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# 1 About these Qualifications

This booklet contains OCR's Advanced Subsidiary GCE and Advanced GCE specifications in ICT for teaching from September 2008.

In today's world where ICT is constantly changing, individuals will increasingly need technological and information literacy skills that include the ability to gather, process, and manipulate data. These skills are now as essential as the traditional skills of numeracy and literacy.

The impact of ICT on society is enormous and as the percentage of businesses and households connected to communication networks such as the internet grows, so does the need for individuals who can master and manipulate these new technologies. As well as the rapid development of new technologies that gather, organise, and share information, familiar technologies like television, telephone, and computers are evolving and being expanded by digitised information, causing a convergence of technologies.

GCE ICT encourages students to become discerning users of ICT. It allows them to develop a broad range of ICT skills, knowledge and understanding. This could form a basis for progression into further learning, including progression from AS to A2, and/or employment.

## 1.1 The Two-Unit AS

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The Advanced Subsidiary GCE is both a 'stand-alone' qualification and also the first half of the corresponding Advanced GCE. The AS GCE is assessed at a standard appropriate for candidates who have completed the first year of study (both in terms of teaching time and content) of the corresponding two-year Advanced GCE course, i.e. between GCSE and Advanced GCE.

From September 2008 the AS GCE is made up of **two** mandatory units, which form 50% of the corresponding four-unit Advanced GCE.

AS Unit G061 is externally assessed, and AS Unit G062 is internally assessed through coursework.

## 1.2 The Four-Unit Advanced GCE

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From September 2008 the Advanced GCE is made up of **two** mandatory units at AS and **two** further units at A2. A2 Unit G063 is externally assessed, and A2 Unit G064 is internally assessed through coursework.

## 1.3 Qualification Titles and Levels

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These qualifications are shown on a certificate as:

- OCR Advanced Subsidiary GCE in ICT.
- OCR Advanced GCE in ICT.

Both qualifications are Level 3 in the National Qualification Framework (NQF).

## 1.4 Aims

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The aims of these specifications are to encourage candidates to develop:

- the capacity for thinking creatively, innovatively, analytically, logically and critically
- the skills to work collaboratively
- the ability to apply skills, knowledge and understanding of ICT in a range of contexts to solve problems
- an understanding of the consequences of using ICT on individuals, organisations and society and of social, legal, ethical and other considerations on the use of ICT
- an awareness of emerging technologies and an appreciation of the potential impact these may have on individuals, organisations and society.

## 1.5 Prior Learning/Attainment

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No prior knowledge of ICT is assumed, although the specifications develop the aims of GCSE specifications in ICT by enhancing and broadening the range and the understanding of the capabilities of applications and information systems studied. The use of a range of tools and techniques is required to solve more extensive and more complex problems.

## 2 Summary of Content

### 2.1 AS Units

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#### Unit G061: *Information, Systems and Applications*

- Data, Information, Knowledge and Processing
- Software and Hardware Components of an Information System
- Characteristics of Standard Applications Software and Application Areas
- Spreadsheet Concepts
- Relational Database Concepts
- Applications Software used for Presentation and Communication of Data
- The Role and Impact of ICT – Legal, Moral and Social Issues

#### Unit G062: *Structured ICT Tasks*

- Design
  - Software development
  - Testing
  - Documentation
- 

### 2.2 A2 Units

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#### Unit G063: *ICT Systems, Applications and Implications*

- The Systems Cycle
- Designing Computer-based Information Systems
- Networks and Communication
- Applications of ICT
- Implementing Computer-based Information Systems
- Implications of ICT

#### Unit G064: *ICT Project*

- Definition, Investigation and Analysis
  - Design
  - Software Development, Testing and Implementation
  - Documentation
  - Evaluation
-

# 3 Unit Content

## 3.1 AS Unit G061: *Information, Systems and Applications*

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This unit covers the fundamental knowledge required to support all subsequent units of study. It is intended to provide candidates with a deeper understanding and knowledge of basic concepts covered by a GCSE (Short Course) syllabus in ICT; however, the depth of study is at AS GCE Level and candidates are expected to respond appropriately and fully to question papers.

### 3.1.1 Data, Information, Knowledge and Processing

#### Content

- a. Terminology
- b. Types of data
- c. Sources of data
- d. Quality of information
- e. Coding data
- f. Validation and verification
- g. Test data
- h. Back-up and archive
- i. Cost of information
- j. Input-process-output-feedback loop

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#### Learning outcomes

- Candidates should be able to:
- a. describe the term data, using an example, clearly identifying the fact that data has no meaning;
  - b. describe what is meant by the term information, using an example to show how data can become information through the use of context, structure and meaning;
  - c. describe different methods used to convey information: text, pictures, videos, animation, sound, LED and give advantages, disadvantages and examples of the use of each;
  - d. describe what is meant by the term knowledge, distinguishing the difference between information and knowledge;
  - e. describe different data types: Boolean, real, integer, string, date/time, selecting an appropriate data type for a given situation;
  - f. give examples of different sources from which data can be derived, for example, gathered from original source or gathered from an indirect source and explain the advantages and disadvantages of using each source;
  - g. compare the use of static information sources (for example CD-ROM) compared to dynamic sources (for example, the World Wide Web);

- h. describe how the following can affect the quality of the information produced: accuracy, relevance, age, completeness, presentation, level of detail;
- i. describe the advantages and disadvantages of coding data;
- j. describe and give examples of the following validation methods: range, type, check digit, length, lookup, picture/format and presence, and their purpose, indicating that these methods can only ensure reasonable data is input to a system and that there is no certainty of accuracy;
- k. describe and give examples of the following verification methods: double entry with automatic comparison and proof reading, and understand that verification does not ensure the data is correct but that it is entered correctly and reduces errors;
- l. explain the difference between backing up and archiving of data and give reasons why they are necessary;
- m. describe the costs of producing information in terms of hardware, software, consumables and personnel;
- n. describe clearly the terms input, processing, output, storage and feedback, drawing a diagram to illustrate how they are related.

### 3.1.2 Software and Hardware Components of an Information System

#### Content

- a. Difference between hardware and software
- b. Input, output and storage devices
- c. Specialist hardware devices
- d. Specialist software devices
- e. Types of software
- f. User interfaces

#### Learning outcomes

Candidates should be able to:

- a. describe the difference between hardware and software, giving examples of each to illustrate the description and explain the lack of standardisation affecting both hardware and software;
- b. identify an appropriate input, output or storage device for a given situation and justify the choice made;
- c. describe specialist hardware devices for physically disabled users: puff-suck switch, foot mouse, eye typer, Braille printers and keyboards, speakers and microphones;
- d. describe specialist software for physically disabled users: text matrices, predictive text, sticky keys, zoom, voice recognition;

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- e. describe different types of software (operating systems, user interfaces, utilities, applications software) and give examples of how and where each type of software would be used;
  - f. describe the characteristics of different styles of user interface, command-based, forms, dialogue, natural language, wimp interfaces (windows, icons, menus, pointer), and their appropriate uses.

### 3.1.3 Characteristics of Standard Applications Software and Application Areas

#### Content

- a. Types of software used for basic tasks
- b. Characteristics of applications
- c. Wizards, style templates and macros
- d. Design considerations and tailoring of data entry screens
- e. House style
- f. Master documents and slides
- g. Transfer of data between applications.

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- Learning outcomes

Candidates should be able to:

- a. identify basic tasks which standard/generic applications software can readily be used for: letter writing, memos, reports, flyers, brochures, posters, business cards, graphs, data modelling, forecasting, data handling, sorting, searching, mail merging, web page authoring, presentations;
- b. describe the characteristics of the following applications: school administration and teaching systems, stock control, booking systems, on-line training systems, timetabling and route finding systems, customer records systems and on-line banking systems;
- c. describe the purpose and characteristics of wizards, styles, templates and macros, describing the advantages and disadvantages of their use;
- d. describe the design considerations for tailored data-entry screens;
- e. describe how standard/generic applications software can be tailored using buttons, forms, form controls, menus and templates and give examples of the use of each;
- f. explain the advantages and disadvantages of tailoring standard/generic applications software;
- g. explain why an organisation needs a consistent house style;
- h. describe how master documents/slides, style sheets and templates can be used to create a consistent house style;

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- i. describe how to import/export files between standard/generic applications with no common format;
  - j. explain the needs of different users of standard/generic applications software .

### 3.1.4 Spreadsheet Concepts

#### Content

- a. Characteristics of modelling software
- b. Variables, formulae, functions and rules
- c. Worksheets, workbooks, rows, columns, cells, ranges
- d. Absolute and relative referencing.

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- Learning outcomes

Candidates should be able to:

- a. describe the characteristics of modelling software and give reasons why a model might be used;
- b. explain how variables, formulae, rules and functions are used in modelling software;
- c. describe how a data model may be used for answering 'what-if?' questions and explain the advantages of being able to answer such questions using a spreadsheet;
- d. describe and explain the purpose and use of worksheets, workbooks, rows, columns, cells and ranges in spreadsheet software;
- e. describe absolute and relative cell referencing, and give examples of uses of each method;
- f. explain the advantages and disadvantages of using a spreadsheet to create and run simulations.

### 3.1.5 Relational Database Concepts

#### Content

- a. Database terminology
- b. Advantages and disadvantages of normalisation
- c. Data dictionary
- d. Entity Relationship Diagrams
- e. Characteristics of 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> normal form
- f. Select data types
- g. Queries.

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- Learning outcomes

Candidates should be able to:

- a. describe the terms typically used in relational database terminology: tables, primary keys, fields, records, relationships, foreign keys, duplicate data, referential integrity, entity, attribute, redundant data, explaining the role and purpose of each;
  - b. identify tables, records, fields, primary keys and foreign keys and define relationships
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- between entities using an entity relationship diagram for a given scenario;
  - c. identify the characteristics of data in unnormalised (0NF), first normal form (1NF), second normal form (2NF) and third normal form (3NF);
  - d. describe the advantages and disadvantages of normalisation;
  - e. describe the components of a data dictionary;
  - f. select appropriate data types for a given set of data, and explain the advantages and disadvantages of alternative data types;
  - g. describe dynamic and static parameter queries and simple and complex queries and explain when and how they might be used.

### 3.1.6 Applications Software used for Presentation and Communication of Data

#### Content

- a. Characteristics of documents
- b. Mail merge
- c. Reformatting documents to meet the needs of an application
- d. Clip art and thumbnail images
- e. Vector and bitmap graphics
- f. Graphic libraries
- g. Features of presentation software.

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- Learning outcomes

Candidates should be able to:

- a. describe the characteristics of documents: character, paragraph, sections, frames, headers, footers, footnotes and pages and how they should be used;
  - b. describe how word processing and desktop publishing (DTP) software can be used with data from a spreadsheet or database for mail merge, and describe the advantages of using this technique;
  - c. describe how a document can be reformatted to suit the needs of a given application;
  - d. discuss the advantages and disadvantages of using clip art images and collections of thumbnail images;
  - e. describe the differences between vector and bitmap graphics and evaluate their suitability for given applications;
  - f. describe the advantages and disadvantages of using graphic libraries and their use in the following applications: kitchen design, cartography and network design;
  - g. describe the features of presentation software: text, images, sound, video, animation, slide transition, hyperlinks, hotspots, buttons;
  - h. compare delivering a presentation using printed acetate and using a computer and projector describing the advantages and
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disadvantages of each;

- i. compare and give advantages and disadvantages of different modes of navigation (automatic and manual transition) and identify and give examples of when the use of each method is more suitable;
- j. describe non-linear and hierarchical presentations giving the advantages and disadvantages of each. Identify and give examples of where each may be more suitable.

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### 3.1.7 The Role and Impact of ICT

Content

- a. Impact of ICT
- b. Future developments of ICT
- c. Legal aspects of ICT
- d. Combating ICT crime and protecting ICT systems
- e. Networking computers
- f. Standards in ICT
- g. Health and Safety

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• Learning outcomes

Candidates should be able to:

- a. discuss the impact of ICT on society, organisations and individuals;
  - b. discuss possible future developments in ICT and their impact on the following application areas: transport, medicine, disabled, education, entertainment, shopping, marketing and communication;
  - c. discuss the main aspects, purpose and implications of the Data Protection Act (1998), Computer Misuse Act (1990), Copyright, Designs and Patents Act (1988), Regulation of Investigatory Powers Act (2000), Electronic Communications Act (2000) and Freedom of Information Act (2000) and subsequent changes/updates;
  - d. explain methods for combating ICT crime and protecting ICT systems: physical security, firewalls, backup, encryption, biometric security, software patches/updates, 'anti-virus' and anti spyware software, access rights, auditing, education of users, user IDs, passwords and methods for ensuring passwords remain effective;
  - e. describe the advantages and disadvantages of networking computers;
  - f. explain why standards are required and the impact of different organisations and networks having different standards;
  - g. describe health problems related to working
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with ICT: repetitive strain injury, carpal tunnel syndrome, ulnar neuritis, deep vein thrombosis, eyesight defects, fatigue, backache and stress;

- h. describe safety problems related to working with ICT: trailing wires, risk of fire and electrocution, unsecured equipment, food and drink and proximity to water;
  - i. describe appropriate measures for avoiding health and safety problems.
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## 3.2 AS Unit G062: *Structured ICT Tasks*

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This unit is designed to develop practical aspects of the subject in a way that is not possible when leading to a formal written examination. A structured approach is possible which is suitable for Advanced Subsidiary GCE candidates. The tasks are intended to be structured in nature covering practical aspects of ICT which cannot easily be tested in an examination environment.

The following skills are developed:

- Design
- Software Development
- Testing
- Documentation

Tasks may involve:

- The design of part of a system
- The production of a testing strategy
- The use of software for development
- The production of user documentation to show the user how to use the system
- The production of technical documentation to show how the system was developed.

Each year, a selection of the content and learning outcomes listed below will be tested through the use of the structured ICT tasks.

### 3.2.1 Design

Candidates should be able to create a design, using appropriate methods such as flow charts, screen connectivity diagrams, entity relationship models, layout diagrams and written specifications.

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Content

- a. Interface design
- b. Data structures/models
- c. Routines

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Learning Outcomes

Candidates should be able to:

- a. design the layout of data capture forms, screen layouts, report layouts and/or other forms of output (for example, audio output);
  - b. design how input screens and outputs link together as part of the interface;
  - c. produce written design specifications;
  - d. design the data structures/models necessary to solve a given problem;
  - e. specify any routines using methods such as flow charts.
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### 3.2.2 Software development

Candidates should be able to develop a solution to a problem using software such as word processing, desk top publishing, spreadsheets, graphics, web design, multimedia, monitoring & control and databases.

Content

- a. Creation of data structures
- b. Creation of user interfaces and methods of input
- c. Using software
- d. Producing outputs
- e. Setting up security

Learning Outcomes

Candidates should be able to:

- a. create data structures using appropriate software tools;
- b. create user interfaces appropriate to a given audience;
- c. create customised routines using methods such as validation, macros and wizards;
- d. use word processing software to create and edit documents – in particular candidates will be expected to use mailmerge;
- e. use desk top publishing software to create and edit documents;
- f. use functions and formulae to solve a problem;
- g. use graphics software to create and edit graphical images;
- h. use web design software to create and edit web pages;
- i. use multimedia software to create and edit presentations, sounds, animations and videos;
- j. use database software to solve problems;
- k. incorporate various types of data (such as text, images, sound, video, animation) into a single document;
- l. create customised outputs;
- m. set up appropriate security methods.

### 3.2.3 Testing

Candidates should be able to select suitable test data, develop a test plan using that data and then test a solution following the test plan.

Content

- a. Test data
- b. Test plan
- c. Software testing

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Learning Outcomes

Candidates should be able to:

- a. select suitable test data that could be used to test a given problem, including normal, invalid and extreme data where appropriate;
  - b. produce a test plan that could be used to test a solution;
  - c. test a solution, providing documented evidence that the solution has been tested.
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### 3.2.4 Documentation

Candidates should be able to produce documentation appropriate to the specified audience. Documentation can take several forms and candidates will be expected to be familiar with user, technical and on-screen documentation.

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Content

- a. User documentation
  - b. Technical documentation
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Learning Outcomes

- a. prepare user documentation for a system to include contents, overview, hardware/software requirements, glossary of terms and troubleshooting;
  - b. prepare an instruction guide to show a user how to use part or all of a system;
  - c. prepare documentation in an electronic format using text, images, sound, animation and video;
  - d. prepare technical documentation to show how a software solution was developed.
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### 3.3 A2 Unit G063: *ICT Systems, Applications and Implications*

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This module covers communications between computers and interactions between humans and computers. Ranges of other information and communications technologies are also covered. The convergence of communications technology and information technology and their impact on society, commerce and industry is an integral part of the module. Candidates are expected to acquire a more in-depth knowledge of the range of application areas covered at AS Level ICT, and demonstrate knowledge of the growing range of applications resulting from advances in ICT.

The purpose of this module is to extend the fundamental ICT concepts developed at AS Level. It provides candidates with a more detailed understanding of the nature of both information technology and communications technology and the importance and potential of both for a wide range of applications.

Candidates are expected to explore the need for communication between computer-based information systems, and between human users and computer-based information systems.

Candidates are introduced to the design and selection of ICT solutions for a range of problems.

Candidates are expected to have knowledge of a range of application areas.

Candidates should be able to demonstrate knowledge of information and communications technologies and their applications and capabilities, both in general and within a context.

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### 3.3.1 The Systems Cycle

#### Content

- a. Systems cycle
- b. Project management
- c. Process modelling

#### Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. describe the following stages of the system life cycle (definition of the problem, investigation and analysis, design, implementation, testing, installation, documentation, evaluation and maintenance) and how the stages relate to ICT systems;
- b. discuss different approaches an analyst might use when investigating a system: questionnaires, interviews, meetings, document analysis, observation;
- c. describe the following software development methodologies: prototyping, and Rapid Application Development (RAD);
- d. describe the purpose of test data and explain the importance of testing and test plans;
- e. describe the contents of the requirements specification, the design specification and the system specification, distinguishing between them;
- f. describe the roles and responsibilities of the following members of the project team: project manager, systems analyst, systems designer, programmer and tester;
- g. describe, interpret and create critical path analysis (CPA) and Gantt charts as tools for project planning;
- h. describe, interpret and create entity relationship diagrams, state transition diagrams, data flow diagrams and flowcharts, and for each explain its suitability for use in a given application.

### 3.3.2 Designing Computer-based Information Systems

Content

- a. Processing systems
- b. Designing the user interface

Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. discuss batch, interactive and real-time processing systems in terms of processing methods, response time and user interface requirements;
- b. describe the difference between types of operating systems (single-user, multi-user, multi-tasking, interactive, real time, batch processing and distributed processing systems) by identifying their major characteristics;
- c. discuss the use of colour, layout, quantity of information on screen, size of font, complexity of language and type of controls, when designing the human-computer interface;
- d. discuss different methods of dialogue that allow interaction between computer and person, person and computer, and computer and computer;
- e. discuss the concept and implication of good methods of human-device communications, particularly human-computer interfaces (HCI) using command line interfaces, menus/submenus, Graphical User Interfaces (GUIs), natural languages (including speech input-output) and forms dialogue;
- f. explain how a potential user's perception, attention, memory and learning can be taken into account when designing an interface;
- g. describe mental models and how they can be applied to the design of a user interface;
- h. discuss the importance of designing a system model which matches closely the user's mental model;
- i. describe the user interface design tool known as the Model Human Processor, developed by Card, Moran and Newell, and its application.

### 3.3.3 Networks and Communications

#### Content

- a. Network environments: intranets, internets, on-line services
- b. Communications and standards

#### Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. compare the characteristics of a local area network (LAN), a wide area network (WAN) and a virtual network;
- b. discuss the characteristics and purpose of intranets, the internet and extranets;
- c. describe client-server and peer-to-peer networks giving advantages and disadvantages of each;
- d. explain the importance of bandwidth when transmitting data and how different types of communication media (cables, wireless, optical) govern the bandwidth available (knowledge of examples of different communication media is expected);
- e. compare the role of the following network components: switches, hubs, wireless access points, network interface cards, wireless network interface cards, routers, repeaters, bridges and servers (file, applications, mail, proxy, print, backup) and identify where their use would be appropriate;
- f. describe optical communication methods (infrared, fibre optic, laser), their advantages and disadvantages and typical applications;
- g. describe wireless communication methods (Bluetooth®, radio) their advantages, disadvantages and typical applications;
- h. describe the facilities of the following communication applications: fax, email, bulletin (discussion) boards, tele/video conferencing and Internet Relay Chat (IRC) and compare their use for a given application;
- i. compare different types of broadband connection and give suitable situations where the use of each would be appropriate: Asymmetric Digital subscriber line (ADSL), cable, wireless, leased line, satellite;
- j. describe how a mobile phone network operates (cellular and satellite) and the advantages and disadvantages of cellular and satellite mobile phone systems and their use;
- k. describe how satellite communications systems are used and work in global positioning, weather, data transfer systems and television, explaining the advantages and disadvantages of using satellites for these applications;

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- l. discuss the implications of being able to communicate from anywhere in the world using mobile technology;
  - m. explain the importance of standards for communicating between devices and explain how protocols are used to enable this communication (candidates will not be expected to have detailed knowledge of specific protocols).

### 3.3.4 Applications of ICT

#### Content

- a. Applications and limitations of ICT
- b. Converging communications and information technologies
- c. Distributed databases
- d. Systems

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#### Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. describe the use of telecommunication and information technology in telephone systems, banking, production control, global positioning systems, navigation and weather forecasting;
  - b. discuss the use of software based training methods;
  - c. explain the limitations of using ICT in society today and how advances in technology may overcome some of those limitations;
  - d. discuss the use of networks of computers at work and at home;
  - e. explain how databases may be stored in more than one physical location and how distribution may be carried out using different approaches: partitioned between sites (vertical and horizontal), entire databases duplicated at each site, central database with remote local indexes;
  - f. discuss the use of different types of distributed database systems;
  - g. explain security issues of distributed databases: interception of data, physical access to data, consistency and integrity of data and describe methods of overcoming these issues;
  - h. explain what is meant by an expert system and describe its components and applications;
  - i. describe how the following ICT tools can be used to assist decision making: Management Information Systems (MIS) and expert systems;
  - j. discuss the range of services offered by digital television networks and the impact of
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- these services on individuals, television companies and broadcasters;
  - k. describe the internal resources of a system: human, technological and accommodation;
  - l. explain the importance of ensuring that information is exchanged accurately and in a timely manner within an organisation and describe how this is achieved;
  - m. describe the characteristics of the following systems: personnel, finance and stock control.

### 3.3.5 Implementing Computer-based Information Systems

#### Content

- a. Custom-written and off-the-shelf approaches
- b. Upgrading systems
- c. System installation
- d. System maintenance

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#### Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. describe the involvement of the client when a custom-written computer-based information system is to be produced, from the initial meeting with the client to the installation of the system;
  - b. discuss the implications of selecting, implementing and supporting the installation of custom-written and off-the-shelf solutions;
  - c. explain how the expertise of staff, costs, benefits and current systems affect decisions about upgrading or installing software and hardware;
  - d. describe a range of methods for installing a new computer-based information system: parallel, phased, direct, pilot;
  - e. discuss the choice of a particular installation method or methods for a range of applications;
  - f. explain the role of reviews during the life of a computer-based information system, describing how reviews may be planned for and carried out effectively;
  - g. describe perfective, adaptive and corrective maintenance;
  - h. explain the need for perfective, adaptive and corrective maintenance during the life of a computer-based information system.
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### 3.3.6 Implications of ICT

#### Content

- a. The impact of external change
- b. Managing change
- c. The impact of ICT on the role of the manager
- d. Quality issues
- e. Advanced systems

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#### Learning outcomes

Candidates should, in general and within the context of a scenario, be able to:

- a. discuss the impact of external change on an organisation, individuals within the organisation and on the systems in use;
  - b. describe change management and factors which must be considered (staff capability, staff views, systems, equipment and accommodation) when managing change;
  - c. discuss the importance of consultation, participation and communication when managing change;
  - d. discuss ethics relating to ICT with reference to codes of conduct, for example, the British Computer Society (BCS) code of conduct and Association for Computing Machinery (ACM) Code of Ethics and Professional Conduct;
  - e. describe the purpose and activities of professional bodies, for example, BCS;
  - f. explain the advantages and disadvantages of belonging to a professional body;
  - g. discuss the need to keep data confidential and explain how this can be achieved;
  - h. discuss how encryption, authorisation, authentication, virus checking, virus protection and physical security can be used to protect data;
  - i. discuss hardware and software developments which are changing, or might change the way we live. Examples might include advances in treating injuries or disease, leisure activities, the environment, the home, education and freedom of speech and movement. This list of examples is not exhaustive as questions will reflect the current use or abuse of ICT in society.
-

## 3.4 A2 Unit G064: *ICT Project*

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This project allows candidates to develop their knowledge and understanding of ICT and the skills described in Assessment Objective 2. The project is a substantial piece of work requiring analysis and design over an extended period of time, which is organised, evaluated and presented in a report.

Candidates choose, in conjunction with a third party user, a well defined client-driven problem which enables them to demonstrate their skills to:

- analyse a problem;
- design a solution to the problem;
- develop the software solution;
- test the solution against the requirements specification;
- document the solution;
- evaluate the solution.

### **Recommended Prior Knowledge**

Candidates are likely to have completed the ICT AS modules before starting the ICT project. The project will be conducted in parallel with the study of the A2 theory module.

Candidates should identify a problem that requires solving rather than a project to complete. Each candidate must submit a report on their work, supported by evidence of software development and testing.

The supervisor marks the project using the mark scheme provided by OCR, after which moderation takes place according to OCR procedures.

ICT projects are assessed as follows:

- |  |            |
|--|------------|
| • Definition, Investigation and Analysis           | [25 marks] |
| • Design   | [12 marks] |
| • Software Development, Testing and Implementation | [24 marks] |
| • Documentation                                    | [11 marks] |
| • Evaluation                                       | [ 8 marks] |

More detailed marking criteria are given in Appendix B.

### **3.4.1 Definition, Investigation and Analysis**

An explanation of the problem to be solved, the user's requirements and how they were obtained is expected. There should be a clear statement of the requirements and how they were determined. Candidates should be aware that the relative complexity of the problem solution will have a bearing on the marks that are available in c (i) (Software Development and Testing) – see Appendix B for details.

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Content

- a. Define the problem to be solved
  - b. Investigate the problem
  - c. Record findings/analyse findings/identify problems and inefficiencies with current system
-

- 
- d. Identify possible solutions and present them in such a way as to be understandable to the end user
  - e. Specify the objectives for the project and the hardware and software requirements

---

Learning outcomes

Candidates should:

- a. undertake an initial investigation to determine the nature of the problem to be solved. This should include a clear identification of the user if different to the client;
- b. identify methods with which to investigate the problem and use such methods to inform their analysis of the requirements of the owner of the problem. This must include a structured interview;
- c. study the current solution to the problem if one exists;
- d. study and analyse similar systems **if** there is no existing system;
- e. record information/data and gather sample documents currently used if appropriate to the solution of the problem;
- f. analyse the data/information collected;
- g. specify the client's requirements of the system;
- h. consider a number of different methods for satisfying the requirements of the system and make a reasoned determination of the most effective in discussion with the client;
- i. specify the hardware and software requirements to produce and operate the system.

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### 3.4.2 Design

A system design should be produced and documented including, where necessary, details of input format, output format, the processing involved, data structures and website maps.

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Content

- a. Design of the solution using decisions made in section 1
- b. Task model

---

Learning outcomes

Candidates should:

- a. consider the data requirements of the proposed system to include, where necessary, the design of the methods of data: capture, preparation, input, storage, the design of structures to be used;
- b. specify any validation required as well as the nature of any interactive feedback required if any data is input incorrectly;

- c. design the output required from the system;
  - d. consider the processing required to produce the intended results;
  - e. produce a detailed task model specifying the steps necessary for a satisfactory solution.
- Candidates may wish to use the stages in the specification as a basis for the task model.

### 3.4.3 Software Development, Testing and Installation

A software solution is developed from the design and the comprehensive test plan is developed from the set of objectives, agreed with the client when analysing the problem. It should show that the system satisfies those objectives with cases of valid, invalid and extreme data (or, if it does not, under which circumstances it fails). The test plan should be clearly cross-referenced with the relevant objective and with evidence of these tests being carried out. It is important to test the user interface as well as system functionality. User testing should be in evidence.

Content

- a. Test plan
- b. Software development
- c. Testing the software solution
- d. Installation of the finished solution, including testing by the end user

Learning outcomes

Candidates should:

- a. create, develop and document a test plan for the design;
- b. select suitable test data and test actions/responses for the design, to include a determination of expected results to the tests;
- c. tailor standard application packages or utilise other software to develop their design;
- d. test the software solution, illustrating how the software solution evolves;
- e. produce a strategy for installing the system into the host organisation;
- f. test the software solution with the user, providing documented evidence that the user has successfully used the solution.

### 3.4.4 Documentation

Content

- a. The production of supporting documentation.

This should include step by step instruction for operating all aspects of the system, including a means of dealing with any errors that may occur. The documentation should include appropriate 'Help' and other messages within the software solution, or be present in the form of a hypertext document.

Learning outcomes

Candidates should:

- a. develop a detailed hard copy manual;
- b. include appropriate on-screen help within the

---

software solution.

### 3.4.5 Evaluation

This section should include evidence of the acceptability to the user/client, including a letter of acceptance (or equivalent, hard copy, acknowledgement) from the user/client and reference to the results of user testing.

A critical discussion is expected of what has been achieved to include any desirable extensions.

---

Content

- a. User/client evaluation of the solution
- b. Identification by the candidate of any limitations and necessary/possible extensions to the system

---

Learning outcomes

Candidates should:

- a. obtain a written response to the system produced from the original client and comment on the points made;
  - b. obtain, if the end user is different from the original client, a written response to the system produced and comment on the points made;
  - c. identify any limitations and possible extensions to the system, indicating how the extensions could be carried out.
-

# 4 Schemes of Assessment

## 4.1 AS GCE Scheme of Assessment

### AS GCE ICT (H117)

#### AS Unit G061: *Information, Systems and Applications*

60% of the total AS GCE marks  
2 hrs written paper

This paper has **one** section, comprising both short and long answer questions.

120 marks

Candidates are required to answer all questions in this paper.

#### AS Unit G062: *Structured ICT Tasks*

40% of the total AS GCE marks  
Coursework  
80 marks

Coursework for this unit comprises of a number of structured tasks covering practical aspects of ICT. Each task may address up to **three** of the **four** skills within this unit (Design/Software development/Testing/Documentation).

Each year, a selection from the content listed in section 3.2 will be tested through the use of these structured ICT tasks.

The structured ICT tasks direct candidates to answer questions using practical ICT skills. The tasks are set by OCR and change each year. Students are able to work on the tasks any time from 1 September in the year before they are assessed.

**Assessment Criteria:** The mark scheme is confidential and retained by OCR until March in the year of assessment. Centres must **not** allow students see the mark scheme until after the publication of results by OCR and advice must **not** be given to candidates once the mark scheme has been viewed. Each year the mark scheme will be different and will reflect the specific questions asked in the Structured ICT Tasks. Teachers can ask their examinations officer to release the mark scheme in stages if they wish to mark one of the tasks before another is completed by students. Centres are required to submit one copy of a completed mark scheme per piece of coursework assessed. Annotations should be made on the mark scheme and work to indicate where marks have been awarded. Please refer to Appendix B at the back of this specification.

## 4.2 Advanced GCE Scheme of Assessment

### Advanced GCE ICT (H517)

AS Units as above, Unit G061 being 30% of the total Advanced GCE marks and Unit G062 being 20% of the Advanced GCE marks.

#### A2 Unit G063: *ICT Systems, Applications and Implications*

30% of the total  
Advanced GCE marks  
2 hrs written paper  
120 marks

This question paper has **two** sections, comprising both short and long answer questions:

**Section A:** Candidates are required to answer all questions in this section.

**Section B:** Candidates are required to answer all questions in this section.

This unit is synoptic.

**and**

#### A2 Unit G064: *ICT Project*

20% of the total  
Advanced GCE marks  
Coursework  
80 marks

The project is a substantial piece of work requiring analysis and design over an extended period of time, allowing candidates to demonstrate their skills to analyse a problem, design a solution to a problem, develop a software solution, test, document and evaluate the solution. This project is conducted in parallel with Unit G063.

This unit is synoptic.

## 4.3 Unit Order

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The normal order in which the unit assessments could be taken is AS Units 1 and 2 in the first year of study, leading to an AS GCE award, then A2 Units 3 and 4 leading to the Advanced GCE award. However, the unit assessments may be taken in any order.

Alternatively, candidates may take a valid combination of unit assessments at the end of their AS GCE or Advanced GCE course in a 'linear' fashion.

## 4.4 Unit Options (at AS/A2)

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There are no optional units in the AS GCE specification; for AS GCE ICT candidates must take AS Units G061 and G062.

There are no optional units in the Advanced GCE specification; for Advanced GCE ICT candidates must take AS Units G061 and G062, *and* A2 Units G063 and G064.

## 4.5 Synoptic Assessment (A Level GCE)

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Synopticity is assessed in all A2 GCE units.

Synoptic assessment tests the candidates' understanding of the connections between different elements of the subject. Each of A2 Unit G063 and Unit G064 fulfils this requirement. Each is based on areas of study covered in both AS Unit G061 and Unit G062.

A2 Unit G063 requires candidates to demonstrate an understanding of both information technology and communications technology and the importance and potential of both for a wide range of applications. A2 Unit G064 gives candidates the opportunity to practically demonstrate their ICT skills and knowledge which has been built up in the AS units.

## 4.6 Assessment Availability

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There are two examination series each year, in January and June.

All units **except** AS Unit G062 *Structured ICT Tasks* are available in January and June. AS Unit G062 *Structured ICT Tasks* is **only** available in June.

In 2009, only AS units will be assessed.

In 2010 onwards, both AS units and A2 units will be assessed.

## 4.7 Assessment Objectives

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Candidates are expected to demonstrate the following in the context of the content described:

### AO1 Demonstrate Knowledge and Understanding

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Candidates should be able to demonstrate knowledge and understanding of:

- the characteristics of data and information, and the need for organisation and manipulation to facilitate its effective use;
- the use of ICT for a range of purposes;
- the influence of social, cultural, legal, technical, ethical, economic and environmental considerations on the use of ICT;
- the consequences of using ICT for individuals, organisations and society;
- the components, characteristics and functions of ICT systems (including hardware, software and communication) which allow effective solutions to be achieved;
- the systematic development of high quality ICT based solutions to problems;
- emerging technologies and their implications for future use of ICT.

### AO2 Skills

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Candidates should be able to:

- investigate and analyse a problem and produce a specification;
- design an effective solution;
- select and use appropriate application software;
- test and implement an effective ICT related system;
- document specifications and solutions;
- evaluate solutions and their own performance.

## AO weightings in AS GCE

Unit	% of AS GCE		Total
	AO1	AO2	
AS Unit G061: <i>Information, Systems and Applications</i>	55-60	0-5	60%
AS Unit G062: <i>ICT Structured Tasks</i>	0-10	30-40	40%
	55-70%	30-45%	100%

## AO weightings in Advanced GCE

Unit	% of Advanced GCE		Total
	AO1	AO2	
AS Unit G061: <i>Information Systems and Applications</i>	27.5-30	0-2.5	30%
AS Unit G062: <i>Structured ICT Tasks</i>	0-5	15-20	20%
A2 Unit G063 <i>ICT Systems, Applications and Implications</i>	15-20	10-15	30%
A2 Unit G064 <i>ICT Project</i>	0-2.5	17.5-20	20%
	42.5-57.5%	42.5-57.5%	100%

## 4.8 Quality of Written Communication

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*Quality of written communication* is assessed in all units and credit may be restricted if communication is unclear.

Candidates will:

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

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# 5 Technical Information

## 5.1 Making Unit Entries

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Please note that centres must be registered with OCR in order to make any entries, including estimated entries. It is recommended that centres apply to OCR to become a registered centre well in advance of making their first entries. Centres must have made an entry for a unit in order for OCR to supply the appropriate forms or moderator details for coursework.

**It is essential** that unit entry codes (the four-figure alpha-numeric codes given in brackets at the end of the unit title) are quoted in all correspondence with OCR. See Sections 4.1 and 4.2 for these unit entry codes.

## 5.2 Making Qualification Entries

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Candidates must enter for qualification certification separately from unit assessment(s). If a certification entry is **not** made, no overall grade can be awarded.

Candidates may enter for:

- AS GCE certification (entry code H117).
- Advanced GCE certification (entry code H517).

A candidate who has completed all the units required for the qualification may enter for certification either in the same examination series (within a specified period after publication of results) or at a later series.

AS GCE certification is available from January 2009.  
Advanced GCE certification is available from January 2010.

## 5.3 Grading

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The AS GCE is awarded on the scale A-E. All GCE units are awarded a-e. The Advanced GCE is also awarded on the scale A-E. However, candidates who achieve A on the Advanced GCE also have access to the enhanced A\* grade. This is awarded only to candidates who achieve both the A grade on the A level aggregation and gain at least 180 UMS on their A2 units. When both these conditions are satisfied the A\* will be the reported A level grade. Grades are reported on certificates. Results for candidates who fail to achieve the minimum grade (E or e) will be recorded as unclassified (U or u) and this is not certificated.

A Uniform Mark Scale (UMS) enables comparison of candidates' performance across units and across series. The two-unit AS GCE has a total of 200 *uniform* marks and the four-unit Advanced GCE has a total of 400 *uniform* marks.

OCR converts the candidate's *raw* mark for each unit to a *uniform* mark. The maximum *uniform* mark for any unit depends on that unit's weighting in the specification. In these ICT specifications, the four units of the Advanced GCE specification have UMS weightings of 30%/20%/30%/20% (and the two units of the AS GCE specification have UMS weightings of 60%/40%). The UMS

totals are 120 and 80 respectively. Each unit's *raw* mark grade boundary equates to the *uniform* mark boundary at the same grade. Intermediate marks are converted on a pro-rata basis.

*Uniform* marks correspond to *unit* grades as follows:

(Advanced GCE) Unit Weighting	Maximum Unit Uniform Mark	Unit Grade					u	
		a*	a	b	c	d		e
30%	120		120-96	95-84	83-72	71-60	59-48	47-0
20%	80		80-64	63-56	55-48	47-40	39-32	31-0

OCR adds together the unit *uniform* marks and compares these to pre-set boundaries (see the table below) to arrive at *qualification* grades.

Qualification	Qualification Grade					U	
	A*	A	B	C	D		E
AS GCE		200-160	159-140	139-120	119-100	99-80	79-0
Advanced GCE		400-320	319-280	279-240	239-200	199-160	159-0

## 5.4 Result Enquiries and Appeals

Under certain circumstances, a centre may wish to query the grade available to one or more candidates or to submit an appeal against an outcome of such an enquiry. Enquiries about unit results must be made immediately following the series in which the relevant unit was taken.

For procedures relating to enquires on results and appeals, centres should consult the OCR *Handbook for Centres* and the document *Enquiries about Results and Appeals – Information and Guidance for Centres* produced by the Joint Council. Copies of the most recent editions of these papers can be obtained from OCR.

## 5.5 Shelf-Life of Units

Individual unit results, prior to certification of the qualification, have a shelf-life limited only by that of the qualification.

## 5.6 Unit and Qualification Re-sits

There is no restriction on the number of times a candidate may re-sit each unit before entering for certification for an AS GCE or Advanced GCE.

Candidates may enter for the full qualifications an unlimited number of times.

## 5.7 Guided Learning Hours

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AS GCE ICT requires **180** guided learning hours in total.  
Advanced GCE ICT requires **360** guided learning hours in total.

## 5.8 Code of Practice/Subject Criteria/Common Criteria Requirements

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These specifications comply in all respects with current *GCSE, GCE, GNVQ and AEA Code of Practice* as available on the QCA website, the subject criteria for GCE ICT and *The Statutory Regulation of External Qualifications 2004*.

## 5.9 Arrangements for Candidates with Particular Requirements

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For candidates who are unable to complete the full assessment or whose performance may be adversely affected through no fault of their own, teachers should consult the *Access Arrangements and Special Consideration Regulations and Guidance Relating to Candidates who are Eligible for Adjustments in Examinations*. In such cases advice should be sought from OCR as early as possible during the course.

## 5.10 Prohibited Qualifications and Classification Code

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Candidates who enter for the OCR GCE specifications may not also enter for any other GCE specification with the certification title *ICT* in the same examination series.

Every specification is assigned to a national classification code indicating the subject area to which it belongs.

Centres should be aware that candidates who enter for more than one GCE qualification with the same classification code will have only one grade (the highest) counted for the purpose of the School and College Achievement and Attainment Tables.

The classification code for these specifications is 2650.

## 5.11 Coursework Administration/Regulations

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### Supervision and Authentication

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As with all coursework, teachers must be able to verify that the work submitted for assessment is the candidate's own work. Sufficient work must be carried out under direct supervision to allow the teacher to authenticate the coursework marks with confidence.

## Submitting marks to OCR

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Centres must have made an entry for a unit in order for OCR to supply the appropriate forms or moderator details for coursework. Coursework administration documents are sent to centres on the basis of estimated entries. Marks may be submitted to OCR either via Interchange, on the computer-printed Coursework Mark Sheets (MS1) provided by OCR (sending the top copy to OCR and the second copy to their allocated moderator) or by EDI (centres using EDI are asked to print a copy of their file and sign it before sending to their allocated moderator).

Deadlines for the receipt of coursework marks are:

10 January for the January series

15 May for the June series

The awarding body must require centres to obtain from each candidate a signed declaration that authenticates the coursework they produce as their own.

For regulations governing coursework, centres should consult the *OCR Handbook for Centres*. Further copies of the coursework administration documents are available on the OCR website ([www.ocr.org.uk](http://www.ocr.org.uk)).

## Standardisation and Moderation

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All internally-assessed coursework is marked by the teacher and internally standardised by the centre. Marks must be submitted to OCR by the agreed date, after which postal moderation takes place in accordance with OCR procedures.

The purpose of moderation is to ensure that the standard for the award of marks in internally assessed coursework is the same for each centre, and that each teacher has applied the standards appropriately across the range of candidates within the centre.

The sample of work which is submitted to the moderator for moderation must show how the marks have been awarded in relation to the marking criteria.

## Minimum Coursework Required

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If a candidate submits no work for a unit, then the candidate should be indicated as being absent from that unit on the coursework mark sheets submitted to OCR. If a candidate completes any work at all for that unit then the work should be assessed according to the criteria and marking instructions and the appropriate mark awarded, which may be zero.

## 6 Other Specification Issues

### 6.1 Overlap with other Qualifications

There is a small degree of overlap between the content of these specifications and those for Advanced GCE Computing.

### 6.2 Progression from these Qualifications

Throughout the course of study candidates are encouraged to become discerning users of ICT, developing a broad range of ICT skills and knowledge and understanding of ICT. This should form a basis for progression into further learning, including progression from AS to A2, and/or employment.

### 6.3 Key Skills Mapping

These specifications provide opportunities for the development of the Key Skills of *Communication, Application of Number, Information Technology, Working with Others, Improving Own Learning and Performance* and *Problem Solving* at Levels 2 and/or 3. However, the extent to which this evidence fulfils the Key Skills criteria at these levels will be totally dependent on the style of teaching and learning adopted for each unit.

The following table indicates where opportunities *may* exist for at least some coverage of the various Key Skills criteria at Levels 2 and/or 3 for each unit.

Unit	C			AoN			IT			WwO			IoLP			PS				
	.1a	.1b	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	.1	.2	.3	
1	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
2	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
3	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4	✓		✓	✓				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

### 6.4 Spiritual, Moral, Ethical, Social, Legislative, Economic and Cultural Issues

These specifications encourage candidates to explore the spiritual, moral, ethical, social, legal and cultural aspects of the introduction of ICT solutions to problems through a study of the effects of ICT on society.

Candidates have an opportunity to consider issues such as changing leisure patterns and work practices, privacy and confidentiality of data held in systems, opportunities for access to information and environmental concerns.

## 6.5 Sustainable Development, Health and Safety Considerations and European Developments

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These specifications support these issues, consistent with current EU agreements, in AS Unit G061, Section 1.7

## 6.6 Avoidance of Bias

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OCR has taken great care in preparation of these specifications and assessment materials to avoid bias of any kind.

## 6.7 Language

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These specifications and associated assessment materials are in English only.

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# Appendix A: Performance Descriptions

Performance descriptions have been created for all GCE subjects. The performance descriptions for GCE ICT aim to describe learning outcomes and levels of attainment likely to be shown by a representative candidate performing at the A/B and E/U boundaries for the AS and A2. They illustrate the expectations at these boundaries for the AS and A2 as a whole; they have not been written at a 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.

There is a requirement for all AS GCE and Advanced GCE specifications to assess candidates' *quality of written communication*. In these specifications, this will be met through AO1.

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	Assessment Objective 1	Assessment Objective 2	Assessment Objective 3 <i>(includes QWC)</i>
Assessment Objectives for both AS GCE and Advanced GCE	New Performance Descriptors to follow from QCA		
AS A/B boundary Performance Descriptions			
AS E/U boundary Performance Descriptions			
A2 A/B boundary Performance Descriptions			
A2 E/U boundary Performance Descriptions			

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# Appendix B: Coursework Assessment

## Criteria for A2 Unit G064: *ICT Project*

Since the ICT project seeks to assess the systems analysis section of the specification in a practical manner, the candidate should **not** produce a system from their own limited knowledge of the requirements of the organisation.

A Project should:

- allow candidates to demonstrate their knowledge and understanding of ICT systems and their skills in the assessment objectives;
- encourage the sensible use of computers and communications systems to produce a solution, which solves a problem sensibly, within the constraints of resources available to candidates;
- show the successful completion of a whole task from the initial definition **involving** a third party, to acceptance and evaluation by that third party and other possible users. Projects which involve much repetitive design, analysis or especially implementation, leading to unwieldy reports, are to be discouraged;
- involve all elements of the skills of definition, analysis, design, development, testing, documentation, installation and evaluation. Projects need not be stand-alone: the enhancement or modification of an existing system provided that all these elements are covered, is more likely to be a real work situation;
- involve a client and/or third party user, who may be different people and who will provide information for the analysis, use the solution and contribute towards its evaluation. Whilst a teacher could act as the third party, this arrangement is far from ideal. Candidates should, individually, look beyond school life into business and organisations in their community for their projects. Though it is recognised that this may be impractical, a member of the family is often an ideal client/user. The student should seek to involve them and present them with a report on the work which has been carried out.

The client/user has to be someone who is willing to be involved in the project throughout, but particularly at the following stages:

- in the analysis of the problem, where their requirements are obtained. This will include an interview with the candidate, who will be taking an active part in decision making;
- at the software development, testing and implementation stages, where they are involved in prototyping;
- at the evaluation stage, where they are involved in checking that the system is completed as specified and, leading on from this, is then willing to write a letter of acceptance of the system, including any criticism of it.

Candidates should make the final choice of the problem for solution in collaboration with the potential client/user, although guidance about the suitability of the chosen problem should be given by the supervisor. Guidance should continue throughout the life of the project. This should include guidance on the appropriateness of an implementation on a stand-alone or networked computer-based information system or other available facility. In a well-organised project the candidate will focus on the production of an overall system analysis and design.

The solution may be implemented using one or more of:

- a standard generic applications software package;
- pre-written modules;

- toolkits/authoring/publishing software;
- interface/client software (including HTML/JAVA).

Descriptions of any software used, together with reasons for their selection, should be included in the report.

Test data should be devised and used systematically to thoroughly test the effectiveness of the solution in solving the problem. The choice of test data used, and the reason for choice, should be included. A description of the methods of testing should also be included, together with evidence of testing.

The projects should contain the title, a contents list, a description and justification of investigation, analysis, design and an evaluation. Pages should be clearly numbered. The report must be supported by appropriate evidence of implementation, such as screen dumps or photographs of screen layouts and printouts, paper based documentation and a letter(s) from the client/third party user to support the evaluation.

Candidates should **not** submit magnetic or optical media as supporting evidence, but can make references to web pages available over the internet or photographic evidence supplied. A witness statement would also provide suitable evidence where it is not possible to produce suitable hard copy evidence of parts of their solution e.g hyperlinks.

The projects will seldom involve programming or the installation of hardware but will involve the choosing of the types of hardware and software that will be needed to implement the solution.

The mark scheme has attempted to be as generic as possible, but there will, doubtless, be occasions when candidates are creating a solution which is not adequately covered by the mark scheme. On these occasions please contact OCR for advice about adapting the given scheme to fit the solution.

Some possible ideas are given below. However, it is important for candidates to realise that the project chosen should be user driven. This means that candidates must understand that they should find possible users of ICT systems and find out their needs before developing an idea.

The examples do not show the analysis of the problem nor do they give all facilities which may be required by the user. For example, the staff who run the village hall bank may well require many other facilities which can only be ascertained by interviewing the appropriate staff and, possibly, some of the users of the bank. The examples only give a few ideas of the type of project, which could provide candidates with the opportunities to demonstrate Advanced GCE ICT skills and an understanding of solving real life problems.

## Example 1

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The local village hall committee has a bank that is used by a large number of local people to save money for Christmas. The staff who run the bank must keep details of people who use the bank as well as details of individual accounts. It is useful to have a list of all the people who use the bank together with addresses and so on, which help the staff to contact them. Sometimes the staff need to contact someone urgently.

Villagers need bank statements from time to time. This occurs when someone asks for a statement at the end of November. The statements are sent automatically as emails or email attachments to the bank users.

The bank statements must give details of each transaction such as deposit number, amount withdrawn, amount deposited and an up-to-date balance. It should also show any interest payments.

The staff have to be able to create a separate statement for each person and it must only be accessed by the person's account number. Sometimes people forget their account numbers and the staff must be able to provide them on proof of identity.

The committee who run the scheme are particularly worried about the security of the files.

Candidates would be expected to produce a tailored solution with an appropriate interface. An obvious solution would be to use a table of customers, each record being linked to a spreadsheet of activity for the person's account. Data could be extracted from the table and relevant spreadsheet to produce a statement and a photograph could be appended to records to provide proof of identity.

## Example 2

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A local hotelier wants to have a website to advertise the facilities available at the hotel.

You are to design a computer-based information system that could be used by the hotelier.

This would involve the student in analysing the problem, collecting the necessary information and designing a solution, which would include a full implementation of the site.

Candidates should be aware that, on one level, this is a fairly trivial problem. The teacher/moderator will be looking for detailed analysis of the problem, and design solutions, which involve the hotelier at all stages. It will also be necessary to ensure that some of the implementation is at more than a basic level, examples could include the ability to download documents like the hotel brochure from the site, a link to a file which keeps a record of all queries sent to the site, or the ability to book rooms and pay for them in advance through the site (though candidates hoping to do this should be made aware of the difficulties before they start).

As the original problem was to create a website to advertise a hotel, it is reasonable to insist that part of the problem solution must be to make the website available over the internet. This would mean that the candidate must provide a URL to allow the site to be accessed during assessment.

## Example 3

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Ms Johnson has a small newsagent's shop and employs eight people to deliver the papers. She wishes to be able to produce delivery lists for each morning round and each evening round. At the moment she does not deliver Sunday papers but may wish to do so in the future.

She wants to keep details of her customers, including which morning papers and which evening papers they have and which delivery round they are on. Some customers only have one morning and one evening paper, others do not have both a morning and evening paper. Some customers have weekly magazines, some fortnightly magazines and some monthly magazines.

Ms Johnson would also like to be able to produce a weekly paper bill for each customer.

You are to design a computer-based information system that could be used by Ms Johnson including the facility to browse on-line for information.

(Note that the actual production of the lists for the rounds in specific orders is difficult and has been avoided during the problem formulation. The problem is difficult enough, particularly when considering the unknown number of papers and periodicals that each person may order).

This is an example of a popular type of project, being based on database software, however the formulation of the problem is everything with this type of problem and candidates should be wary of

too simplistic an approach. The solution which simplifies the problem unreasonably will also be penalised.

## Example 4

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The student is asked by the head teacher of a school to develop an information system for use in the classrooms and public areas. The information needs to be on computer screens, which can be amended from a central location.

The student is involved in analysing the problem in respect to site of screens, user interfaces, types of information, passwording to allow users to edit only their pages...

You are to design a computer-based information system that could be used by the school.

The implementation of the system is relatively straightforward using a piece of authoring software. However, the candidate can enlarge the scope of the project by including, for instance, a budgeting system so that individual departments are allocated a set amount of time or an accounting system so that departments can be billed on a monthly basis. Another extension might be to include an archiving system to store messages for future inspection.

The teacher/moderator should be looking for a detailed analysis of the requirements and a measure of extension to the basic problem, which would illustrate the candidate's ability to integrate the information into other software.

DRAFT

## Guidance on Marking Information and Communications Technology Projects

The project should be awarded marks according to the following module headings.

- (a) Definition, Investigation and Analysis [25 marks]
- (b) Design [12 marks]
- (c) Software Development and Testing [24 marks]
- (d) Documentation [11 marks]
- (e) Evaluation [8 marks]

**(a) Definition, Investigation and Analysis [25 marks]**

**(i) Definition – nature of the problem to be investigated. [3 marks]**

A candidate should not expect the moderator to be familiar with the theory and practice in the area of the chosen system. This section is designed to credit a brief description and introduction to the problem.

The report should contain:

1 mark	A brief description of the organisation or group that has the problem.
1 mark	An introduction to the client and/or the end user(s) and their place within the organisation or group.
1 mark	An outline of the problem that needs to be solved.

The above elements should be in the initial specification of the problem and can be thought of as carrying one mark each. There should be little detail as yet, because no formal collection of information about the problem will have taken place.

## (ii) Investigation

[10 marks]

This section credits skills of investigation and information collection.

The report should contain:

- detail relating to the planning of the interview with the client/end-user;
- the original plan of the questions, showing that all areas had been planned to be covered and that sensible follow up questions have been considered;
- record of interview, including an element of later analysis and isolation of important facts;
- further evidence of information collection relevant to the problem area which may involve further interviews with client and/or end user and/or other forms of information collection;
- a record of the findings from the various means of information collection.

The investigation of the problem must include an interview of the client/end user. If the client is, in reality, a focus group then a meeting of the group should be treated in the same way.

The report should include the following detail:

1 mark	Thorough planning of the mechanics of the interview situation.
4 marks	Reasoned set of questions to elicit important information. Possible responses have been considered and follow-up questions have been planned.
1 mark	Record of key responses of interview, demonstrating two-way discussion.
2 marks	Additional information collection which has been justified as being sensible. This may take the form of additional interviews, the collection of currently used forms, observation of current system or other methods.
2 marks	Clear presentation of the results of any additional information collection.

**(iii) Analysis**

**[12 marks]**

This section credits skills of analysis of data collected and working with another person in order to decide on a course of action.

The report should contain:

- an analysis of the findings from the different forms of information collection which is agreed with the client;
- a formal problem definition in the form of a requirement specification containing detailed objectives which the finished solution should meet;
- consideration of different methods of solving the problem, together with evidence that the end user has made the final decision about the method of solution to be used;
- hardware and software requirements of the system with discussion about the needs for each and any problems that may be anticipated.

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3 marks	Evidence of analysis of the current system or of likely problem areas, arriving at reasoned conclusions which will show evidence of being agreed by client.
3 marks	A requirement specification containing a number of clearly defined objectives which the solution should meet. These must be arrived at through consultation with the client.
3 marks	A comparison of a number of different methods of solution, one of which may be the present solution and at least two others to allow a reasoned decision to be made in consultation with the client.
3 marks	A reasoned list of hardware and software requirements for the new system, providing clear justification for each choice in relation to the problem to be solved.

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It is important that the analysis section should be compiled in such a way as to be understandable to the client who will be expected to make decisions based on the findings.

**(b) Design**

**[12 marks]**

**(i) Nature of the Solution**

**[10 marks]**

This section of the report should specify the candidate's design of the solution. Initial designs should be produced and active involvement of the client /user should be sought in approving the designs.

The report should contain:

- an explanation of the way any data is to be collected and prepared for entry to the system;
- a detailed human computer interface (HCI) design;
- details of any file structures that are to be used and the links between them, also the relationships between output screens for an information system;
- explanation of the way the data is manipulated through the system. This section should contain diagrammatic representation of the use of any data through the system;
- thorough design of any error capture methods on inappropriate data.

The design work will tend to overlap with the analysis section and candidates should be encouraged to revisit the analysis if the evidence shows the need for collection of further information in order to complete the design. Similarly, it would be normal to revisit the design section based on the experience gained during the development of the solution. A system development should not be a linear process and the better reports will show evidence of this.

The report will be expected to show the following points, where appropriate:

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4 marks	Design of data handling, including capture, preparation and storage or design of website to include map and diagrammatic representation of links.
4 marks	Design of inputs, processing and outputs, including error capture reports as appropriate, based clearly on the analysis of the client requirements.
2 marks	Clear evidence of end user/client involvement in decision making and evidence that the options of the user/client have had an effect on the solution.

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**(ii) Task Model**

**[2 marks]**

It is important that candidates should plan not only the solution, but should also have a clear understanding of the requirements necessary to produce the solution and how the different stages will interact with each other.

The report should contain a clear description, diagrammatic or otherwise, of the different tasks necessary to complete the solution and a clear timetable.

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2 marks	Clear description, diagrammatic or otherwise, of the different tasks necessary to complete the solution and a clear timetable.
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**(c) Software Development, Testing and Implementation [24 marks]**

**(i) Software Development and Testing [19 marks]**

This section of the report gives a technical description of the solution relating it to the specification produced and agreed with the client. The candidate should produce evidence of their development work and a test plan for the system.

An attempt should be made to show that all the original objectives from the agreed requirements specification of the system have been tested. Evidence of testing is essential. Comments by teachers and others are of value, but the test plan must be supported by evidence of a properly reported testing process. The moderator must be left in no doubt the system actually works in the target environment. This evidence may be in the form of hardcopy output (possibly including screen dumps) or photographs.

The report should contain:

- a test plan. This should consist of enough individual tests to provide evidence that the developed software is robust and that the client requirements have been met;
- evidence of the existence of software which has been produced to solve the problem that the candidate was originally set, or is, at least, solving some of the objectives of the work;
- details of an effective HCI which satisfies the client/user requirements;
- evidence of testing throughout the production of the software, clear analysis of the test results and description of any necessary amendments carried out;
- detail of all testing carried out to establish the validity of the software to solve the problems agreed in the requirements specification;
- evidence of testing of the solution by the end user(s);
- evidence that each of the tasks highlighted in the task model has been addressed.

The software development and testing should be clearly related to both the analysis and design stages which have already highlighted the requirements for the project.

The report should contain:

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4 marks	A test plan which will identify a number of tests which will be carried out on completion of the work. Each test outlined should be clearly related to the relevant requirements stated in the requirement specification, all of whose requirements should feature in the test plan. The specific test to be carried out should be included in the plan together with the result which will be expected. The tests specified in the test plan will be completed during the testing of the solution.
8 marks	A software solution (of whatever type and in whatever form) which attempts to solve the original problem. The form of the original problem will tend to dictate the complexity of the solution. The marks awarded will be based on the complexity of the solution.
2 marks	Hard copy evidence of an effective HCI with annotations explaining its effective solutions for problems which had been highlighted in the requirements specification.
2 marks	Evidence that the individual stages of the solution have been tested during the development of the solution and that failures in the design or implementation of the solution have been identified and corrected.
3 marks	Evidence that each of the tests specified in the test plan have been carried out, that they are linked to the hard copy evidence, that the results have been analysed and that any necessary action has been identified.

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**(ii) Installation****[5 marks]**

It is recognised that the client may not fully implement the system, although this is the ultimate aim. There should be an implementation plan written, including details of a system changeover.

The report should contain:

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2 marks	Details of the training that will need to be available for the staff who must use the new system.
2 marks	Details of the means by which the new files are going to be created, including some indication of the scale of the problem, and also the possible need for hardware installation and the installation of the software on the hardware.
1 mark	Details of appropriate, different, methods of changeover explained so that the client can make a reasoned decision.

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**(d) Documentation****[11 marks]****Manual**

Clear guidance, written in language which is suitable for the client/end user to understand, should be given to the user for all operations that they would be required to perform. These would include input format with screen displays, print options, back-ups (file integrity routines), security of access to data and a guide to common errors that may occur. The manual should be well presented with an index and, where necessary, a glossary of the terms used. Part of the documentation should be an electronic guide (screen dumps will be required).

The manual must be a stand-alone document.

The manual should contain:

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1 mark	A contents page.
3 marks	A 'useful' guide which explains, at least, the basic operations which a user will need to carry out in order to satisfy the requirements of the problem solution. At least <b>three</b> areas of operation of the solution should be fully explained (other than back-up routines and archiving strategies).
2 marks	Back-up routines and archiving strategies.
1 mark	Methods that have been used to protect the data. For example: passwords on files or to allow access to specific screens.
1 mark	A trouble-shooting section/guide to common errors.
3 marks	On-screen help. This may take the form of error messages or may be more active, allowing the user to access advice about a particular part of the solution from within the solution. Screen dumps or photographs of these on-screen help facilities will be needed as evidence.

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**(e) Evaluation** **[8 marks]**

**(i) Evaluate the user's response to the system** **[3 marks]**

Marks are awarded for the degree of satisfaction that the client/end-user indicates in the acceptance procedure. Could the system or its results be used? Was the requirements specification achieved? Do any system faults still exist?

The report should contain:

- a letter from the client stating that they have used the software solution and listing the things they managed to do and those that they could not, or that still need work to improve them. Evidence for assertions made by the client should be available in the body of the report;
- some indication of the degree of success that the candidate has achieved in the opinion of the client/end user.

This section is assessed according to client satisfaction with the completed work .

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3 marks	Full marks should be credited where evidence is provided that the client is satisfied with the completed work.
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**(ii) Quality of the Report** **[3 marks]**

It is expected that the candidate will keep in mind the importance of the quality of presentation and ease of understanding of the report.

The candidate is expected to provide:

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1 mark	A contents page relating, correctly, to numbered pages in the report.
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1 mark	A report which shows a professional approach by providing a consistency of style both in presentation and content.
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1 mark	A diary/log, or other format, which details the order in which the tasks were performed, the problems met and the solutions used. This does not need to be a large piece of work but should be maintained throughout the life of the project.
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**(iii) Desirable Extensions** **[2 marks]**

The candidate should identify extensions to the system, which would be sensible, indicating how the extensions could be carried out.

The report should contain:

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1 mark	A clear indication that the candidate realises that, although the project is finished, the solution is not and that there are a number of possibilities for extending the solution.
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1 mark	Brief outlines about what would be involved in such extensions.
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