will be available to learners in the January and June examination series.

Internal assessment

Learners must submit a portfolio of work for each internally assessed unit. Teachers are expected to guide and advise learners on the production of their portfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. The GCSE, GCE, and GNVQ Code of Practice requires that assessors record full details of the nature of any assistance given to individual learners beyond that of the teaching group as a whole, but within the parameters laid down in this specification. The level of assistance should be taken into account when assessing learners' work; this is indicated in the *Delivering this unit* section that accompanies each internally assessed unit in this specification. In addition, sufficient work must take place under direct supervision to allow the teacher marking the work to authenticate each learner's work with confidence.

If learners' practical skills are being assessed it is important that witness statements/checklists are completed by assessors to authenticate learner work and provide evidence that learners have achieved the level of performance required in the assessment criteria grid.

Digital copies of observation records and witness statements can be downloaded from the Edexcel website.

Applying the mark bands

Portfolios will be marked by the centre, and externally moderated by Edexcel. Each of the internally assessed units has an assessment criteria grid, divided into three broad mark bands, showing how to award marks in relation to the task and the assessment objectives. The assessment criteria grids indicate the required assessment outcomes as well as the quality of the outcomes needed for achievement in each of the mark bands. In general terms, progression across the bands is characterised as follows.

- The assessment criteria grid shows the allocation of marks by assessment criterion and by mark band. This grid should be used to determine marks for learner achievement in each unit. Learners can achieve marks in different bands for each Assessment Objective. The total mark achieved will depend on the extent to which the learner has met the assessment criteria overall.
- Within each assessment criterion, it is a general principle that shortcomings in some aspects of the assessment requirements may be balanced by better performance in others. However, it is also important to note that for full marks in any particular assessment criterion, all the requirements should have been met.
- Marks should be awarded according to the criteria for each strand set out in the assessment criteria grid, and assessors should apply their professional judgement where relevant. The *Assessment Evidence* section in each unit gives specific details of how marks should be allocated.
- There should be no reluctance to use the full mark range and, if warranted, assessors should award maximum marks. Learners' responses should be considered positively. A mark of 0 should be awarded only where the learner's work does not meet any of the required criteria.
- All learners are entitled to initial guidance in planning their work, but the level of assistance required should be taken into account when their work is assessed. In the assessment criteria grids, reference is made to learners working with 'some support and guidance', with 'limited guidance' and 'independently'. When marking the work, assessors should follow the guidelines below.
 - '*Some support and guidance*': the learner has to be guided and advised throughout to ensure that progress is made. The learner relies on the support of the teacher, who has to assist in most aspects of the work. This level of support restricts the learner's mark to band 1, irrespective of the quality of the outcomes
 - '*Limited guidance*': the teacher supports the learner in the choice of topic for investigation. From then on, the teacher reacts to questions from the learner and suggests a range of ideas that the learner acts on. The learner frequently checks matters of detail. The teacher needs to assist in some aspects of the work. This level of support restricts the learner's mark to bands 1 or 2, irrespective of the quality of the outcomes

- *'Independently'*: the teacher supports the learner in the choice of topic for the investigation or task. From then on, the teacher occasionally helps the learner, and only when asked, but monitors progress throughout. This level of support gives access to all three mark bands.
- For internal record-keeping purposes, centres may wish to make a copy of the assessment criteria grid for each learner and use it to record the mark for that unit. The GCSE, GCE, GNVQ Code of Practice requires assessors to show clearly how credit has been assigned.

Eportfolio

Learners must submit their work for each internally assessed unit in an eportfolio. This will allow assessors and moderators to view their evidence on-screen. This has obvious advantages for some types of evidence, namely products that were designed to be viewed/used on-screen, such as the e-book produced in Unit 1 and the website produced in Unit 5. However, it also gives learners an opportunity to present information in multimedia form, using, for example, audio and/or video to comment on their work and capture ephemeral evidence such as working with others. Being able to present evidence effectively in an eportfolio is an important skill.

Learners will need to understand the difference between document creation and document publication and to distinguish between file formats appropriate for document creation and read-only file formats appropriate for viewing. They will be expected to present eportfolio content in a format appropriate for viewing at a resolution of 1024 x 768 pixels.

The eportfolio must be constructed so that its contents can be accessed using 5th generation, or equivalent, web browsers, such as Microsoft Internet Explorer version 5 or Netscape Navigator version 5.

Learners may need access to suitable conversion software and compression software.

Learners will need to be taught techniques for optimising available storage space and will be expected to limit the size of their eportfolios.

Security and backups

It is the responsibility of the centre to keep learners' work secure. Centres are strongly advised to utilise firewall protection and virus checking software and to employ an effective backup strategy, so that an up-to-date archive of learners' data is maintained.

No special consideration will be given to any learner whose work is lost or destroyed as a consequence of inadequate centre security/backup procedures.

Centres are advised to archive completed, assessed work so as to free-up work space for work in progress.

Differentiation across AS and A2 units

Differentiation across AS and A2 units is characterised in general terms by:

- increasing depth and breath of understanding
- increasing application of knowledge and understanding and skills
- increasing independence.

There is also differentiation through the content of the units. AS unit content forms the foundation of knowledge and understanding which underpins the higher-level concepts found in the A2 units.

Synoptic assessment

Synoptic assessment occurs at A2 in *Unit 8: Managing ICT Projects*. It is designed to link together, concepts, skills, knowledge and understanding across the entire course. The synoptic unit is internally assessed as a project, including user feedback, review and evaluation.

Standardisation and moderation

Where marking for a unit has been carried out by more than one assessor in a centre, there must be a process of internal standardisation to ensure that there is consistent application of the criteria laid down in the assessment criteria grids.

Marks awarded by the centre will be subject to external moderation by Edexcel. This is to ensure consistency with national standards. A sample of learner portfolios will be examined, and marks will be adjusted where they are found to vary from the national standard. If the moderation process reveals an inconsistent application of the assessment criteria by centre assessors, Edexcel reserves the right to return the sample work in order for internal standardisation to be carried out.

Language of assessment

Assessment for this qualification will be available in English only. Assessment materials will be published in English only and all written and spoken work submitted for examination and moderation must be produced in English.

Statutory requirements

All assessment of this qualification will be carried out in accordance with the GCSE, GCE and GNVQ Code of Practice, published annually by the regulatory authorities.

Grading information

Mark bands

The assessments are designed to allow learners to demonstrate positive achievement and to have a positive experience in completing each assessment.

In line with the above, the criteria for assessing each assignment have been written so that a learner working at the lower end of the GCE ability range should be capable of meeting approximately 80 per cent of the band 1 criteria. This equates to approximately 40 per cent of the total credit available for the assignment.

Grading, aggregation and equivalence

The overall grade for:

- Advanced Subsidiary (Single Award) qualifications will be graded on a five-grade scale from A to E where A is the highest grade.
- Advanced Subsidiary (Double Award) qualifications will be graded on a nine-grade scale AA to EE, where AA is the highest grade.
- Advanced GCE (Single Award) qualifications will be graded on a six-grade scale from A* to E where A* is the highest grade.
- Advance GCE with Advanced Subsidiary (Additional) qualifications will be graded on a 10-grade scale from A*A to EE where A*A is the highest grade.
- Advanced GCE (Double Award) qualifications will be graded on an 11-grade scale A*A* to EE, where A*A* is the highest grade.

The mark bands used for internal assessment do not relate to pre-determined grade boundaries. Following each examination and moderation series, Edexcel will set the grade boundaries for internally and externally assessed units at an awarding meeting.

The raw mark boundaries will be converted to uniform marks on a scale of 0-100. The final grade for the qualification will be determined by aggregating the uniform marks for the units. The table below gives details of the uniform mark scales (UMS) used for the units and for the qualifications.

In Advanced Double Award, to gain Grade A*A* candidates must gain Grade AA on the qualification overall and at least 90% of the maximum uniform mark on the aggregate of the six A2 units. To gain Grade A*A, candidates must gain Grade AA on the qualification overall and at least 90% of the maximum mark on the aggregate of the three best A2 units.

In Advanced with AS Additional, to gain Grade A*A candidates must gain Grade AA on the qualification overall and at least 90% of the maximum uniform mark on the aggregate of the three A2 units.

Unit results

The minimum uniform marks required for each grade:

Unit grade	A	B	C	D	E
Maximum uniform mark = 100	80	70	60	50	40

Candidates who do not achieve the standard required for a grade E will receive a uniform mark in the range 0-39.

Qualification results

Advanced Subsidiary (Single Award)

The minimum uniform marks required for each grade:

Qualification grade	A	B	C	D	E
Maximum uniform mark = 300	240	210	180	150	120

Candidates who do not achieve the standard required for a grade E will receive a uniform mark in the range 0-119.

Advanced GCE (Single Award)

The minimum uniform marks required for each grade:

Qualification grade	A	B	C	D	E
Maximum uniform mark = 600	480	420	360	300	240

Candidates who do not achieve the standard required for a grade E will receive a uniform mark in the range 0-239.

Advanced Subsidiary (Double Award)

The minimum uniform marks required for each grade:

Qualification grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
Maximum uniform mark = 600	480	450	420	390	360	330	300	270	240

Candidates who do not achieve the standard required for a grade EE will receive a uniform mark in the range 0-239.

Advanced GCE with Advanced Subsidiary (Additional)

The minimum uniform marks required for each grade:

Qualification grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
Maximum uniform mark = 900	720	690	630	600	540	510	450	420	360

Candidates who do not achieve the standard required for a grade EE will receive a uniform mark in the range 0-359.

Advanced GCE (Double Award)

The minimum uniform marks required for each grade:

Qualification grade	AA	AB	BB	BC	CC	CD	DD	DE	EE
Maximum uniform mark = 1200	960	900	840	780	720	660	600	540	480

Candidates who do not achieve the standard required for a grade EE will receive a uniform mark in the range 0-479.

Performance descriptions

Performance descriptions for this subject are given in *Appendix D*.

Additional information

Learner entry

Details of how to enter learners for this qualification can be found in Edexcel's *Information Manual* produced each year, a copy is sent to all Examinations Officers. The information can also be found on our website (www.edexcel.com).

Resitting of units

There is no restriction on the number of times a unit may be attempted before claiming certification for the qualification. The best available result for each unit will count towards the final grade.

Results of units will be held in Edexcel's unit bank for as many years as this qualification remains available. Once the Advanced Subsidiary or Advanced GCE qualification has been certificated, all unit results are deemed to be used up at that level. These results cannot be used again towards a further award of the same qualification at the same level, but unit results remain available for any other qualifications available in this specification.

Access arrangements and special requirements

Edexcel's policy on access arrangements and special considerations for GCE, GCSE, and Entry Level aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the Disability Discrimination Act 1995 and the amendments to the Act) without compromising the assessment of skills, knowledge, understanding or competence.

Please see the Edexcel website (www.edexcel.com) for:

- the JCQ policy Access Arrangements and Special Considerations, Regulations and Guidance Relating to students who are Eligible for Adjustments in Examinations
- the forms to submit for requests for access arrangements and special considerations
- dates for submission of the forms.

Requests for access arrangements and special considerations must be addressed to:

Special Requirements
Edexcel
One90 High Holborn
London WC1V 7BH

Disability Discrimination Act (DDA)

Please see the Edexcel website (www.edexcel.com) for information with regard to the Disability Discrimination Act.

Quality of Written Communication (QWC)

Learners will be assessed on their ability to:

- i) ensure that text is legible and that spelling, grammar and punctuation are accurate so that meaning is clear
- ii) select and use a form of writing appropriate to the purpose and to complex subject matter
- iii) organise information clearly and coherently, using specialist vocabulary when appropriate.

Stretch and challenge

Learners can be stretched and challenged in all units through the use of different assessment strategies, for example:

- using a variety of stems in questions – for example analyse, evaluate, discuss, compare
- ensuring connectivity between sections of questions
- a requirement for extended writing
- use of a wider range of question types to address different skills – for example open-ended questions, case studies etc.

Malpractice and plagiarism

For up-to-date advice on malpractice and plagiarism, please refer to the Joint Council for Qualifications *Suspected Malpractice in Examinations: Policies and Procedures* document on the JCQ website www.jcq.org.uk

Learner recruitment

Edexcel's access policy concerning recruitment to our qualifications is that:

- they must be available to anyone who is capable of reaching the required standard
- they must be free from barriers that restrict access and progression
- equal opportunities exist for all learners.

The wider curriculum

Key skills

This qualification gives opportunities for developing and generating evidence for assessing the key skills listed below:

- application of number
- communication
- information and communication technology
- improving own learning and performance
- problem solving
- working with others.

Appendix A maps the opportunities available at Level 3. Where appropriate, these opportunities should be directly cross-referenced, at specified level(s), to the criteria listed in Part B of the key skills specifications.

Spiritual, moral, ethical, social, cultural (SMESC) and other wider curriculum links

This qualification gives opportunities for developing an understanding of spiritual, moral, ethical, social and cultural issues, together with an awareness of environmental issues, health and safety considerations, and European initiatives consistent with relevant international agreements appropriate for the ICT sector. *Appendix C: Wider curriculum* maps the opportunities available.

Resources, support and training

Edexcel publications

You can order further copies of the Specification, Sample Assessment Materials (SAMs) and Teacher's Guide documents from:

Edexcel Publications
Adamsway
Mansfield
Nottinghamshire NG18 4FN

Telephone: 01623 467467
Fax: 01623 450481
Email: publication.orders@edexcel.com
Website: www.edexcel.com

Endorsed resources

Edexcel also endorses some additional materials written to support this qualification. Any resources bearing the Edexcel logo have been through a quality assurance process to ensure complete and accurate support for the specification. For up-to-date information about endorsed resources, please visit www.edexcel.com/endorsed.

Please note that while resources are checked at the time of publication, materials may be withdrawn from circulation and website locations may change.

Edexcel support services

Edexcel has a wide range of support services to help you implement this qualification successfully.

ResultsPlus – ResultsPlus is an application launched by Edexcel to help subject teachers, senior management teams, and students by providing detailed analysis of examination performance. Reports that compare performance between subjects, classes, your centre and similar centres can be generated in 'one-click'. Skills maps that show performance according to the specification topic being tested are available for some subjects. For further information about which subjects will be analysed through ResultsPlus, and for information on how to access and use the service, please visit www.edexcel.com/resultsplus.

Ask the Expert – Ask the Expert is a new service, launched in 2007, that provides direct email access to senior subject specialists who will be able to answer any questions you might have about this or any other specification. All of our specialists are senior examiners, moderators or verifiers and they will answer your email personally. You can read a biography for all of them and learn more about this unique service on our website at www.edexcel.com/asktheexpert.

Ask Edexcel – Ask Edexcel is Edexcel's online question and answer service. You can access it at www.edexcel.com/ask or by going to the main website and selecting the Ask Edexcel menu item on the left.

The service allows you to search through a database of thousands of questions and answers on everything Edexcel offers. If you don't find an answer to your question, you can choose to submit it straight to us. One of our customer services team will log your query, find an answer and send it to you. They'll also consider adding it to the database if appropriate. This way the volume of helpful information that can be accessed via the service is growing all the time.

Examzone – The Examzone site is aimed at learners sitting external examinations and gives information on revision, advice from examiners and guidance on results, including re-marking, re-sitting and progression opportunities. Further services for learners – many of which will also be of interest to parents – will be available in the near future. Links to this site can be found on the main homepage at www.examzone.co.uk.

Appendices

Appendix A: Key skills mapping	279
Appendix B: Key skills development suggestions	281
Appendix C: Wider curriculum	289
Appendix D: Performance descriptions	291

Appendix A: Key skills mapping

Key skills (Level 3)	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14
Application of number														
N3.1			✓								✓			
N3.2			✓								✓			
N3.3			✓								✓			
Communication														
C3.1	✓													
C3.2a						✓		✓						
C3.2b	✓												✓	
C3.3	✓	✓		✓	✓	✓		✓		✓			✓	✓
Information and communication technology														
ICT3.1	✓	✓											✓	
ICT3.2	✓	✓	✓					✓						
ICT3.3	✓	✓	✓	✓	✓	✓		✓						

Key skills (Level 3)	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14
Improving own learning and performance														
LP3.1	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
LP3.2	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
LP3.3	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓
Problem solving														
PS3.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PS3.2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
PS3.3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Working with others														
WO3.1	✓							✓						✓
WO3.2										✓	✓	✓		
WO3.3							✓	✓					✓	✓

Appendix B: Key skills development suggestions

Application of number – Level 3

Plan and carry out one or more activities, each one of which should include task for N3.1, N3.2 (a or b or c or d) and N.3.

Overall, through one or more activities learners must:

- use two different types of sources, including a large data set, ie over 50 items of data (N3.1)
- carry out calculations to do with a, b, c and d (N3.2)
- present findings in two different ways using charts, graphs or diagrams (N3.3).

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
N3.1 Plan an activity and get relevant information from relevant sources.	Unit 3, 11	Learners solve problems using information from a variety of sources. Learners create complex spreadsheets to handle data from a range of sources.
N3.2 Use this information to carry out multi-stage calculations to do with: a amounts or sizes b scales or proportion c handling statistics d using formulae.	Unit 3, 11	Learners use a formulae and functions to carry out calculations. Data sets can be interrogated statistically, or manipulated with formulae.
N3.3 Interpret the results of your calculations, present your findings and justify your methods.	Unit 3, 11	Learners interpret findings and justify their chosen solutions.

Communication – Level 3

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
C3.1a Take part in a group discussion.	1	Learners could hold a group discussion on aspects of the digital divide, or on the impact of ICT on society.
C3.1b Make a formal presentation of at least eight minutes using an image or other support material.	Unit 6, 8	Learners give a presentation on web-based tools for collaborative working. Learners present a project proposal to senior management.
C3.2 Read and synthesise information from at least two documents about the same subject. Each document must be a minimum of 1000 words long.	1	Learners carry out research for their e-book.

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
<p>C3.3 Write two different types of documents, each one giving different information about complex subjects. One document must be at least 1000 words long.</p>	<p>Unit 1, 2, 4, 5, 6, 8, 10, 13, 14</p>	<p>Learners create an e-books covering aspects of life in the Information Age. Learners produce a report on an interactive website. Learners write a report describing and justifying their chosen solution. Learners produce a system specification to meet a user’s requirements. Learners produce a proposal for enhancing the functionality of the website. Learners produce a technical support manual and a report on the communication needs of a SME. Learners produce a project definition document and an evaluation of the project. Learners produce documentation relating to the design and production of the software product. Learners produce a report explaining the need for web hosting services and technical documentation relating to the website. Learners produce documentation relating to the design and production of the software product.</p>

Use at least one image, either to obtain information, or to convey information in one of the documents you write.

Information and communication technology – Level 3

Show that learners can plan and carry through a number of different tasks, one of which must be a major task covering ICT3.1, ICT3.2 and ICT3.3.

Each component, ICT3.1, ICT3.2 and ICT3.3, must be covered at least twice, and ICT3.3 must be covered for at least two different audiences. Smaller tasks may be used to ensure each component is covered.

Overall through at least two activities learners must:

- include at least one ICT-based information source
- include at least one non ICT-based information source
- use at least one example of text, one example of image and one example of number
- use one example of combined information such as text and number, or image and number or text and image
- present evidence of sending and receiving email; one of these emails must have an attachment related to the task.

Key skill portfolio evidence requirement	Opportunities for development or internal assessment
<p>ICT3.1 Search for information, using different sources, and multiple search criteria in at least one case.</p>	<p>Opportunities abound within this qualification for evidencing ICT 3.1 to 3.3 and so no specific suggestions are provided here.</p>
<p>ICT3.2 Enter and develop the information and derive new information.</p>	
<p>ICT3.3 Present combined information such as text with image, text with number or image with number.</p>	

Improving own learning and performance – Level 3

Provide at least one example of meeting the standard for LP3.1, LP3.2 and LP3.3 (the example should cover at least three targets). Overall, learners must show they can use at least two different ways of learning to improve their performance.

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
<p>LP3.1 Set targets using information from appropriate people and plan how these will be met.</p>	<p>All portfolio units Unit 5 Units 3, 7 and 9 Unit 8 All portfolio units Unit 8</p>	<p>Learners must negotiate deadlines and plan their work. Learners must draw up a project plan for the production of the website. Learners must plan effectively to complete the work on the set assignment in the given time. Learners must plan how they will meet targets associated with their project. This includes negotiating and setting deadlines. Learners must manage their time efficiently, eg by prioritising their tasks and working arrangements. This will involve, for example, changing targets or plans when circumstances demand it. Project development will require efficient time management, and ongoing monitoring of progress.</p>
<p>LP3.2 Take responsibility for your learning, using your plan, to help meet targets and improve your performance.</p>	<p>All portfolio units Unit 8</p>	<p>Learners must manage their time efficiently, eg by prioritising their tasks and working arrangements. This will involve, for example, changing targets or plans when circumstances demand it. Learners must manage the project, using the plan to monitor progress and drive forward the project.</p>
<p>LP3.3 Review progress and establish evidence of your achievements.</p>	<p>All portfolio units Unit 8</p>	<p>Learners must evaluate the outcomes of each unit and their own performance. Learners must review project progress and carry out an end-of-project review, evaluating all aspects of the project including their own performance.</p>

Problem solving – Level 3

Provide at least one example of meeting the standard for PS3.1, PS3.2 and PS3.3. The example should include exploring at least **three** different ways of tackling a problem (for PS3.1).

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
PS3.1 Explore a problem and identify different ways of tackling it.	All units	Learners need to understand what they are being asked to produce and identify different ways of producing it.
PS3.2 Plan and implement at least one way of solving the problem.	All units	Learners must plan and implement a strategy for producing the evidence required for each unit.
PS3.3 Check if the problem has been solved and review your approach to problem solving.	All units	Learners must evaluate the outcomes of each unit and their own performance.

Working with others – Level 3

Provide at least one example of meeting the standard for WO3.1, WO3.2 and WO3.3, to include work in a group or team situation. Learners must check progress on two occasions (for WO3.2).

Key skill portfolio evidence requirement	AS/A2 units	Opportunities for development or internal assessment
WO3.1 Plan work with others.	Unit 1, 8	Learners could work in small groups to investigate topics within this unit. Learners need to plan work with stakeholders.
WO3.2 Seek to develop cooperation and check progress towards your agreed objectives.	Units 8, 10, 11, 12	Learners must use prototyping and feedback from others to develop software. Keep stakeholders fully informed as project progresses.
WO3.3 Review work with others and agree ways of improving collaborative work in the future.	Unit 1, 7, 8, 13, 14	Learners can provide each other with feedback on their e-book development Evaluate with others the final database solution Evaluate the success of the project with the help of stakeholders Evaluate how feedback has resulted in change or improvement of the website Evaluate with users how well the programme meets their needs

Appendix C: Wider curriculum

Signposting

Issue	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11	Unit 12	Unit 13	Unit 14
Spiritual	✓													
Moral	✓				✓			✓					✓	
Ethical	✓	✓		✓	✓	✓		✓					✓	✓
Social	✓	✓		✓	✓			✓		✓			✓	
Cultural	✓				✓			✓		✓			✓	
Citizenship	✓	✓			✓	✓				✓			✓	
Environment	✓													
European initiatives					✓								✓	
Health and safety	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Development suggestions

Issue	AS/A2 units	Opportunities for development
Spiritual	1	<ul style="list-style-type: none"> The changes wrought by ICT on the modern world have an impact on spiritual and religious perspectives.
Moral	1, 5, 8, 13	<ul style="list-style-type: none"> Moral influences affect our responses to digital communication, websites, games, entertainments and management practices
Ethical	1, 2, 4, 5, 6, 8, 13, 14	<ul style="list-style-type: none"> Ethical issues embrace obeying regulations, codes of practice, protocols, and fulfilling professional obligations
Social	1, 2, 4, 5, 8, 10, 13	<ul style="list-style-type: none"> The use of ICT introduces social issues of access, working practices and equality
Cultural	1, 5, 8, 10, 13	<ul style="list-style-type: none"> Cultural influences affect our responses to digital communication, websites, games, entertainments and management practices
Citizenship	1, 2, 5, 6, 10, 13	<ul style="list-style-type: none"> Legal and security issues arise in these units, in relation to things like money transactions, pornography etc
Environment	1	<ul style="list-style-type: none"> Students investigate the impact of ICT on the environment
European initiatives	5, 13	<ul style="list-style-type: none"> Emergency international standards relating to accessibility and compliance
Health and safety	All units	<ul style="list-style-type: none"> Standard ways of working encompass health and safety issues relating to computer use

Appendix D: Performance descriptions

- The performance descriptions for GCE in Applied ICT aim to describe learning outcomes and levels of attainment likely to be shown by a representative candidate performing at the A/B and E/U boundaries for the AS and A2. The performance descriptions illustrate the expectations at these boundaries for the AS and A2 as a whole; they have not been written at specification or unit level.
- Each performance description is aligned to one Assessment Objective. An alphabetical system has been used to denote each element of a performance description. There is no hierarchy of elements.
- Performance descriptions are designed to assist examiners in exercising their professional judgement at awarding meetings where the grade A/B and E/U boundaries will be set by examiners using professional judgement. This judgement will reflect the quality of the candidates' work, informed by the available technical and statistical evidence. Performance descriptions will be reviewed continually and updated where necessary.
- Teachers may find performance descriptions useful in understanding candidates' performance across qualifications as a whole but should use the marking criteria identified in the specification when assessing candidates' work.

GCE Applied ICT performance descriptions – AS

The performance descriptions for AS indicate the level of attainment characteristic of A/B and E/U boundary learners. They give a general indicator of the required learning outcomes. The descriptions should be interpreted in relation to the content outlined in the specification; they are not designed to define the content. The grade awarded will depend in practice on the extent to which the learner has met the Assessment Objectives overall. Shortcomings in some aspects of assessment may be balanced by better performance in others. The requirement for all AS and A2 level specifications to assess learners' quality of written communication will be met through all four Assessment Objectives.

AS	A01	A02	A03	A04	Quality of Written Communication
Assessment Objective	Learners demonstrate practical capability in applying ICT.	Learners demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Learners apply knowledge skills and understanding to produce solutions to ICT problems.	Learners evaluate: <ul style="list-style-type: none"> • ICT solutions • their own performance. 	
A/B boundary performance description	Learners demonstrate an ability to: <ol style="list-style-type: none"> a use a wide range of ICT tools and techniques in a variety of practical activities. 	Learners demonstrate an understanding of: <ol style="list-style-type: none"> a components and functions of a range of ICT systems b how the role of ICT helps a range of organisations in different sectors meet their objectives c the positive and negative effects of ICT on society and individuals. 	Learners demonstrate an ability to: <ol style="list-style-type: none"> a apply their knowledge and skills of ICT tools and techniques to produce efficient solutions to a variety of problems arising from familiar contexts. 	Learners demonstrate an ability to: <ol style="list-style-type: none"> a identify strengths and weaknesses in their initial solution and refine it in relation to the user's needs b reflect on their experiences in order to improve their own performance. 	The learner has expressed complex ideas clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments will be consistently well structured. There will be few, if any, errors of grammar, punctuation and spelling.

AS	A01	A02	A03	A04	Quality of Written Communication
E/U boundary performance description	Learners demonstrate an ability to: a use a limited range of ICT tools and techniques in a variety of practical activities.	Learners demonstrate an understanding of: a components and functions of given ICT systems b how the role of ICT helps selected organisations meet their objectives c some of the effects of ICT on society and individuals.	Learners demonstrate an ability to: a apply their knowledge and skills of ICT tools and techniques to produce working solutions to problems arising from familiar contexts.	Learners demonstrate an ability to: a comment on the effectiveness of their solutions to problems and suggest improvements b comment on their actions and role in solving problems.	The learner has expressed simple ideas clearly, but may express complex and subtle complex ineffectively. Arguments may be obscurely presented. Errors in grammar, punctuation and spelling may be present.

GCE Applied ICT performance descriptions – A2

The performance descriptions for A2 indicate the level of attainment characteristic of A/B and E/U boundary candidates. They give a general indicator of the required learning outcomes. The descriptions should be interpreted in relation to the content outlined in the specification; they are not designed to define the content. The grade awarded will depend in practice upon the extent to which the learner has met the Assessment Objectives overall. Shortcomings in some aspects of assessment may be balanced by better performance in others. The requirement for all AS and A2 level specifications to assess learners' quality of written communication will be met through all four Assessment Objectives.

A2	A01	A02	A03	A04	Quality of Written Communication
Assessment Objective	Learners demonstrate practical capability in applying ICT.	Learners demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Learners apply knowledge skills and understandings to ICT problems.	Learners evaluate: <ul style="list-style-type: none"> ICT solutions their own performance. 	
A/B boundary performance descriptions	Learners demonstrate an ability to: <ol style="list-style-type: none"> use their initiative to develop, enhance and extend their range of ICT skills and techniques as required. 	Learners demonstrate: <ol style="list-style-type: none"> detailed knowledge of formal and informal tools and techniques for developing and managing ICT systems thorough understanding of the effects of proposed solutions on end users an understanding of the implications of current relevant legislation. 	Learners demonstrate an ability to: <ol style="list-style-type: none"> apply their knowledge and skills of ICT tools and techniques to produce effective solutions to complex problems arising from unfamiliar contexts use methodical, analytical and critical approaches to problem solving. 	Learners demonstrate an ability to: <ol style="list-style-type: none"> provide a critical analysis of their solutions to ICT problems, identifying strengths and weaknesses in order to refine the solution taking account of user feedback reflect on their own performance by identifying strengths and weaknesses and use this review to improve their SKU. 	The learner has expressed complex ideas clearly and fluently. Sentences and paragraphs follow on from one another smoothly and logically. Arguments will be consistently well structured. There will be few, if any, errors of grammar, punctuation and spelling.

A2	A01	A02	A03	A04	Quality of Written Communication
E/U boundary performance descriptions	Learners demonstrate an ability to: a develop and extend their range of ICT skills and techniques as required.	Learners demonstrate: a a knowledge of tools and techniques for developing ICT systems b a recognition that their solutions will have effects on end users c a knowledge of current relevant legislation.	Learners demonstrate an ability to: a apply their knowledge and skills of ICT tools and techniques to solve straightforward problems arising from unfamiliar contexts.	Learners demonstrate an ability to: a comment on the effectiveness of their solution in relation to user needs, suggesting improvements b comment on their actions and role in solving problems and identify areas for improvement.	The learner has expressed simple ideas clearly, but may express complex and subtle concepts ineffectively. Arguments may be obscurely presented. Errors in grammar, punctuation and spelling may be present.

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