

INTERNATIONAL ADVANCED LEVEL

Applied ICT

SPECIFICATION

Pearson Edexcel International Advanced Subsidiary in Applied ICT (XIT01)

Pearson Edexcel International Advanced Level in Applied ICT (YIT01)

For first teaching in September 2016

First examination June 2017

Issue 1

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Acknowledgements

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About this specification

Pearson Edexcel International Advanced Level in Applied ICT is designed for use in schools and colleges outside the United Kingdom. It is part of a suite of International Advanced Level qualifications offered by Pearson.

This qualification is not accredited or regulated by any UK regulatory body.

This specification includes the following key features.

Structure: six units, modular qualification. Five mandatory units and one optional unit.

Content: relevant, engaging to an international audience.

Assessment: four units are internally assessed and the evidence is presented as either an ebook or eportfolio. Two units are externally assessed and students will be required to use computer systems throughout the assessment.

Approach: independent learning and critical thinking skills incorporating synoptic assessment at International A2.

Specification updates

This specification is Issue 1 and is valid for the Pearson Edexcel International Advanced Subsidiary and International Advanced Level examination from 2017. If there are any significant changes to the specification Pearson will write to centres to let them know. Changes will also be posted on our website.

For more information please visit qualifications.pearson.com

Using this specification

This specification has been designed to give guidance to teachers and encourage effective delivery of the qualification. The following information will help you get the most out of the content and guidance.

Compulsory content: as a minimum, all the bullet points in the content must be taught.

Examples: throughout the unit content, we have included examples of what could be covered or what might support teaching and learning. It is important to note that examples are for illustrative purposes only and centres can use other examples. We have included examples that are easily understood and recognised by international centres.

Unit assessments use a range of material and are not limited to the examples given. Teachers should deliver the qualification using a good range of examples to support the assessment of the unit content.

Depth and breadth of content: teachers should use the full range of content and all the assessment objectives given in the unit.

Qualification abbreviations

International Advanced Level – IAL

International Advanced Subsidiary – IAS

International A2 (the additional content required for an IAL) – IA2

Qualification aims and objectives

The aims and objectives of this qualification are to enable students to:

- develop a broad range of ICT skills and knowledge of the uses of ICT in vocational contexts, as a basis for progression to further learning in ICT-related fields, including progression from IAS to IA2
- develop knowledge and understanding of the components, functions and applications of information systems in a range of organisations
- develop an understanding of the main principles of solving problems using ICT and development of the skills necessary to apply this understanding
- apply their knowledge and understanding of ICT and use skills (e.g. 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.

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Qualification at a glance

Qualification structure

- The Pearson Edexcel International Advanced Level in Applied ICT comprises six units and contains an International Advanced Subsidiary subset of three IAS units.
- The International Advanced Subsidiary is the first half of the International Advanced Level qualification and consists of Units 1, 2 and 3. It may be awarded as a discrete qualification or contribute 50 per cent of the total International Advanced Level marks.
- The full International Advanced Level award consists of three IAS units (Units 1, 2 and 3), plus three IA2 units (Units 4 and 5, plus one from either Units 6, 7 or 8) which make up the other 50 per cent of the International Advanced Level. Students wishing to take the full International Advanced Level must, therefore, complete all six units.
- The structure of this qualification allows teachers to construct a qualification of study that can be taught and assessed either as:
 - distinct modules of teaching and learning with related units of assessment taken at appropriate stages during the qualification, or
 - a linear qualification which is assessed in its entirety at the end.

Pearson Edexcel International Advanced Subsidiary in Applied ICT (XIT01)			
Unit	Mandatory units	Assessment method	GLH
1	The Information Age	Internal	60
2	The Digital Economy	Internal	60
3	The Knowledge Worker	External	60

Pearson Edexcel International Advanced Level in Applied ICT (YIT01)			
Unit	Mandatory units	Assessment method	GLH
1	The Information Age	Internal	60
2	The Digital Economy	Internal	60
3	The Knowledge Worker	External	60
4	Using Database Software	External	60
5	Managing ICT Projects	Internal	60
Optional units (one unit from this group)			
6	Using Multimedia Software	Internal	60
7	Using Spreadsheet Software	Internal	60
8	Customising Applications	Internal	60

Unit overview

IAS Unit 1: The Information Age	*Unit code WIT01	
<ul style="list-style-type: none"> Internally assessed IAL compulsory unit Availability: June First assessment: June 2017 	33% of the total IAS	17% of the total IAL
<p>Content summary</p> <p>Students will learn about the information communication technologies that enable people to access and exchange information and to carry out transactions anytime, anywhere.</p> <p>Students 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.</p> <p>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. Students 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. Their investigation and evaluation of all these aspects of the age in which we live will be presented in the form of an ebook designed to be read on a computer screen.</p> <p>Throughout the unit students will acquire the tools and techniques needed to make effective use of the information available to them on the internet. The skills and knowledge they gain while studying this unit will be a useful foundation for the rest of the qualification.</p>		
<p>Assessment</p> <ul style="list-style-type: none"> Students must submit an eportfolio of their work. Teachers are expected to guide and advise students on the production of their eportfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. Eportfolios will be marked by the centre, and externally moderated by Pearson. 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. 		

IAS Unit 2: The Digital Economy		*Unit code WIT02	
<ul style="list-style-type: none"> Internally assessed IAL compulsory unit Availability: June First assessment: June 2017 		33% of the total IAS	17% of the total IAL
<p>Content summary</p> <p>Students will investigate how organisations are responding to the pressures of the e-marketplace by using transactional websites to:</p> <ul style="list-style-type: none"> present their products and services gather information provide a personalised service. <p>Security and privacy are two key concerns for organisations and individuals operating in the digital economy. Students will assess potential threats to customer data and evaluate the effectiveness of current legislation and measures taken by organisations to protect data.</p> <p>Databases are key to managing the large amount of data that organisations collect. Students will learn how to use database software to analyse data and identify trends and patterns.</p> <p>The 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.</p>			
<p>Assessment</p> <ul style="list-style-type: none"> Students must submit an eportfolio of their work. Teachers are expected to guide and advise students on the production of their eportfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. Eportfolios will be marked by the centre, and externally moderated by Pearson. 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. 			

IAS Unit 3: The Knowledge Worker		*Unit code WIT03	
<ul style="list-style-type: none"> Externally assessed IAL compulsory unit Availability: June First assessment: June 2017 		33% of the total IAS	17% of the total IAL
<p>Content summary</p> <p>Knowledge workers are discerning consumers of information. They have the information handling skills to turn information into knowledge.</p> <p>Students will learn about making informed decisions using the knowledge available to them. They will learn how to select their sources and decide on how much credence you can place in them. They 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 their knowledge. Decisions often have to be made within time constraints. Students will learn how to manage their time effectively by prioritising tasks and setting interim deadlines.</p> <p>In <i>Unit 2: The Digital Economy</i>, students will have used database software to organise and interrogate a large data set and to extract useful information. In this unit, they will develop their 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 them to try out some of the possible alternatives that have been identified.</p> <p>Together with information from other sources, students will use the outcome of the models to inform their decision making.</p>			
<p>Assessment</p> <ul style="list-style-type: none"> Assessment will be by examination. Students will be required to use computer systems throughout the assessment. Students will work under exam conditions on a problem solving assessment set by Pearson. The duration of the examination will be 2 hours and 30 minutes. Printing and assembling work for submission must be completed within this time allocation. The assessment for this unit will be available to students in the June examination series. 			

IA2 Unit 4: Using Database Software	*Unit code WIT04
<ul style="list-style-type: none"> Externally assessed IAL compulsory unit Availability: June First assessment: June 2018 	17% of the total IAL
<p>Content summary</p> <p>Students will develop their knowledge of, and skills in using, databases further. They will learn the principles of data modelling and 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.</p> <p>Students will design and implement user interfaces that make it easier for people to enter data and extract information, while ensuring the overall security and integrity of the database. They will also make full use of the facilities of the software to generate reports that are well presented, easy to read and fit for purpose.</p> <p>The work for this unit will culminate in the design, development, testing and evaluation of a database for a specific purpose in a given scenario.</p>	
<p>Assessment</p> <ul style="list-style-type: none"> Assessment will be by examination. Students will be required to use computer systems throughout the assessment. Students will work under exam conditions on a database assessment set by Pearson. Students are expected to spend no more than ten hours working on the assignment. Printing and assembling work for submission must be completed within this time allocation. The assessment for this unit will be available to students in the June examination series. 	

IA2 Unit 5: Managing ICT Projects	*Unit code WIT05
<ul style="list-style-type: none"> Internally assessed IAL compulsory unit Availability: June First assessment: June 2018 	17% of the total IAL
<p>Content summary</p> <p>It is now widely recognised that specialist knowledge and skills are required to manage projects successfully.</p> <p>Students will learn to develop some formal project management tools and methods and will have the opportunity to use specialist software to plan and monitor projects. They will put into practice what they have learned by setting up and running a small-scale software project. They will draw on the knowledge and skills learned throughout the qualification in order to plan for and produce the required software product.</p> <p>Although budgeting is an important factor in any project in real life, in this instance students will not be expected to consider finance. However, they will need to identify other resource requirements such as expertise, equipment and time. This is not a team activity, but it will involve working closely with others, since people skills and good communication are key to successful project management.</p> <p>The summative evaluation of students' work for this unit will take the form of an end-of-project review at which they and other project stakeholders will assess the success of the project and their performance as the project manager.</p>	
<p>Assessment</p> <ul style="list-style-type: none"> Students must submit an eportfolio of their work. Teachers are expected to guide and advise students on the production of their eportfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. Eportfolios will be marked by the centre, and externally moderated by Pearson. 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. 	

IA2 Unit 6: Using Multimedia Software	*Unit code WIT06
<ul style="list-style-type: none"> Internally assessed IAL optional unit Availability: June First assessment: June 2018 	17% of the total IAL
<p>Content summary</p> <p>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.</p> <p>Students will increase their understanding of the features and possibilities of these media types and other tools so that they can combine them to produce well-designed multimedia products that communicate their ideas effectively.</p> <p>The work for this unit will culminate in the design, development and testing of an interactive multimedia product for a specified target audience.</p>	
<p>Assessment</p> <ul style="list-style-type: none"> Students must submit an eportfolio of their work. Teachers are expected to guide and advise students on the production of their eportfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. Eportfolios will be marked by the centre, and externally moderated by Pearson. 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. 	

IA2 Unit 7: Using Spreadsheet Software	*Unit code WIT07
<ul style="list-style-type: none"> • Internally assessed • IAL optional unit • Availability: June • First assessment: June 2018 	17% of the total IAL
<p>Content summary</p> <p>Students will learn the skills and techniques needed to design and create technically complex spreadsheets. They will learn how to use data validation and other techniques to reduce the potential for data entry errors.</p> <p>In order to get maximum return from any spreadsheets, students will learn how to incorporate 'future-proofing' features which will make it easier for them to implement modifications and extensions at a later date should they need to do so. They will also establish the functional requirements of the spreadsheet at the outset and carry out formative evaluation and testing throughout its development. They will learn the importance of seeking and making use of feedback from others to help them with their work.</p> <p>The work for this unit will culminate in the design, development and testing of a spreadsheet capable of analysing, interpreting and communicating complex data.</p>	
<p>Assessment</p> <ul style="list-style-type: none"> • Students must submit an eportfolio of their work. • Teachers are expected to guide and advise students on the production of their eportfolios. • Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. • Eportfolios will be marked by the centre, and externally moderated by Pearson. • 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. 	

IA2 Unit 8: Customising Applications	*Unit code WIT08
<ul style="list-style-type: none"> • Internally assessed • IAL optional unit • Availability: June • First assessment: June 2018 	17% of the total IAL
<p>Content summary</p> <p>Students 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 them to create applications with more scope and flexibility than is possible using ready-made macros, forms etc.</p> <p>The 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.</p>	
<p>Assessment</p> <ul style="list-style-type: none"> • Students must submit an eportfolio of their work. • Teachers are expected to guide and advise students on the production of their eportfolios. • Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. • Eportfolios will be marked by the centre, and externally moderated by Pearson. • 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. 	

*See *Appendix F: Codes* for a description of this code and all other codes relevant to this qualification.

Applied ICT unit content

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Unit 1: The Information Age

IAL compulsory unit

Internally assessed

Unit description

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 ebook 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 ebook. 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 ebook 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 while 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 qualification. It assumes that you already have some experience of using ICT to combine and present information.

What students 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, e.g. email, instant messaging, newsgroups, online conferencing, blogs, social networking
- real-time information, e.g. train timetables, news services, traffic reports, weather
- commerce, e.g. shopping, banking, auctions
- government, e.g. online tax returns, e-voting, applications for services/grants, revenue collection
- education, e.g. online learning/training, virtual learning environments (VLEs)
- business, e.g. videoconferencing, collaborative working, business networks
- entertainment, e.g. multi-user games, radio players
- download services, e.g. music, film, upgrades, software
- web storage
- online mapping and route planning (not satnav)
- cloud-based applications, e.g. Google Docs, Office 365, Adobe Creative Cloud.

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?
- measures 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 ebook?

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 ebook to present your evidence for this unit.

Ebooks are digital and designed to be viewed on screen. Although the pages can be read in sequence as with most traditional books, ebooks enable the reader to easily view pages in any order. In addition to the normal text and static images found in paper-based books, ebooks 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 ebooks 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.

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

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

- creative writing
- reference materials, e.g. encyclopedias, historical manuscripts
- collaborative projects
- children's books.

When looking at ebooks 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 ebook

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

Before sitting down to design an ebook you need to be clear about:

- the intended audience
- the purpose of the ebook
- 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 ebook, you will learn how to create multimedia components for yourself (see *Section 1.7*).

As you develop an ebook you should test it by:

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

Ebooks 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 ebooks 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, e.g. forward and backward buttons, bookmarking and organising favourites
 - understanding and applying the main search principles of internet search engines, e.g. string, key word searching
 - navigating large websites to locate a specific information resource in a given site using hyperlinks 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 ebook, 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

While 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, e.g. 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 spellcheck, 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 ebook 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 ebook and own performance (assessment evidence (f)).

Imagine that your ebook 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 ebook is enormous. Anyone with internet access in 100 years' time will be able to read it. The ebook should be designed as an on-screen publication. The technical specification for the ebook will be provided by your teacher.

Your portfolio for this unit should include:

An ebook that provides a snapshot of life in the Information Age. It must include the following.

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

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

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO1, 2, 4) QWC (i-iii)	<p>The student:</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 style="text-align: right;">(0–5)</p>	<p>The student:</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 style="text-align: right;">(6–8)</p>	<p>The student:</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 style="text-align: right;">(9–11)</p>	11

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO2, 4)	<p>The student:</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 style="text-align: right;">(0–5)</p>	<p>The student:</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 style="text-align: right;">(6–8)</p>	<p>The student:</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 style="text-align: right;">(9–10)</p>	10

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO2, 4)	<p>The student:</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 style="text-align: right;">(0–4)</p>	<p>The student:</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 style="text-align: right;">(5–6)</p>	<p>The student:</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 style="text-align: right;">(7–8)</p>	8
(d) (AO1, 2, 3)	<p>The ebook:</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>While working on the ebook, the student adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(0–9)</p>	<p>The ebook:</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>While working on the ebook, the student adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(10–13)</p>	<p>The ebook:</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>While working on the ebook, the student adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(14–17)</p>	17

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO1, 3)	In creating the ebook, the student: <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. (0–5)	In creating the ebook, the student: <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 ebook to ensure that it functions correctly. (6–8)	In creating the ebook, the student: <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 ebook to ensure that it functions correctly and is fully fit for purpose. (9–10)	10
(f) (AO4)	The student makes some relevant evaluative comments about key features of: <ul style="list-style-type: none"> the ebook their own performance. (0–1)	The student makes some relevant evaluative comments about key features of: <ul style="list-style-type: none"> the ebook their own performance, incorporating feedback from others. (2)	The student evaluates key features of: <ul style="list-style-type: none"> the ebook their own performance, incorporating feedback from others and suggesting at least one sensible improvement. (3–4)	4
Total marks				60

Assessment guidance

The guidance should be used in 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, students 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.

Student should have described five different types of online service (see *What students need to learn, Section 1.2*). Students 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. Students must also have made an evaluative comment about one of the services described.

The student 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, students 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, students 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, e.g. 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, i.e. those that collectively will give a good overview of the current scope and limitations of the internet as a whole.

Students 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 student 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, students 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, students 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, e.g. 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.

Students 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, students will have drawn from this some general conclusions about the current scope and limitations of the internet as a whole.

The student 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, students 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, students 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.

Students should have described how ICT affects five different aspects of people's lives (see *What students need to learn, Section 1.3*). Students 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.

Students must have identified a benefit and a drawback.

For full marks in this band, students 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, students 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, e.g. newspaper or magazine articles, textbooks, interviews, personal experience, broadcasts, etc.) Students will have needed some prompting to choose appropriate aspects to investigate, i.e. those that collectively will give a good overview of life in the Information Age.

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

Students must have described some benefits and drawbacks.

For full marks in this band, students 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, students must have 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, e.g. 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.

Students 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.

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

For full marks in this band, students 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, students must have described three factors contributing to the digital divide and one measure being taken to bridge the gap (see *What students need to learn, Section 1.4*). Students 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.

Students 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, students 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, students 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.

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

For full marks in this band, students 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, students 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 global and local.

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

For full marks in this band, students 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, students must have designed and produced an ebook which includes all the work produced for (a), (b) and (c) and can be viewed on screen. However, it is likely that students will not have fully taken into account the constraints and opportunities of the medium, e.g. the ebook 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 ebook must also offer the user some means of moving from page to page. However, there is likely to be limited choice, e.g. it may only be possible to go from page to page sequentially rather than being able to jump to any page in any order.

While working on the ebook, students will have needed frequent reminders to adhere to relevant standard ways of working, e.g. file management, copyright, acknowledgement of sources, etc.

For full marks in this band, students must have demonstrated some awareness of purpose by, for example adding a title page and introduction to the ebook, 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, students must have designed and produced an ebook which includes all the work produced for (a), (b) and (c) and is designed to be read on screen, e.g. 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 ebook must also offer the user a means of navigating from page to page, sequential and non-sequential.

While working on the ebook, students will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, students must have demonstrated some awareness of both purpose and audience. In addition, the ebook must present a coherent/consistent whole rather than a jumble of different styles and content.

Mark band 3
(14–17 marks)

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

While working on the ebook, students will have demonstrated that they are fully conversant with standard ways of working and understand their relevance. Students will have adhered to them without being reminded.

For full marks in this band, students must have created an ebook that effectively conveys a picture of life in the Information Age and is fully fit for purpose and audience, e.g. 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, students 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 ebook. However, the range of components used is likely to be limited to just text and graphics and some of the components may be inappropriate, e.g. 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.

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

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

For full marks in this band, the ebook must be largely functional and include more than one suitable original multimedia component.

Mark band 2
(6–8 marks)

To be eligible for mark band 2, students 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.

Students must also have selected and used appropriate software tools to produce the ebook and have carried out some testing.

For full marks in this band, students must have carried out sufficient testing, to ensure that the ebook functions correctly in all anticipated circumstances.

Mark band 3
(9–10 marks)

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

Students must have used appropriate software competently and carried out enough testing to ensure that the ebook functions correctly in all circumstances.

For full marks in this band, students 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, students must have made some relevant evaluative comments about key features of their ebook, such as content, structure, screen layout, use of multimedia components, presentation techniques, ease of navigation, consistency, accessibility, fitness for purpose/audience, etc.

Students must also have commented on their own performance.

Mark band 2
(2 marks)

To be eligible for mark band 2, students must have taken account of feedback from others when evaluating key features of their ebook.

Students must also have commented on their own performance.

Mark band 3
(3 marks)

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

For full marks in this band, students must have given a well-rounded evaluation of both the ebook 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 student 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation, etc.

The *Assessment guidance* section gives 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 ebook – assessment evidence (d) and (e).

Students will need to be aware of the key digital technologies and services available today. Students 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 students. These are real, current issues which students should find interesting and have no difficulty finding information about.

Vocational context

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

Standard ways of working

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

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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

- the ebook
- an evaluation of the ebook and own performance.

Teaching and learning strategies

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

Personal audit

One way of introducing students 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, students 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 student 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.

Students 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 overdependence on the internet.

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

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

The digital divide

Students should consider the negative aspects of the so-called 'digital divide' from a global and local perspective. Local, in this case, can mean own community, region or country. Since students 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, students 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 present to the other groups.

Students should be encouraged to look at the work of organisations which gives refurbished computers to developing countries. 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 ebook

The research and the conclusions students reach while working on assessment evidence requirements (a), (b) and (c) should be presented in the form of an ebook. Ebooks themselves are a product of the digital world we live in. This unit gives students an opportunity to explore the benefits and limitations of ebooks.

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

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

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

Some of the ebooks students may come across use specialist software to emulate features of traditional books such as the turning of pages. Students are not expected to do anything as complicated as this. Their ebook 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.

Students should ensure their ebook content fulfils the requirements of assessment evidence (a) to (d). Assessment evidence (e) asks students to reflect on their ebook product and produce evaluative comments.

Students should use software with appropriate multimedia and publishing features to produce their ebooks (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 students 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

Students must review both the quality of their ebook 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. Students 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 qualification.

Links

Other units

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

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

Students should have access to:

- desktop/laptop computers, ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - 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)
- operating system
- software:
 - word processing, e.g. Microsoft Word, OpenOffice Writer
 - presentation, e.g. Microsoft PowerPoint, OpenOffice Impress
 - web authoring, e.g. Adobe Dreamweaver, Quanta+, Nvu, Microsoft Publisher
 - graphics, e.g. CorelDraw, Adobe Photoshop Elements.

Textbooks

Garrand T – *Writing for Multimedia and the Web*, 3rd Edition (Focal Press, 2006) ISBN 9780240808222

Geer S – *Essential Internet* (Economist Books, 2003) ISBN 9781861975409

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

news.bbc.co.uk/1/hi/sci/tech/466651.stm

Multimedia

Salvation is Cheap (example of a multimedia ebook), Andie Brockie

www.andybrockie.co.uk/projects/mendel-cheap.html

Examples of e-zines

www.ezine-dir.com

Other resources

Students should be encouraged to keep up to date by reading some of the many computer/web magazines available, such as *Web User* published by Dennis Publishing and *net magazine*, published by Future Publishing. In addition to topical information, most of these magazines give handy hints and tips, ideas for projects, free software and inspection copies, etc.

Unit 2: The Digital Economy

IAL compulsory unit

Internally assessed

Unit description

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 students 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
- 24/7 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
- dispatch 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
- spyware.

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 gain 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 practise the internet research skills introduced in *Unit 1: The Information Age*.

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 in 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

While 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, e.g. 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 spellcheck, 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 students to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO1, 2, 4) QWC (i-iii)	<p>The student:</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 style="text-align: right;">(0–9)</p>	<p>The student:</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 style="text-align: right;">(10–14)</p>	<p>The student:</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 style="text-align: right;">(15–18)</p>	18

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO1, 2, 3)	<p>The student 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 style="text-align: right;">(0–5)</p>	<p>The student 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 style="text-align: right;">(6–8)</p>	<p>The student 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 style="text-align: right;">(9–10)</p>	10
(c) (AO2, 4)	<p>The student 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 style="text-align: right;">(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 style="text-align: right;">(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 style="text-align: right;">(6)</p>	6

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO1, 2, 3)	<p>The student:</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 style="text-align: right;">(0–10)</p>	<p>The student:</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 information and identify some significant trends. <p style="text-align: right;">(11–15)</p>	<p>The student:</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 style="text-align: right;">(16–20)</p>	20

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO4)	<p>The student makes some evaluative comments about:</p> <ul style="list-style-type: none"> the performance of the database their own performance in the unit. <p style="text-align: right;">(0–3)</p>	<p>The student 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 style="text-align: right;">(4–5)</p>	<p>The student 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 style="text-align: right;">(6)</p>	6
Total marks				60

Assessment guidance

The guidance should be used in 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, students 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 (see *What students need to learn, Section 2.3*). Students 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 student 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, students 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, students must also have said something about their effectiveness. (*What students need to learn, Sections 2.5-2.6*).

Mark band 2 (10–14 marks)

To be eligible for mark band 2, students 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. Students must also have evaluated the effectiveness of some of the features they describe. In the evaluation of the transactional website, the student 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, students 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, students must have selected a site to investigate without any prompting and produced a comprehensive description of the site's design, using well-chosen illustrations. Students 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 student 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, students 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, students 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 students 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, students 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, students must have produced clear and accurate diagrams.

For full marks in this band, students 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, students must have produced effective diagrams that are easy to understand.

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

Mark band 2 (4–5 marks)

To be eligible for mark band 2, students 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, students 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, students 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, students 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, students 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, students 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. Students must have imported and checked the given data. They will have produced evidence of having manipulated the data set to include sorting on multiple fields in order to group and analyse data, and searched on multiple fields in 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, students 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, students must have studied the data set carefully before creating a relational database, properly customised and including appropriate validation, to hold it. Students will have carried out extensive testing before importing the data and will 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, students 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, students must have made at least one relevant evaluative comment about the performance of the database they have created. They must also have commented on their own performance in the unit.

For full marks in this band, students must have commented on several aspects of 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, students must have taken account of feedback from others when evaluating the performance of the database they have created and their own performance in the unit.

For full marks in this band, students 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, students 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 ecommerce. Students look 'beneath the surface' of a transactional website. If they study *Unit 1: The Information Age* 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 students 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 students 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation, etc.

The *Assessment guidance* section gives 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. Students 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.

Students 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 students to undertake work experience. However, students will benefit from learning about industry practices in relation to the design and day-to-day running of transactional websites. Ideally, students 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, students must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, students must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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

- a description/evaluation of the design of the selected transactional website. Note – students 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

What students need to learn, Section 2.1 asks students 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. Students 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, students 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 students 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, i.e. 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. Students 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, working with a 'real' business organisation operating a transactional website will be extremely beneficial in helping students to fully understand how the site works and all the back-office processes involved.

Students should begin by exploring a range of transactional websites, both commercial and public service, before deciding which one to investigate in depth. Students 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, students would benefit from considering online supermarket sites. These sites allow students to register and to carry out many functions without the need to subscribe or pay for using the facilities. In addition, many students will be familiar with supermarket loyalty schemes, either from personal/family experience or from their KS4 studies.

Students 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 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 students 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. Students 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.

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

Back-office processes

Students 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 an item is being purchased. This will also include the flow of information to third parties involved in the processes. Students should use flow charts 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. Students 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 students to design a database to hold a given data set collected from a transactional website. Data sets should be given to students in a single file in csv format and should be large enough to contain trends. Students will use database tools to design and create the database, test the created structure, import the data set 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.

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

Students 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. Students are not required to produce front ends and forms, they should examine *What students need to learn*, Sections 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*.

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

Students should have access to:

- desktop/laptop computers, ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - sound output (16-bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- operating system
- software:
 - word processing, e.g. Microsoft Word, OpenOffice Writer
 - database, e.g. Microsoft Access, SQL, MySQL
 - drawing, e.g. Microsoft Visio, OpenOffice Draw
 - html authoring software, pdf converter.

Textbooks

Geer S – *Essential Internet* (Economist Books, 2003)
ISBN 9781861975409

Heathcote F R – *Further Access 2000–2002* (Payne-Gallway, 2004) ISBN 9781903112984

Websites

Good examples of commercial websites include:

www.amazon.co.uk

www.boots.com

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.nhs.uk

Other resources

Students should be encouraged to keep up to date by reading some of the many computer/web magazines available, such as *Web User* published by Dennis Publishing and *net magazine*, published by Future Publishing.

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

Unit 3: The Knowledge Worker

IAL compulsory unit

Externally assessed

Unit description

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 qualifications that are available and the entrance requirements. You may have a personal preference for a particular qualification, but other factors may lead you to choose another.

In this Information Age, computers and communications technology give many of us 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: The Digital Economy*, 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.

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 students 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 give you 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, e.g. 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 make recommendations for the future.

3.7 Computer modelling

You will need to practise using spreadsheet models to help you make decisions. However, 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 and consider 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, e.g. absolute and relative cell referencing, adding data and text to a chart
 - formatting data, e.g. colours, shading and borders, headers and footers
 - using formulae and functions, e.g. mathematical, statistical, financial and relational
 - validating and checking data, e.g. errors in formulae, accuracy of results
 - analysing and interpreting data, e.g. filters, subtotals
 - presenting information, e.g. 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, e.g. adding a spreadsheet graph/chart to a word-processing document
 - formatting documents
 - creating document layouts, e.g. 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, e.g. adding a spreadsheet graph/chart to a presentation
 - checking and proofreading presentations.

3.13 Standard ways of working

While 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, e.g. 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 spellcheck, 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
 - correctly labelling 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 2 hour and 30 minute examination and must be taken in one sitting during a designated five-day window.

Working under exam conditions, 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 extract 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, 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 Pearson website in advance of each examination series.

Vocational context

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

Pre-release time

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

Teaching and learning strategies

Standard ways of working

Students 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.

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

Students 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 students to explore alternatives in order to aid their decision. Students 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), or the consideration of qualifications/institutions for higher education.

Working in groups may benefit students at this stage, as it will give them the opportunity to present their decisions to others, 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. Students 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?

While not required to create spreadsheet models for themselves, students will need to be able to use spreadsheet software effectively (see *What students need to learn*, Section 3.12).

Links

Other units

This unit has close links to *Unit 1: The Information Age* and *Unit 2: The Digital Economy*. Students 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 IA2, especially in *Unit 5: Managing ICT Projects*.

Unit 7: 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

Students should have access to:

- desktop/laptop computers, ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - sound output (16-bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- operating system
- software:
 - spreadsheet, e.g. Microsoft Excel, OpenOffice Calc
 - word processing, e.g. Microsoft Word, OpenOffice Writer
 - presentation, e.g. Microsoft PowerPoint, OpenOffice
 - mind mapping, e.g. Inspiration.

Textbooks

Edwards J S and Finley P N – *Decision Making with Computers: The Spreadsheet and Beyond* (Financial Times/Prentice Hall, 1997) ISBN 9780273621287

Websites

Examples of models:

www.bizpeponline.com/index.html – biz pep Business Support Software

Unit 4: Using Database Software

IAL compulsory unit

Externally assessed

Unit description

In *Unit 2: The Digital Economy*, you used database software to organise and to interrogate structured information. You saw how large organisations rely on databases to manage their information and give them 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, while 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 in 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 students need to learn

4.1 Database applications

In *Unit 2: The Digital Economy*, 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.

4.2 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.

4.3 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.

4.4 Data modelling

You are already familiar with the concept of a model. In *Unit 3 The Knowledge Worker*, 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.

4.5 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, e.g. limited length, unlimited length, memo
- number, e.g. integer, auto record number, floating point
- Boolean, e.g. true and false, Y and N
- date, e.g. dd/mm/yy, dd month
- time, e.g. 24-hour clock, hh/mm/ss
- currency, e.g. 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 know 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.

4.6 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.

4.7 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 on screen 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.

4.8 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 demonstrate that you did not lose sight of the functional specification you identified in *What students need to learn*, Section 4.2. It should also include 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.

4.9 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.

4.10 Standard ways of working

While 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, e.g. 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 spellcheck, 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 exam conditions, 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 students 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 Pearson 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 Pearson.

Delivering this unit

General information

Assessment requirements

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

Vocational context

This unit has a user focus. It is important that students 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 students with pre-release material. It is important that students use that time to investigate possible database structures to fit the scenario and create practice data to test these structures.

Teaching and learning strategies

Standard ways of working

Students 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.

Students should be reminded of the work they did 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.

Students 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 learned.

Students 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 students will need to supply programmed solutions.**

Students 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.

Students need to have practised developing parts of a system and simple systems before the examination.

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 students undertake in this unit.

Assessors may want to use this unit as a vehicle for introducing some of the project management techniques covered in *Unit 5: 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

Students should have access to:

- desktop/laptop computers ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- operating system
- software:
 - relational database software, e.g. Microsoft Access, SQL, MySQL

Books

Heathcote P M – *Successful ICT Projects in Access*, 3rd Edition (Payne-Gallway, 2002) ISBN 9781903112731

Unit 5: Managing ICT Projects

IAL compulsory unit

Internally assessed

Unit description

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 learned 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 qualification 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 qualification. It assumes that you already have some experience of developing a software product, possibly though your work on *Unit 4: Using Database Software*.

What students need to learn

5.1 Examples of projects

As you know from your own experience, a project is not a never-ending process. It runs for a predetermined 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.

5.2 Stakeholders

In 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.

5.3 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.

5.4 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, i.e. a rough estimate of what will be delivered when
- resource requirements, i.e. 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, i.e. the product(s)/service(s) to be produced
- the quality criteria that the deliverables must meet
- the target completion date.

5.5 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.

5.6 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
- handover to customer.

You will learn how to breakdown each phase into a number of activities, estimate how much time will be needed for each and identify any dependencies between activities.

5.7 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 effect 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 over time by capturing and storing copies of the plan at key points in the project (known as baselining).

You will learn the importance of baselining project plans at regular intervals to create a detailed project history.

5.8 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.

5.9 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.

5.10 Reviews

One way of checking that a project is on track 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 life cycle 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 has 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.

5.11 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 learned. 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.

5.12 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.

5.13 Standard ways of working

While 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, e.g. 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 spellcheck, 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 students to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO2)	<p>An outline project proposal that:</p> <ul style="list-style-type: none"> provides some information, but is 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 style="text-align: right;">(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 style="text-align: right;">(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 style="text-align: right;">(6)</p>	6

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO1, 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 identities some potential risks. <p>Evidence that some limited use was made of the plan to monitor and communicate progress.</p> <p style="text-align: right;">(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 identities 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 style="text-align: right;">(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 identities 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 style="text-align: right;">(10–12)</p>	12

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO3, 4)	<p>During the project, the student:</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 style="text-align: right;">(0–10)</p>	<p>During the project, the student:</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 style="text-align: right;">(11–15)</p>	<p>During the project, the student:</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 style="text-align: right;">(16–20)</p>	20

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO1, 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) (AO4) 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 student 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 learned strengths and weaknesses of their own performance as a project manager. <p>The student 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/decisions made strengths and weaknesses of their own performance as a project manager, identifying areas for improvement. <p>The student 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>	<p style="text-align: right;">12</p>
Total marks				60

Assessment guidance

The guidance should be used in 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, students must have produced an outline project proposal providing some of the required information (*What students need to learn, Section 5.3*) and an approved project definition document (Section 5.4). However, the proposal will not provide sufficient information to enable senior management to make a decision.

For full marks in this band, students 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, students 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, students must have drawn up a project definition document that accurately reflects this decision.

For full marks in this band, students must have considered the likely impact of their proposal on others 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, students 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. Students 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, students must have produced a 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 student 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.

Students must also have updated the plan from time to time during 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, students 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, students 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, students 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.

Students 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, students 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, students must have made some attempt to manage the project, though they will have needed considerable support. 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, students must have communicated with stakeholders – formally and informally – at intervals throughout the project and organised and run different types of review meetings, e.g. peer, formal management, end of project.

Mark band 2
(11–15 marks)

To be eligible for mark band 2, students 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, students 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, students 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, students 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, students 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, students 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, students 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, students must have made some use of feedback from the end-of-project review meeting to comment on the success of the project and their own performance as a project manager. The student 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, students 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, students 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 student 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, students must have identified key lessons learned and assessed the strengths and weaknesses of their own performance.

Mark band 3 (10–12 marks)

To be eligible for mark band 3, students 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 learned. The student 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, students 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 students 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation.

The *Assessment guidance* section gives 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.

Students will need to use project management software for this unit.

Vocational context

This unit has a user focus. Ideally, students 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, students must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, students must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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, e.g. project reports, agendas, minutes, diaries, project logs
- the software product, plus any other deliverables and 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 their 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, e.g. *Unit 6: Using Multimedia Software*, *Unit 7: Using Spreadsheet Software* or *Unit 8: Customising Applications*. Students will need to have had some experience of developing software before attempting to produce a detailed project plan.

If combining the unit with another, students must ensure that each unit is individually evidenced with clear links to the relevant unit strands.

Although this is not a team project, students 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, e.g. the teacher could act as the senior manager, a fellow student as a reviewer and other people role play the customer and end user(s).

When researching their project proposal, students should consider carefully the impact that the proposed software will have on others. The new product could impact on working practices.

The projects students 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 students 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 ebook or an eportfolio
- a website for an organisation.

Students 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 students for the purposes of formative review. Each student 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 students 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 students to receive peer support while 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

Students 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

Students should use project management software to draw up an initial plan using the phases in *Section 5.6*. Gantt charts are a good way of depicting the plan in a graphical format and incorporating much of *Section 5.7*. 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. Students 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 students should be able to categorise whether they are likely to happen or not. Students need to understand how the plan is used at review meetings with stakeholders to ensure the project is kept on track.

Communicating with stakeholders

Students 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 student 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 student in their role as project manager. Students 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 student 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 learned. Feedback from this meeting is essential in order for assessment evidence (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 while 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 screenshots of email inbox and sent items.

Delivering the project

The student must provide evidence that a software product has been produced in accordance with the project plan and that the objectives specified in the project definition have been met. Evidence that the product has been produced using project management methods should be found in the plans and in communications with stakeholders. The product needs to be delivered to the client on the target handover date, as set in the definition of scope forming the basis of the plan and updates. The student will formally hand over the project, including 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 student 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. Students should produce a thoughtful evaluation which assesses the strengths and weaknesses of the project, the project management methods and the student's own performance as a project manager.

Links

Other units

The project management skills and techniques that students 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

Students should have access to:

- desktop/laptop computers ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - sound output (16-bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- operating system
- software:
 - project management, e.g. Microsoft Project (note – there are many open source applications available to download from the internet)
 - word processing, e.g. Microsoft Word, OpenOffice Writer
 - presentation, e.g. Microsoft PowerPoint, OpenOffice Impress.

Textbooks

Heathcote T – *Edexcel GCE in Applied ICT: A2 Single Award* (Edexcel, 2006) ISBN 9781903133781

Johnston A K – *A Hacker's Guide to Project Management*, 2nd Edition (Butterworth Heinemann, 2003) ISBN 9780750657464

Watson M – *Managing Smaller Projects*, 2nd Edition (Multi-Media Publications Inc, 2006) ISBN 9781895186857

Websites

www.ganttproject.biz – open source project management software

Unit 6: Using Multimedia Software

IAL optional unit

Internally assessed

Unit description

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 students need to learn

6.1 Applications of multimedia

You have already gained some experience of producing a multimedia product – your ebook for *Unit 1: The Information Age*. 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.

6.2 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.

6.3 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 become 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.

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.

6.4 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.

6.5 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.

6.6 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.

6.7 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, e.g. 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.

6.8 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.

6.9 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.

6.10 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.

6.11 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.

6.12 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 the following.

- 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.

6.13 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.

6.14 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 critically assess your own performance on a project 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.

6.15 Standard ways of working

While 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, e.g. 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, compatability 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...' 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 students to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO2, 3)	A functional specification that: <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 style="text-align: right;">(0–2)</p>	A functional specification that: <ul style="list-style-type: none"> describes the purpose of the product, the context and intended audience explains what it must do. <p style="text-align: right;">(3)</p>	A functional specification that: <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 style="text-align: right;">(4)</p>	4

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO1, 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) (AO1, 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...’ instructions, giving an indication of how to install and use the product.</p> <p>While working on this project, the student adheres to relevant standard ways of working, but needs frequent prompting.</p> <p>(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...’ instructions, enabling a competent user to install and use the product.</p> <p>While working on this project, the student adheres to relevant standard ways of working, with only occasional prompting.</p> <p>(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...’ instructions enabling a novice user to install and use the product.</p> <p>While working on this project, the student adheres to relevant standard ways of working, independently.</p> <p>(15–18)</p>	18
(d) (AO4)	<p>Evidence of some limited formative and summative testing, but not sufficient to ensure that the multimedia product works as intended.</p> <p>(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>(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>(7–8)</p>	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO4) 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 student 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 student 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>A 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 student 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>	<p style="text-align: right;">14</p> <p style="text-align: right;">Total marks</p> <p style="text-align: right;">60</p>

Assessment guidance

The guidance should be used in 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, students 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, students 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, students must have outlined what the product will 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, students 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, students 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.

Students 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.

Students 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, students 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.

Students 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, students must have paid attention to how users will interact with the product (*What students need to learn, Section 6.6*). 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, students 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, students 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, students 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.

While working on the multimedia product, students will have needed frequent reminders to adhere to relevant standard ways of working, e.g. file management, copyright, acknowledgement of sources.

For full marks in this band, the product must meet most of the requirements. Students must also have produced some basic 'getting started...' instructions covering system requirements and installation procedures.

Mark band 2 (10–14 marks)

To be eligible for mark band 2, students 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. Students must also have provided some 'getting started...' instructions.

While working on the multimedia product, students will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, students must have produced a product that is easy to use and is accompanied by detailed 'getting started...' instructions, enabling a competent user to install and use it.

Mark band 3 (15–18 marks)

To be eligible for mark band 3, students 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...' instructions that would enable even a novice user to install and use the product.

While working on the multimedia product, students 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, students 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, students 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, students 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, students 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, students 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, students must show that they adopted a thorough and systematic approach to testing and involved other people.

For full marks in this band, students 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, students 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 student 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, students must have commented on the effectiveness of the solution.

Mark band 2
(8–11 marks)

To be eligible for mark band 2, students 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 student 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, students 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, students 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 student 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, students 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 students 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation, etc.

The *Assessment guidance* section gives 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.

Students will need to have access to fully featured multimedia authoring software.

Vocational context

This unit has a user focus. It is not essential that students undertake work experience. However, students 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 run online design workshops and seminars which students might find useful.

Standard ways of working

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

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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...' instructions for users
- an evaluation of the product and own performance.

Teaching and learning strategies

Students 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 students' 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 jukebox, a web promotion, etc.

Examining examples of multimedia products online such as subject tutorials, a revision site with a quiz style assessment, an ebook or an e-learning site will be beneficial in developing students' understanding of how an interactive multimedia product may be used to enhance communication.

Functional specification

From a given set of requirements students 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 students 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. Students 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 students 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 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 students will need to learn.

Students will need to learn elements of multimedia design, for example the rule of three in choosing colour and font, the need to develop a coordinated 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 ensure the product works as intended. Students 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. Students should explain and justify any changes made to the original specification.

Students also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal, students 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 students did in *Unit 1: The Information Age*.

Production of a multimedia product could be used as the focus for *Unit 5: 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

Students should have access to:

- desktop/laptop computers ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - 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)
- operating system
- software:
 - office software, e.g. Microsoft Office
 - web authoring, e.g. Adobe Dreamweaver
 - graphics, e.g. Adobe Photoshop, CorelDraw, Adobe Fireworks
 - animation, e.g. Adobe Animate CC
 - video editing software
 - sound editing software
 - image manipulation software.

Textbooks

Aho K – *Multimedia Projects for Macromedia Flash MX and Dreamweaver MX* (Course Technology, 2002)
ISBN 9780619055141

Chapman N and Chapman J – *Digital Multimedia*, 3rd Edition
(John Wiley & Sons, 2009) ISBN 9780470512166

Elsom-Cook M – *Principles of Interactive Multimedia* (McGraw-Hill, 2001) ISBN 9780077096106

Hart J – *The Art of the Storyboard*, 2nd Edition
(Focal Press, 2007) ISBN 9780240809601

Mitra S and Bhatnagar G – *Introduction to Multimedia Systems* (Academic Press, 2001) ISBN 9780125004527

Tapley S, Pickle S, Heins J and Dharkar A – *Macromedia Studio 8 Step-by-step* (Course Technology, 2005)
ISBN 9780619267094

Vaughan T – *Multimedia: Making It Work*, 8th Edition
(McGraw-Hill Osborne, 2011) ISBN 9780071748469

Websites

Examples of multimedia products:

www.learnbrite.com

Unit 7: Using Spreadsheet Software

IAL optional unit

Internally assessed

Unit description

In *Unit 3: The Knowledge Worker*, 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 students need to learn

7.1 Spreadsheet applications

As you discovered in *Unit 3: the Knowledge Worker*, 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. While doing so, you should make a note of any good or not-so-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.

7.2 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.

7.3 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.

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.

7.4 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.

7.5 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.

7.6 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.

7.7 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, e.g. 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.

7.8 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.

7.9 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 the following.

- 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.

7.10 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.

7.11 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.

7.12 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, e.g. exporting and importing data, linked objects
- organising data, e.g. linked sheets, lookup tables
- entering and editing data, e.g. absolute and relative cell referencing, inserting data into multiple cells simultaneously, using multiple worksheets
- formatting, e.g. conditional formatting, cell formats that match the data format
- using functions and formulae to solve complex problems, e.g. lookups, arguments, arrays, selection
- validating and checking data, e.g. using formulae to determine valid entries for cells
- analysing and interpreting data, e.g. pivot tables, data maps, adding messages to data
- presenting information, e.g. views, pivot table reports, different types of graphs and charts
- limiting access, e.g. hide and protect cells
- customising and automating, e.g. templates, macros, forms, menus.

7.13 Standard ways of working

While 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, e.g. 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 spellcheck, 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 students to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO2, 3)	A functional specification that: <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. (0–2)	A functional specification that: <ul style="list-style-type: none"> fully describes the problem explains what the spreadsheet must do. (3)	A functional specification that: <ul style="list-style-type: none"> fully describes the problem explains what the spreadsheet must do and specifies measurable success criteria. (4)	4

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO1, 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 style="text-align: right;">(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 style="text-align: right;">(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 style="text-align: right;">(13–16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
<p>(c) (AO1, 3)</p>	<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>While working on the spreadsheet the student adheres to relevant standard ways of working, but needs frequent prompting.</p> <p style="text-align: right;">(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>While working on the spreadsheet, the student adheres to relevant standard ways of working, with only occasional prompting.</p> <p style="text-align: right;">(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>While working on the spreadsheet the student adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(15–18)</p>	18

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO3, 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) (AO4) 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 student 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 student 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 student 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>	<p style="text-align: right;">14</p>
Total marks				60

Assessment guidance

The guidance should be used in 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, students 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, students 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, students must have given 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, students 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, students 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, e.g. 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).

Students 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, students 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, students 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. Students 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.

Students 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, students must have thought about the user interface and included some features designed to make their spreadsheet solution easy to use. Students 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, students 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. Students 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, students 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. Students 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, students 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.

While working on the spreadsheet, students will have needed frequent reminders to adhere to relevant standard ways of working, e.g. file management, quality assurance, safe working.

For full marks in this band, the working solution must meet most of the requirements.

Students 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, students 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.

While working on the spreadsheet, students will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, students 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, students 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.

While working on the spreadsheet, students 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, students 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, students 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, students 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, students 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, students' 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, students' 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, students 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, students 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 student 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, students must have commented on the effectiveness of the solution.

Mark band 2

(8–11 marks)

To be eligible for mark band 2, students 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 student 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, students 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, students must have produced a well-rounded and critical evaluation of 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 student 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, students 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 students 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, mastery of software tools, depth of analysis/evaluation, etc.

The *Assessment guidance* section gives 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.

Students will need to have access to fully featured spreadsheet software.

Vocational context

This unit has a user focus. It is not essential that students 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, students must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, students must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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

Students are required to design and produce a complex spreadsheet. It must have a clear purpose and be sufficiently complex in nature to challenge students' 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 macro navigation, validated forms controls for input, date functions, combination functions and formulae, statistical analysis functions and facilities, e.g. pivot tables and charts, scenarios and scenario summary reports.

Students will need to develop and practise their spreadsheet skills before tackling the final spreadsheet project.

Functional specification

From either an end user client (preferably) or a provided outline of a situation, students 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 used as a yardstick to measure the success of the project.

If students 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. Students 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 students 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 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 students 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. Students 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. Students should explain and justify any changes made to the original specification.

Students also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal, students 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 spreadsheet modelling skills developed in *Unit 3: The Knowledge Worker*.

Production of a complex spreadsheet model could be used as the focus for *Unit 5: 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

Students should have access to:

- desktop/laptop computer ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - CD/DVD
 - some form of rewritable media
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
- printing facilities
- sufficient individual storage space
- internet access (broadband)
- operating system
- software (macro enabled):
 - spreadsheet, e.g. Microsoft Excel.

Textbooks

Edwards J S and Finley P N – *Decision Making with Computers: The Spreadsheet and Beyond* (Financial Times/Prentice Hall, 1997) ISBN 9780273621287

Unit 8: Customising Applications

IAL optional unit

Internally assessed

Unit description

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 qualification. It is recommended that you study *Unit 4: Using Database Software* before starting this unit.

What students need to learn

8.1 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 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.

8.2 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.

8.3 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.

8.4 Designing routines

You cannot simply launch into producing a custom solution to a problem without doing some planning 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 become 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.

8.5 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.

8.6 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.

8.7 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.

8.8 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.

8.9 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.

8.10 Program documents

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.

8.11 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 application's 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.

8.12 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.

8.13 Standard ways of working

While 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, e.g. 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 spellcheck, 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 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 students to be assessed on Quality of Written Communication (QWC) – (i-iii).

Assessment criteria

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(a) (AO2, 3)	A functional specification that: <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 style="text-align: right;">(0–2)</p>	A functional specification that: <ul style="list-style-type: none"> • fully describes the problem • explains what the custom solution must do. <p style="text-align: right;">(3)</p>	A functional specification that: <ul style="list-style-type: none"> • fully describes the problem • explains what the custom solution must do and specifies measurable success criteria. <p style="text-align: right;">(4)</p>	4

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(b) (AO1, 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 style="text-align: right;">(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 style="text-align: right;">(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 style="text-align: right;">(13–16)</p>	16

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(c) (AO1, 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>While working on the custom solution, the student 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>While working on the custom solution, the student 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>While working on the custom solution, the student adheres to relevant standard ways of working, independently.</p> <p style="text-align: right;">(15–18)</p>	18

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(d) (AO3, 4)	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. (0–4)	Evidence of systematic formative and summative testing sufficient to ensure that the custom solution as a whole works as intended under most normal conditions. (5–6)	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. (7–8)	8

	Mark band 1	Mark band 2	Mark band 3	Mark awarded
(e) (AO4) 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 student 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 student 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 student 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>	<p style="text-align: right;">14</p>
Total marks				60

Assessment guidance

The guidance should be used in 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, students 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, students 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, students must have given 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, students 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, students 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, e.g. appropriate use of a one-to-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, e.g. using storyboards.

Students 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, students 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, students 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.

Students 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, students 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, students 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. Students 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, e.g. 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, students must have produced detailed designs for each form 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, students 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.

While working on the custom solution, students will have needed frequent reminders to adhere to relevant standard ways of working, e.g. file management, quality assurance, safe working.

For full marks in this band, the working solution must meet most of the requirements. In addition, students 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, students 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.

While working on the custom solution, students will have needed only occasional reminders to adhere to relevant standard ways of working.

For full marks in this band, students 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, students 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.

While working on the custom solution, students 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, students 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, students must have carried out some testing of most of the functions identified in assessment evidence (b). However, they will have done little – if anything – to check that the solution as a whole works as intended.

For full marks in this band, students 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, students 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, students' 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, students' 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, students 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, students 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 student 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, students 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, students must have produced a well-rounded evaluation, identifying both strengths and weaknesses of the custom solution and their own performance/skill level.

The student 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, students must have considered alternative solutions and justified the use of coding.

Mark band 3
(12–14 marks)

To be eligible for mark band 3, students must have produced a well-informed and critical evaluation, drawing on feedback from others.

The student 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, students 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. Students 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. *Unit 2: The Digital Economy* and *Unit 3: The Knowledge Worker* 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. Students will find it advantageous to study *Unit 4: Using Database Software* beforehand, since it will give them the necessary in-depth knowledge of database software. Students who want to focus on producing custom solutions using spreadsheets would be well advised to study *Unit 7: Using Spreadsheet Software* first.

Assessment requirements

The *Assessment evidence* section is addressed to students 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. While the requirements remain the same across the mark bands, performance is differentiated by the quality of the student's response, e.g. level of detail provided, quality of output, mastery of software tools, depth of analysis/evaluation, etc.

The *Assessment guidance* section gives 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.

Students 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 in Access or Excel.

Vocational context

This unit has a user focus. It is not essential that students 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, students must work safely and adhere to relevant legislation and codes of practice. To be eligible for higher mark bands, students must use standard ways of working to manage files, enhance personal effectiveness and quality assure their work.

Eportfolio

Students 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 a web browser and be in a format appropriate for viewing at a resolution of 1024×768 pixels.

Students 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.

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

Students 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, e.g. 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.

Students 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.

Students 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, students 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 students 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 students normalise/classify data, e.g. requiring related tables or linked sheets. A collection of small, unrelated tasks would not be appropriate.

Students are not expected to tackle projects requiring both spreadsheet and database programming as part of their solution.

Students 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 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 students will need to learn.

Students 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

Students 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.

- Students also need to evaluate their own performance and assess their current level of competence. As part of this self-appraisal, students should consider what else they need to know or be able to do and identify further training needs.

Links

Other units

Students who take this unit must have a good grasp of applications software, particularly databases and spreadsheets. *Unit 2: The Digital Economy* and *Unit 4: Using Database Software* provides the necessary grounding in DBMS application software. *Unit 3: The Knowledge Worker* provides an introduction to spreadsheet software. Students taking the Advanced Level Double Award might also wish to study *Unit 7: Using Spreadsheet Software*.

Production of a custom solution could be used as the focus for *Unit 5: 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

Students should have access to:

- desktop/laptop computers ideally with the following minimum specification:
 - 256 MB memory
 - 1.7 Ghz Intel processor or equivalent
 - 40 GB hard drive
 - video card with 32 MB memory
 - keyboard and pointing device
 - colour, high resolution monitor, capable of supporting 1024×768 resolution
 - sound output (16-bit soundcard, output through speakers/headphones)
- printing facilities
- sufficient individual storage space
- operating system
- software:
 - spreadsheet, e.g. Microsoft Excel
 - database, e.g. Microsoft Access.

Textbooks

Bullen S et al – *Excel 2002 VBA Programmer's Reference* (Wiley Publishing, Inc., 2001) ISBN 9780764543715

Cardoza P et al – *Access 2003 VBA Programmer's Reference* (Wiley Publishing, Inc., 2004) ISBN 9780764559037

Day A and Heathcote P M – *Tackling Computer Projects in Access with VBA*, 4th Edition (Payne-Gallway, 2004) ISBN 9781904467533

Edwards J S and Finley P N – *Decision Making with Computers: The Spreadsheet and Beyond* (Financial Times/Prentice Hall, 1997) ISBN 9780273621287

Gosnell D – *Beginning Access 2003 VBA* (Wiley Publishing, Inc., 2004) ISBN 9780764556593

Jackson M and Staunton M – *Advanced Modelling in Finance using Excel and VBA* (John Wiley & Sons, 2001) ISBN 9780471499220

Shepherd R – *Excel VBA Macro Programming* (McGraw-Hill Osborne, 2004) ISBN 9780072231441

Assessment information

Assessment objectives and weightings

		% in IAS	% in IA2	% in IAL
A01	ICT capability Students demonstrate practical capability in applying ICT	30	27	28
A02	Knowledge and understanding Students demonstrate knowledge and understanding of ICT systems and their roles in organisations and society	26	13	20
A03	ICT problem solving Students apply knowledge, skills and understanding to produce solutions and solve ICT problems	28	30	29
A04	Evaluation Students evaluate: <ul style="list-style-type: none"> • ICT solutions • their own performance 	16	30	23

Relationship of assessment objectives to units

Unit number	Assessment objective			
	A01	A02	A03	A04
Unit 1	6%	5%	3%	3%
Unit 2	4%	7%	3%	3%
Unit 3	5%	1%	8%	3%
Unit 4	5%	3%	6%	3%
Unit 5	3%	2%	5%	7%
Unit 6/7/8	5%	2%	4%	6%
Total for International Advanced Level	28%	20%	29%	23%

Assessment availability and first award

Unit	June 2017	June 2018	June 2019
1	✓	✓	✓
2	✓	✓	✓
3	✓	✓	✓
4		✓	✓
5		✓	✓
6		✓	✓
7		✓	✓
8		✓	✓
IAS award	✓	✓	✓
IAL award		✓	✓

From June 2017 IAS and IAL will be awarded in June.

Administration and general information

External assessment

The following units will be externally assessed:

Unit 3: The Knowledge Worker

- Assessment will be by examination.
- Students will be required to use computer systems throughout the assessment.
- The duration of the examination will be 2 hours and 30 minutes.

Unit 4: Using Database Software

- Assessment will be by examination.
- Students will be required to use computer systems throughout the assessment.
- Students will work under exam conditions on a database assessment set by Pearson.
- They are expected to spend no more than 10 hours working on the assessment.

The Instructions for the Conduct of the Examination (ICE) document gives further information on how these examinations must be administered by centres. Please refer to this document on the Pearson website: <http://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/applied-ict-2016.html>

Internal assessment

Students must submit a portfolio of work for each internally-assessed unit. Teachers are expected to guide and advise students on the production of their portfolios. Teachers should monitor progress to ensure that the work is appropriate for the requirements of the specification. Assessors are required to record full details of the nature of any assistance given to individual students 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 students' 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 student's work with confidence.

If students' practical skills are being assessed, it is important that witness statements/checklists are completed by assessors to authenticate student work and provide evidence that students have achieved the level of performance required in the assessment criteria grid.

Digital copies of observation records and witness statements can be downloaded from our website at qualifications.pearson.com

Applying the mark bands

Portfolios will be marked by the centre, and externally moderated by Pearson. 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 student achievement in each unit. Students can achieve marks in different bands for each assessment objective. The total mark achieved will depend on the extent to which the student 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. Students' responses should be considered positively. A mark of 0 should be awarded only where the student's work does not meet any of the required criteria.
- All students 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 students 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 student has to be guided and advised throughout to ensure that progress is made. The student relies on the support of the teacher, who has to assist in most aspects of the work. This level of support restricts the student's mark to band 1, irrespective of the quality of the outcomes.
 - '*Limited guidance*': the teacher supports the student in the choice of topic for investigation. From then on, the teacher reacts to questions from the student and suggests a range of ideas that the student acts on. The student frequently checks matters of detail. The teacher needs to assist in some aspects of the work. This level of support restricts the student's mark to bands 1 or 2, irrespective of the quality of the outcomes.
 - '*Independently*': the teacher supports the student in the choice of topic for the investigation or task. From then on, the teacher occasionally helps the student, 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 student and use it to record the mark for that unit. Assessors are required to show clearly how credit has been assigned.

Quality of Written Communication

Candidates will be assessed on their ability to:

- select and use a form of writing appropriate to the purpose and complex subject matter
- organise relevant information clearly and coherently, using specialist vocabulary when appropriate
- ensure that text is legible and that spelling, grammar and punctuation are accurate so that meaning is clear.

Eportfolio

Students 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 ebook produced in *Unit 1: The Information Age*. However, it also gives students 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.

Students 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 1024×768 pixels.

The eportfolio must be constructed so that its contents can be accessed using a web browser.

Students may need access to suitable conversion software and compression software.

Students 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 students' 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 students' data is maintained.

No special consideration will be given to any student 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.

Entries

Details of how to enter students for the examinations for this qualification can be found in our *International Information Manual*. A copy is made available to all examinations officers and is available on our website at qualifications.pearson.com

Resitting of units

Students can resit any unit irrespective of whether the qualification is to be cashed in. Only the better of the two most recent non-absent attempts at an IAL unit will be available for aggregation to a qualification grade. Please refer to the *International Advanced level examinations: Entry, Aggregation and Certification* document on the Pearson website: qualifications.pearson.com/IAL-entry-certification-procedures

Forbidden combinations

Students should be advised that, if they take two qualifications in the same subject, colleges, universities and employers are very likely to take the view that they have achieved only one of the two A Levels. Students or their advisers who have any doubts about subject combinations should check with the institution to which they wish to progress before embarking on their programmes.

Access arrangements, reasonable adjustments, special consideration and malpractice

Equality and fairness are central to our work. Our Equality Policy requires all students to have equal opportunity to access our qualifications and assessments, and our qualifications to be awarded in a way that is fair to every student.

We are committed to making sure that:

- students with a protected characteristic (as defined by the UK Equality Act 2010) are not, when they are undertaking one of our qualifications, disadvantaged in comparison to students who do not share that characteristic
- all students achieve the recognition they deserve for undertaking a qualification and that this achievement can be compared fairly to the achievement of their peers.

Language of assessment

Assessment of this qualification will only be available in English. All student work must be in English.

Access arrangements

Access arrangements are agreed before an assessment. They allow students with special educational needs, disabilities or temporary injuries to:

- access the assessment
- show what they know and can do without changing the demands of the assessment.

The intention behind an access arrangement is to meet the particular needs of an individual student with a disability without affecting the integrity of the assessment. Access arrangements are the principal way in which awarding bodies comply with the duty under the UK Equality Act 2010 to make 'reasonable adjustments'.

Access arrangements should always be processed at the start of the qualification. Students will then know what is available and have the access arrangement(s) in place for assessment.

Reasonable adjustments

The UK Equality Act 2010 requires an awarding organisation to make reasonable adjustments where a person with a disability would be at a substantial disadvantage in undertaking an assessment. The awarding organisation is required to take reasonable steps to overcome that disadvantage.

A reasonable adjustment for a particular person may be unique to that individual and therefore might not be in the list of available access arrangements.

Whether an adjustment will be considered reasonable will depend on a number of factors, which will include:

- the needs of the student with the disability
- the effectiveness of the adjustment
- the cost of the adjustment
- the likely impact of the adjustment on the student with the disability and other students.

An adjustment will not be approved if it involves unreasonable costs to the awarding organisation, timeframes or affects the security or integrity of the assessment. This is because the adjustment is not 'reasonable'.

Special consideration

Special consideration is a post-examination adjustment to a student's mark or grade to reflect temporary injury, illness or other indisposition at the time of the examination/assessment, which has had, or is reasonably likely to have had, a material effect on a candidate's ability to take an assessment or demonstrate his or her level of attainment in an assessment.

Further information

Please see our website for further information about how to apply for access arrangements and special consideration.

For further information about access arrangements, reasonable adjustments and special consideration please refer to the JCQ website: www.jcq.org.uk

Malpractice

Candidate malpractice

Candidate malpractice refers to any act by a candidate that compromises or seeks to compromise the process of assessment or which undermines the integrity of the qualifications or the validity of results/certificates.

Candidate malpractice in controlled assessments discovered before the candidate has signed the declaration of authentication form does not need to be reported to Pearson.

Candidate malpractice found in controlled assessments after the declaration of authenticity has been signed, and in examinations must be reported to Pearson on a *JCQ Form M1* (available at www.jcq.org.uk/exams-office/malpractice). The completed form can be emailed to pqsmalpractice@pearson.com or posted to Investigations Team, Pearson, 190 High Holborn, London, WC1V 7BH. Please provide as much information and supporting documentation as possible. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report candidate malpractice constitutes staff or centre malpractice.

Staff/centre malpractice

Staff and centre malpractice includes both deliberate malpractice and maladministration of our qualifications. As with candidate malpractice, staff and centre malpractice is any act that compromises or seeks to compromise the process of assessment or undermines the integrity of the qualifications or the validity of results/certificates.

All cases of suspected staff malpractice and maladministration must be reported immediately, before any investigation is undertaken by the centre, to Pearson on a *JCQ Form M2a* (available at www.jcq.org.uk/exams-office/malpractice).

The form, supporting documentation and as much information as possible can be emailed to pqsmalpractice@pearson.com or posted to Investigations Team, Pearson, 190 High Holborn, London, WC1V 7BH. Note that the final decision regarding appropriate sanctions lies with Pearson.

Failure to report malpractice itself constitutes malpractice.

More detailed guidance on malpractice can be found in the latest version of the document *JCQ General and Vocational qualifications: Suspected Malpractice in Examinations and Assessments*, available at www.jcq.org.uk/exams-office/malpractice

Awarding and reporting

The IAS qualification will be graded on a five-grade scale from A to E. The full International Advanced Level will be graded on a six-point scale A* to E. Individual unit results will be reported. Only Units 1, 2 and 3 will contribute to the IAS grade. All six units will contribute to the IAL grade.

A pass in an International Advanced Subsidiary subject is indicated by one of the five grades A, B, C, D, E of which grade A is the highest and grade E the lowest. A pass in an International Advanced Level subject is indicated by one of the six grades A*, A, B, C, D, E of which grade A* is the highest and grade E the lowest. To be awarded an A*, students will need to achieve an A on the full International Advanced Level qualification and an A* aggregate of the IA2 units. Students whose level of achievement is below the minimum judged by Pearson to be of sufficient standard to be recorded on a certificate will receive an unclassified U result.

Performance descriptions

Performance descriptions give the minimum acceptable level for a grade. See *Appendix B: Performance descriptions* for the performance descriptions for this subject.

Unit results

Unit grades are calculated using a uniform mark scale of 100 marks. The raw marks for a unit are aligned to the uniform mark scale. An A is 80% of the maximum uniform mark, a B is 70% of that maximum, a C is 60% of that maximum, a D is 50% and E is 40%.

The minimum uniform marks required for each grade for each unit:

Unit grade	A	B	C	D	E
Maximum uniform mark = 100	80	70	60	50	40

Students who do not achieve the standard required for a grade E will receive a uniform mark in the range 0–39.

Qualification results

The minimum uniform marks required for each grade:

International Advanced Subsidiary cash-in code XIT01

Qualification grade	A	B	C	D	E
Maximum uniform mark = 300	240	210	180	150	120

Students who do not achieve the standard required for a grade E will receive a uniform mark in the range 0–119.

International Advanced Level cash-in code YIT01

Qualification grade	A	B	C	D	E
Maximum uniform mark = 600	480	420	360	300	240

Students who do not achieve the standard required for a grade E will receive a uniform mark in the range 0–239.

To be awarded an A*, students will need to achieve an A on the full International Advanced Level qualification and an A* aggregate (at least 270 UMS) of the IA2 units.

Support, training and resources

Support

Pearson aims to provide the most comprehensive support for our qualifications. Here are just a few of the support services we offer.

- Subject Advisor – subject experts are on hand to offer their expertise to answer any questions you may have on delivering the qualification and assessment.
- Subject page – written by our Subject Advisors, the subject pages keep you up to date with the latest information on your subject.
- Subject communities – exchange views and share information about your subject with other teachers.
- Training – see 'Training' below for full details.

For full details of all the teacher and student support provided by Pearson to help you deliver our qualifications, please visit <http://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/applied-ict-2016.html>

Training

Our programme of professional development and training qualifications, covering various aspects of the specification and examinations, are arranged each year on a regional basis. Pearson training is designed to fit you, with an option of face-to-face, online or customised training so you can choose where, when and how you want to be trained.

Face-to-face training

Our programmes of face-to-face training have been designed to help anyone who is interested in, or currently teaching, a Pearson Edexcel qualification. We run a schedule of events throughout the academic year to support you and help you to deliver our qualifications.

Online training

Online training is available for international centres who are interested in, or currently delivering our qualifications. This delivery method helps us run training qualifications more frequently to a wider audience.

To find out more information or to book a place please visit: www.edexcel.com/training

Alternatively, email internationaltfp@pearson.com or telephone +44 (0) 44 844 576 0025

Resources

Pearson is committed to ensuring that teachers and students have a choice of resources to support their teaching and study.

To search for Pearson IAL resources, and to search for endorsed resources from other publishers, please visit qualifications.pearson.com/resources

Specifications, Sample Assessment Materials and Teacher Support Materials

Specifications, Sample Assessment Materials (SAMs) and Teacher Support Materials (TSMs) can be downloaded from the International Advanced Level subject pages.

To find a complete list of supporting documents, including the specification, SAMs and TSMs, please visit <http://qualifications.pearson.com/en/qualifications/edexcel-international-advanced-levels/applied-ict-2016.html>

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Appendix A: Unit mapping

This table shows how units have been mapped from the legacy Pearson Edexcel Advanced GCE in Applied ICT qualification to the Pearson Edexcel International Advanced Level in Applied ICT qualification.

Pearson Edexcel Advanced GCE in Applied ICT				Pearson Edexcel International Advanced Level in Applied ICT			
Unit	Title	Unit code	Level	Unit	Title	Unit code	Level
1	The Information Age	6951	AS	1	The Information Age	WIT01	IAS
2	The Digital Economy	6952	AS	2	The Digital Economy	WIT02	IAS
3	The Knowledge Worker	6953	AS	3	The Knowledge Worker	WIT03	IAS
7	Using Database Software	6957	A2	4	Using Database Software	WIT04	IA2
8	Managing ICT Projects	6958	A2	5	Managing ICT Projects	WIT05	IA2
10	Using Multimedia Software	6960	A2	6	Using Multimedia Software	WIT06	IA2
11	Using Spreadsheet Software	6961	A2	7	Using Spreadsheet Software	WIT07	IA2
12	Customising Applications	6962	A2	8	Customising Applications	WIT08	IA2

Appendix B: Performance descriptions

The performance descriptions for Pearson Edexcel International Advanced Level 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 IAS and IA2. The performance descriptions illustrate the expectations at these boundaries for the IAS and IA2 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.

Applied ICT performance descriptions – IAS

The performance descriptions for IAS indicate the level of attainment characteristic of A/B and E/U boundary students. 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 student has met the Assessment Objectives overall. Shortcomings in some aspects of assessment may be balanced by better performance in others. The requirement for all IAS and IA2 level specifications to assess students' quality of written communication will be met through all four Assessment Objectives.

AS	A01	A02	A03	A04	Quality of Written Communication
Assessment objective	Students demonstrate practical capability in applying ICT.	Students demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Students apply knowledge, skills and understanding to produce solutions to ICT problems.	Students evaluate: <ul style="list-style-type: none"> • ICT solutions • their own performance. 	
A/B boundary performance description	Students demonstrate an ability to: <ul style="list-style-type: none"> a) use a wide range of ICT tools and techniques in a variety of practical activities. 	Students demonstrate an understanding of: <ul 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. 	Students demonstrate an ability to: <ul 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. 	Students demonstrate an ability to: <ul 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 student 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	<p>Students demonstrate an ability to:</p> <p>a) use a limited range of ICT tools and techniques in a variety of practical activities.</p>	<p>Students demonstrate an understanding of:</p> <p>a) components and functions of given ICT systems</p> <p>b) how the role of ICT helps selected organisations meet their objectives</p> <p>c) some of the effects of ICT on society and individuals.</p>	<p>Students demonstrate an ability to:</p> <p>a) apply their knowledge and skills of ICT tools and techniques to produce working solutions to problems arising from familiar contexts.</p>	<p>Students demonstrate an ability to:</p> <p>a) comment on the effectiveness of their solutions to problems and suggest improvements</p> <p>b) comment on their actions and role in solving problems.</p>	<p>The student has expressed simple ideas clearly, but may express complex and subtle ideas ineffectively.</p> <p>Arguments may be obscurely presented.</p> <p>Errors in grammar, punctuation and spelling may be present.</p>

Applied ICT performance descriptions – IA2

The performance descriptions for IA2 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 student has met the assessment objectives overall. Shortcomings in some aspects of assessment may be balanced by better performance in others. The requirement for all IAS and IA2 level specifications to assess students' quality of written communication will be met through all four assessment objectives.

AS	A01	A02	A03	A04	Quality of Written Communication
Assessment objective	Students demonstrate practical capability in applying ICT.	Students demonstrate knowledge and understanding of ICT systems and their roles in organisations and society.	Students apply knowledge, skills and understanding to produce solutions to ICT problems.	Students evaluate: <ul style="list-style-type: none"> • ICT solutions • their own performance. 	
A/B boundary performance description	Students demonstrate an ability to: <ul style="list-style-type: none"> a) use their initiative to develop, enhance and extend their range of ICT skills and techniques as required. 	Students demonstrate: <ul style="list-style-type: none"> a) detailed knowledge of formal and informal tools and techniques for developing and managing ICT systems b) thorough understanding of the effects of proposed solutions on end users c) an understanding of the implications of current relevant legislation. 	Students demonstrate an ability to: <ul style="list-style-type: none"> a) apply their knowledge and skills of ICT tools and techniques to produce effective solutions to complex problems arising from unfamiliar contexts b) use methodical, analytical and critical approaches to problem solving. 	Students demonstrate an ability to: <ul style="list-style-type: none"> a) 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 b) reflect on their own performance by identifying strengths and weaknesses and use this review to improve their SKU. 	The student 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.

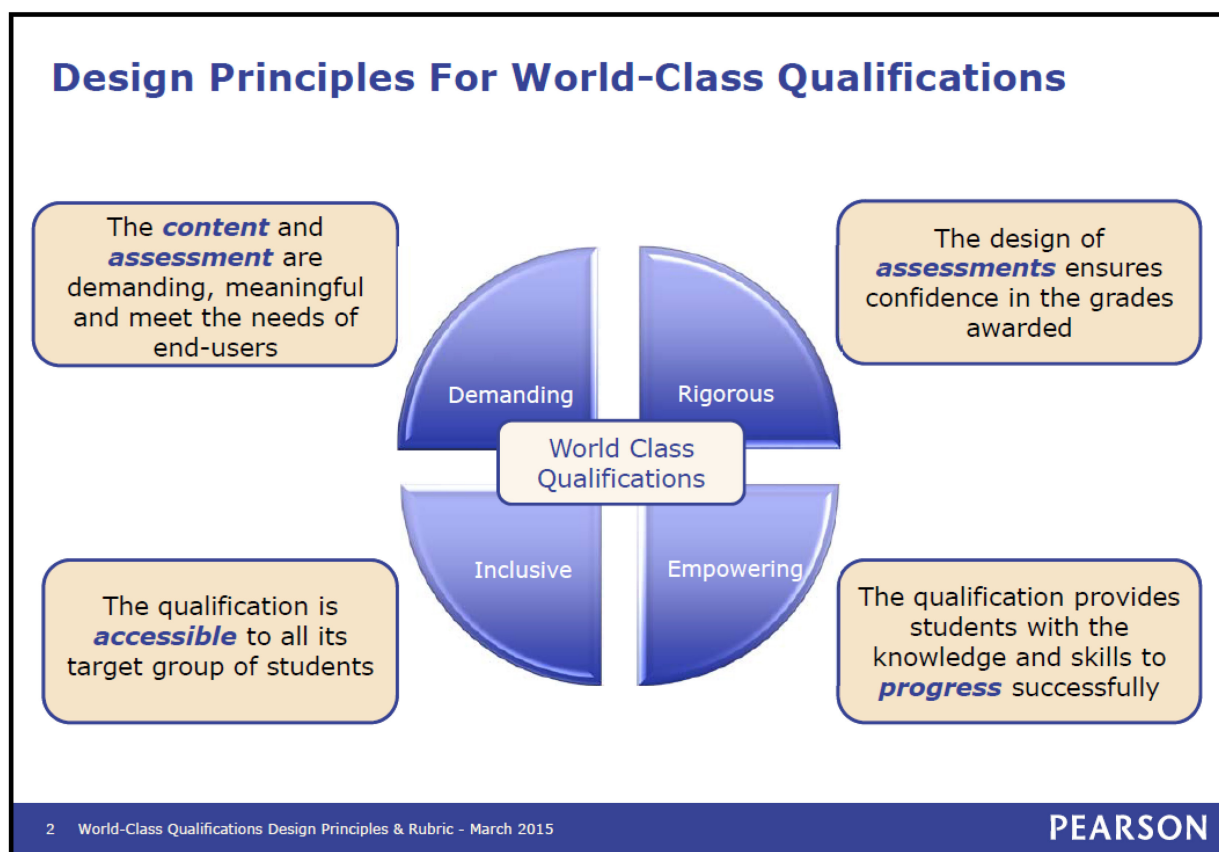
AS	A01	A02	A03	A04	Quality of Written Communication
E/U boundary performance descriptions	<p>Students demonstrate an ability to:</p> <p>a) develop and extend their range of ICT skills and techniques as required.</p>	<p>Students demonstrate:</p> <p>a) a knowledge of tools and techniques for developing ICT systems</p> <p>b) a recognition that their solutions will have effects on end users</p> <p>c) a knowledge of current relevant legislation.</p>	<p>Students demonstrate an ability to:</p> <p>a) apply their knowledge and skills of ICT tools and techniques to solve straightforward problems arising from unfamiliar contexts.</p>	<p>Students demonstrate an ability to:</p> <p>a) comment on the effectiveness of their solution in relation to user needs, suggesting improvements</p> <p>b) comment on their actions and role in solving problems and identify areas for improvement.</p>	<p>The student has expressed simple ideas clearly, but may express complex and subtle ideas ineffectively.</p> <p>Arguments may be obscurely presented.</p> <p>Errors in grammar, punctuation and spelling may be present.</p>

Appendix C: The context for the development of this qualification

All our qualifications are designed to meet our World Class Qualification principles and our ambition to put the student at the heart of everything we do.

We have developed and designed this qualification by:

- reviewing other curricula and qualifications to ensure that it is comparable with those taken in high-performing jurisdictions internationally
- consulting with key stakeholders on content and assessment, including learned bodies, subject associations, higher education academics, teachers and employers to ensure this qualification is suitable for an international context
- reviewing the legacy qualification and building on its positive attributes.



Appendix D: Transferable skills

The need for transferable skills

In recent years, higher education institutions and employers have consistently flagged the need for students to develop a range of transferable skills to enable them to respond with confidence to the demands of undergraduate study and the world of work.

The Organisation for Economic Co-operation and Development (OECD) defines skills, or competencies, as 'the bundle of knowledge, attributes and capacities that can be learned and that enable individuals to successfully and consistently perform an activity or task and can be built upon and extended through learning.'^[1]

To support the design of our qualifications, the Pearson Research Team selected and evaluated seven global 21st-century skills frameworks. Following on from this process, we identified the National Research Council's (NRC) framework as the most evidence-based and robust skills framework.

Cognitive skills

Non-routine problem solving – expert thinking, metacognition, creativity.

Systems thinking – decision making and reasoning.

Critical thinking – definitions of critical thinking are broad and usually involve general cognitive skills such as analysing, synthesising and reasoning skills.

Interpersonal skills

Communication – active listening, oral communication, written communication, assertive communication and non-verbal communication.

Relationship-building skills – teamwork, trust, intercultural sensitivity, service orientation, self-presentation, social influence, conflict resolution and negotiation.

Collaborative problem solving – establishing and maintaining shared understanding, taking appropriate action, establishing and maintaining team organisation.

Intrapersonal skills

Adaptability – ability and willingness to cope with the uncertain, handling work stress, adapting to different personalities, communication styles and cultures, and physical adaptability to various indoor and outdoor work environments.

Self-management and self-development – ability to work remotely in virtual teams, work autonomously, be self-motivating and self-monitoring, willing and able to acquire new information and skills related to work.

Transferable skills enable young people to face the demands of further and higher education, as well as the demands of the workplace, and are important in the teaching and learning of this qualification. We will provide teaching and learning materials, developed with stakeholders, to support our qualifications.

^[1] OECD – *Better Skills, Better Jobs, Better Lives* (2012): skills.oecd.org/documents/OECDSkillsStrategyFINALENG.pdf

^[2] Koenig, J A – *Assessing 21st Century Skills: Summary of a Workshop* (National Research Council, 2011)

Appendix E: Level 3 Extended Project qualification

What is the Extended Project?

The Extended Project is a standalone qualification that can be taken alongside IALs. It supports the development of independent learning skills and helps to prepare students for their next step – whether that be university study or employment. The qualification:

- is recognised by universities for the skills it develops
- is worth half of an IAL qualification at grades A*–E.

The Extended Project encourages students to develop skills in the following areas: research, critical thinking, extended writing and project management. Students identify and agree a topic area of their choice for in-depth study (which may or may not be related to an IAL subject they are already studying), guided by their teacher.

Students can choose from one of four approaches to produce:

- a dissertation (for example an investigation based on predominately secondary research)
- an investigation/field study (for example a practical experiment)
- a performance (for example in music, drama or sport)
- an artefact (for example creating a sculpture in response to a client brief or solving an engineering problem).

The qualification is coursework based and students are assessed on the skills of managing, planning and evaluating their project. Students will research their topic, develop skills to review and evaluate the information, and then present the final outcome of their project.

The Extended Project has 120 guided learning hours (GLH) consisting of a 40-GLH taught element that includes teaching the technical skills (for example research skills) and an 80-GLH guided element that includes mentoring students through the project work. The qualification is 100% internally assessed and externally moderated.

How to link the Extended Project with applied ICT

The Extended Project creates the opportunity to develop transferable skills for progression to higher education and to the workplace, through the exploration of either an area of personal interest or a topic of interest from within the applied ICT qualification content.

Through the Extended Project students will develop skills that support their study of applied ICT, including:

- conducting, organising and using research
- independent reading in the subject area
- planning, project management and time management
- defining a hypothesis to be tested in investigations or in developing a design brief
- collecting, handling and interpreting data and evidence
- evaluating arguments and processes, including arguments in favour of alternative interpretations of data and evaluation of experimental methodology
- critical thinking.

In the context of the Extended Project, critical thinking refers to the ability to identify and develop arguments for a point of view or hypothesis and to consider and respond to alternative arguments. This supports the development of evaluative skills, through evaluating ICT arguments, and using qualitative and quantitative evidence to support informed judgements and propose evidence-based solutions to ICT issues.

Types of Extended Project related to applied ICT

Students may produce a dissertation on any topic that can be researched and argued, for example a controversial ICT issue such as digital security and privacy.

A dissertation might involve an investigation such as:

- the impact of conducting transactions online
- an investigation into the ease of doing business in a chosen country.

The dissertation uses secondary research sources to provide a reasoned defence or a point of view, with consideration of counterarguments.

An alternative might be an investigative project or field study involving the collection of data from primary research.

Using the Extended Project to support breadth and depth

In the Extended Project, students are assessed on the quality of the work they produce and the skills they develop and demonstrate through completing this work. Students should demonstrate that they have extended themselves in some significant way beyond what they have been studying in ICT. Students can demonstrate extension in one or more dimensions:

deepening understanding – where a student explores a topic in greater depth than in the specification content

broadening skills – where a student learns a new skill. This might be learning how to design a website or learning a new statistical technique that can be used in the analysis of either primary or secondary data collected by the student

widening perspectives – where the student's project spans different subjects. A student studying applied ICT with business may wish to research the impact of using mobile applications to deliver a service or sell a product.

A wide range of information to support the delivery and assessment of the Extended Project, including the specification, teacher guidance for all aspects, an editable scheme of work and exemplars for all four approaches, can be found on our website.

Appendix F: Codes

Type of code	Use of code	Code
Subject codes	The subject code is used by centres to enter students for a qualification. Centres will need to use the entry codes only when claiming students' qualifications.	International A Level – YIT01 International AS – XIT01
Unit codes	These codes are provided for unit entry. Students must be entered for individual components.	Unit 1: WIT01 Unit 2: WIT02 Unit 3: WIT03 Unit 4: WIT04 Unit 5: WIT05 Unit 6: WIT06 Unit 7: WIT07 Unit 8: WIT08

Appendix G: Glossary

Term	Definition
Assessment objectives	The requirements that students need to meet to succeed in the qualification. Each assessment objective has a unique focus which is then targeted in examinations or coursework. Assessment objectives may be assessed individually or in combination.
External assessment	An examination that is held at the same time and place in a global region.
JCQ	Joint Council for Qualifications. This is a group of UK examination boards that develops policy related to the administration of examinations.
Linear	Qualifications that are linear have all assessments at the end of a qualification of study. It is not possible to take one assessment earlier in the qualification of study.
Modular	Qualifications that are modular contain units of assessment. These units can be taken during the qualification of study. The final qualification grade is worked out from the combined unit results.
NEA	Non-examination assessment. This is any assessment not sat in examination conditions at a fixed time and place. Non-examination assessment includes coursework, oral examinations and practical examinations.
Performance description	This is a statement of the expected performance of a student for selected grades. Usually for IAL, performance descriptions are provided for grades A and E.
Raw marks	Raw marks are the actual marks that students achieve when taking an assessment. When calculating an overall grade, raw marks often need to be converted so that it is possible to see the proportionate achievement of a student across all units of study.
UMS	Uniform Mark Scale. Student's actual marks (or raw marks) will be converted into a UMS mark so that it is possible to see the proportionate result of a student. Two units may each be worth 25% of a total qualification. The raw marks for each unit may differ, but the Uniform Mark will be the same.
Unit	A modular qualification will be divided into a number of units. Each unit will have its own assessment.

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