Unit 2: Computer Systems

Unit code: M/601/7261

QCF Level 3: BTEC National

Credit value: 10

Guided learning hours: 60

Aim and purpose

The aim of this unit is to enable learners to understand the components of computer systems and develop the skills needed to recommend appropriate systems for business purposes and set up and maintain computer systems.

Unit introduction

At some stage most IT professionals will have to set up and customise a computer system or systems. To do so effectively they will need to understand the components that make up computer systems. The operating system interacts with the hardware and software components in order to make a functioning machine.

In this unit learners will consider a range of hardware and come to understand the technical specifications of components. There are a number of different operating systems, despite the dominance of the Microsoft operating system, and learners will explore at least one other. In terms of software, the operating system itself often provides utility programmes that assist the user in managing the machine. Other third party software utility programmes such as virus checkers are also used extensively. This unit considers both types of utility software.

IT professionals will often be asked to recommend systems for varied user needs. There are many different manufacturers of computer systems and each manufacturer produces a wide range of models with different specifications. Deciding which particular model is appropriate for a given situation depends on a variety of factors. These factors are explored in this unit so that learners can make informed choices when recommending computer systems.

IT professionals also need to develop the skills required to install and configure computer systems. A large part of this unit will involve practical work in installing hardware components and software, configuring systems to meet specific requirements and testing to ensure a fully functioning system is produced.

Learning outcomes

On completion of this unit a learner should:

1   Understand the components of computer systems

2   Be able to recommend computer systems for a business purpose

3   Be able to set up and maintain computer systems.

Unit content

1 Understand the components of computer systems

Internal system unit components: processors; motherboard; BIOS; power supply; fan and heat sink or cooling; hard drive configuration and controllers eg SATA, IDE, EIDE, master, slave; ports eg USB, parallel, serial; internal memory eg RAM, ROM, cache; specialized cards eg network, graphic cards

Peripherals: output devices eg monitor, printer, plotter; input devices eg camera, scanner; cabling eg coaxial, optical, twisted pair

Backing storage: types eg disks, pen drives, optical media, flash memory cards; portable and fixed drives; performance factors eg data transfer rate, capacity

Operating system software: operating system examples eg LINUX, Windows, DOS, MAC OS; command line and GUI operating systems; operating system functions and services eg machine and peripheral management, security, file management; device drivers; features eg ability to customize, support for connectivity of portable media, security, stability and reliability, ease of management, associated utilities, cost and support for the user.

Software utilities: security eg virus protection, firewalls; clean up tools eg for removal of cookies, internet history, defragmentation; drive formatting

2 Be able to recommend computer systems for a business purpose

Considerations for selection: cost; user requirements eg software to be used, network sharing, need for maintenance contract, outputs required, need for integration with other systems eg home entertainment; processing power, storage capacity, accessibility for disabled users, the ICT competence of the intended user, training requirements

3 Be able to set up and maintain computer systems

Connect and set up: equipment eg monitor, printer, modem/router, keyboard, mouse, speakers, microphone, RAM, hard drive

Install hardware: components eg graphics card, sound card, CD/DVD drive

Install software: operating system software eg Windows; applications software eg Microsoft Office; security software eg virus checkers, firewalls; device drivers; create appropriate directory/folder structures

Configure: BIOS configuration eg setting a BIOS password, editing power management options; editing anti-virus configurations; editing the desktop eg icon size, font size, colour, background, icon choice; creating start-up options; setting file sharing/permissions; creating and reconfiguring application toolbars

Testing: functionality eg software applications open and work as intended, default folder settings are correct, desktop shortcuts go to the right place, the correct device drivers are installed, the correct paper sizes are set for printing, menu options work as intended, the correct date and time are set

Routine maintenance: organisation and naming of files; back-up procedures eg online, off-line; back-up media; automatic scheduling and deletion of unwanted data; archiving; defragmentation; deleting temporary files; cleaning hardware eg keyboard, mouse, display screen equipment (DSE), ventilation grills; replacing consumables eg printer paper, ink or toner cartridges; replacing damaged components

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 explain the function of computer hardware components		
P2 explain the purpose of operating systems	**M1** compare the features and functions of different operating systems	
P3 explain the purpose of different software utilities		**D1** explain how software utilities can improve the performance of computer systems
P4 recommend a computer system for a given business purpose [IE1, IE2]	**M2** justify choice of computer system to meet a given business purpose [IE6]	
P5 set up a standalone computer system, installing hardware and software components [SM3]		
P6 configure a computer system to meet user needs		
P7 test a configured computer system for functionality	**M3** evaluate the performance of a computer system. [IE4]	**D2** explain and justify improvements that could be made to a computer system.
P8 undertake routine maintenance tasks on a standalone computer system.		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

The way in which the content is ordered can guide the delivery as outlined in the outline learning plan.

To start with, learners could research the different internal and external hardware components of computer systems and develop their own 'Dummies Guide'. They should be encouraged to investigate cutting-edge technology, not just the safe options. This can be supported with practical sessions where learners can see and handle the components. A stock of redundant or superseded components is a useful aid.

Facilities will need to be available for learners to practise installing both hardware and software components as outlined in the unit content. Note this is for stand-alone machines. This needs to be done under careful supervision, not least to ensure longevity of resources. Health and safety must be a priority and learners must be taught how to work in a safe manner. It should become second nature for learners to take appropriate precautions using static mats and wristbands when handling hardware components. Health and safety issues relating to electrical appliances and use of tools also need to be addressed.

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

Learners will need opportunities to practise configuring systems to meet specific requirements. A variety of requirements should be covered as outlined in the unit content.

Good practice in planning and recording testing should be developed as practical work progresses.

While it will be natural to concentrate on the operating system in use in the centre, learners must be given the opportunity to work with at least one other system, and understand other operating systems as outlined in the content.

A range of software utilities should be investigated. Learners will be familiar with virus protection and firewalls and useful research can be undertaken to discover the latest threats and barriers. It may be difficult for learners to use clean-up tools on the centre systems but they should understand the range and function of these tools.

Once a basic understanding of components is in place, learners can start researching component costs and compatibilities. It can be useful to compile a comparative table, which will help when it comes to assessment.

Using case studies will help learners to understand how to select a system set up for a particular user requirement. As many different scenarios as possible should be used. Commercially available computer systems should be investigated and assessed for compatibility as well as considering building a system from its component parts.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan demonstrates one way in planning the delivery and assessment of this unit.

Topic and suggested assignments/activities and/assessment
Introduction to the unit
Components of computer systems: • whole-class exercise – tutor presentation on internal system unit components, followed by practical exercise • whole-class exercise – tutor presentation on backing store, followed by practical exercise • whole-class exercise – tutor presentation on peripherals, followed by practical exercise • a mixture of practical exploration of the technologies and detailed investigation • whole-class exercise – tutor presentation on operating system software, followed by practical exercise • whole-class exercise – tutor presentation on software utilities, followed by practical exercise • a mixture of practical exploration of the technologies, learner exercises and detailed investigation.
Assignment 1 – Decoding the Jargon
Installing and testing hardware: • whole-class exercise – tutor presentation on test plans and test records, followed by practical exercise • whole-class exercise – tutor presentation on precautions (static mats etc), followed by practical exercise • whole-class exercise – tutor presentation on health and safety regulations • practical installation of hardware.
Installing and testing software: • whole-class exercise – tutor presentation on test plans and test records, followed by practical exercise • practical installation of software • whole-class exercise – tutor presentation on configuring system settings, types of settings and reasons for changing them, followed by practical exercise • practical tasks and tutor demonstrations.
Selecting systems: • whole-class exercise – directed research followed by group discussion on user needs and other considerations • research, case studies, exercises.
Assignment 2 – The Best Solution
Assignment 3 – Setting up the System

Assessment

The suggested assessment of this unit is through the three assignments summarised in the *Programme of suggested assignments* (PSA) table below.

Suggested Assignment 1 – Decoding the Jargon

For P1, evidence such as diagrams or photographs with clear supporting notes will be sufficient. An alternative form of evidence is a web page with hot-spots over different components explaining what the components are. The communication between components must be identified. It is possible that everything could be identified within one diagram.

Alternatively, learners could give a demonstration to the tutor with documented questions and answers or undertake a short test. However, if a test is used, learners must show competence in all areas of the unit content and not just achieve a certain percentage. Potentially, a detailed diagram or poster supplemented by a short test would be appropriate.

For P2, learners should outline the basic functions of operating systems in general, explaining how they are used to facilitate users.

For M1, learners must review the features and functions of different operating systems. Learners will need to present a comparison of selected operating systems, summarising their respective strengths and weaknesses in context.

Suggested Assignment 2 – The Best Solution

For this assignment learners will need to be given a detailed business requirement. This need not be the same as that for the installation assignment (see below), indeed separating the two may give more scope for varying the detail given to learners and allow for more unusual requirements to be included.

For P3, a table is an appropriate format for structuring the information. Learners are required to give one example from each category of software utilities defined in the content.

For P4, learners could present the evidence as a report or presentation. The choice of components should be briefly explained but may not make reference to all the user requirements. It is important that the final specification includes all the necessary hardware and software components for the system to work.

For M2, learners must justify why the system set up was chosen, eg cost, and suggest alternative set ups (at least one) and discuss why they could also be appropriate. The reasons for the choices should be clearly explained and referenced to the user need. Any optional extras must be justified.

For D1, learners must consider the benefits of computer performance created by using software utilities. In this case, learners should give reasons for possible improvements from using a specific utility.

Suggested Assignment 3 – Setting up the System

Ideally, the same business requirement used in Suggested Assignment 2 will be used for this assignment. However, that may not be possible, in which case another scenario can be used to match the hardware/software available for installation.

For P5, learners must install at least one hardware and one software component in a stand-alone system. This is best evidenced with a witness statement or observation record and screenshots. Learners must use suitable safety equipment/tools and pay due regard to health and safety issues.

For P6, learners must configure some basic system settings, such as left and right mouse buttons, power-saving options, screen resolution, desktop theme, font size, default language setting, default folder locations etc. They may have needed considerable prompting to do so. This is best evidenced with a witness statement or observation record and screenshots. To achieve M3, learners will have configured system and software settings in order to make the system more appropriate for the specified purpose.

For P7, evidence will be provided by a test plan and subsequent test results. Screenshots may be relevant. Any test failures should be explained, with reasons.

For P8, evidence will be provided by a short report with screengrabs.

M3 is an extension of P7. Learners should gauge system performance in their tests and evaluating the data.

For D2, learners should offer suggestions on how the system could be improved, considering costs involved and potential benefits gained.

Programme of suggested assignments

The table below shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the assessment and grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, M1	Decoding the Jargon	A business manager has asked for a presentation on computer components for staff development purposes.	Diagrams Notes Comparative tables
P3, P4, M2, D1	The Best Solution	You are to recommend a suitable hardware and software configuration for a specific business requirement.	Presentation Supporting handouts
P5-P8, M3, D2	Setting up the System	Install, configure and test system components. Perform routine maintenance.	Witness statement Observation records Screenshots Test records Report

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC in IT sector suite. This unit has particular links with the following unit titles in the IT suite:

Level 2	Level 3	Level 4
Unit 3: Computer Systems	Unit 9: Computer Networks	Unit 26: Design a Small Office Home Office Network
	Unit 25: Maintaining Computer Systems	

This unit maps to some of the underpinning knowledge from the following areas of competence in the Level 3 National Occupational Standards for IT (ProCom):

- 4.1 Systems Architecture
- 4.3 Human Needs Analysis
- 4.4 Systems Analysis
- 4.7 Systems Design.

Essential resources

Learners will need access to practical resources and suitable technology, they can also use simulators or multimedia tools to gain experience before handling 'live resources'. Learners will require access to computer equipment to enable them to gain a practical awareness and enable them to apply their knowledge and understanding in a practical situation.

Employer engagement and vocational contexts

The use of vocational context is essential in the delivery and assessment of this unit.

There is a range of organisations that may be able to help centres engage and involve local employers in the delivery of this unit, for example:

- Work Experience/Workplace learning frameworks – Centre for Education and Industry (CEI University of Warwick) – www.warwick.ac.uk/wie/cei

- Learning and Skills Network – www.vocationallearning.org.uk

- Network for Science, Technology, Engineering and Maths Network Ambassadors Scheme – www.stemnet.org.uk

- National Education and Business Partnership Network – www.nebpn.org

- Local, regional business links – www.businesslink.gov.uk

- Work-based learning guidance – www.aimhighersw.ac.uk/wbl.htm.

Indicative reading for learners

Textbooks

Anderson H and Yull S – *BTEC Nationals IT Practitioners: Core Units for Computing and IT* (Newnes, 2002) ISBN-10 0750656840, ISBN-13 978-0750656849

Fulton J – *Complete Idiot's Guide to Upgrading and Repairing PCs, 4th Edition* (Alpha, 1999) ISBN-10 0789722062, ISBN-13 978-0789722065

Knott G and Waites N – *BTEC Nationals for IT Practitioners* (Brancepeth Computer Publications, 2002) ISBN-10 0953884821, ISBN-13 978-0953884827

White R and Downs T – *How Computers Work, 9th Edition* (Que, 2007) ISBN-10 0789736136, ISBN-13 978-0789736130

Journals

Computer Weekly

Which? Computer

Websites

www.bized.co.uk

 www.computerweekly.com

www.wrx.zen.co.uk/magazines.htm   For a comprehensive list of UK computer/internet/web/IT magazines

Delivery of personal, learning and thinking skills

The table below identifies the opportunities for personal, learning and thinking skills (PLTS) that have been included within the pass assessment criteria of this unit.

Skill	When learners are ...
Independent enquirers	identifying questions to answer and problems to resolve when specifying suitable components to meet user requirements
	planning and carrying out research, appreciating the consequences of decisions when selecting suitable components to meet user requirements
	analysing and evaluating information, judging its relevance and value when evaluating the performance of a computer system
	supporting conclusions, using reasoned arguments and evidence when justifying a choice of computer system.

Although PLTS are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Independent enquirers	supporting conclusions, using reasoned arguments and evidence when giving reasons for the choice of components to meet a given need
Self-managers	organising time and resources, prioritising actions when setting up, testing and maintaining the system.

● Functional Skills – Level 2

Skill	When learners are ...
ICT – Using ICT	
Plan solutions to complex tasks by analysing the necessary stages	specifying suitable components to meet user requirements
Select, interact with and use ICT systems safely and securely for a complex task in non-routine and unfamiliar contexts	connecting hardware safely to a computer system, testing for functionality configuring software for a given user requirement maintaining the system
ICT – Developing, presenting and communicating information	
Combine and present information in ways that are fit for purpose and audience	explaining and justifying choices to a business.