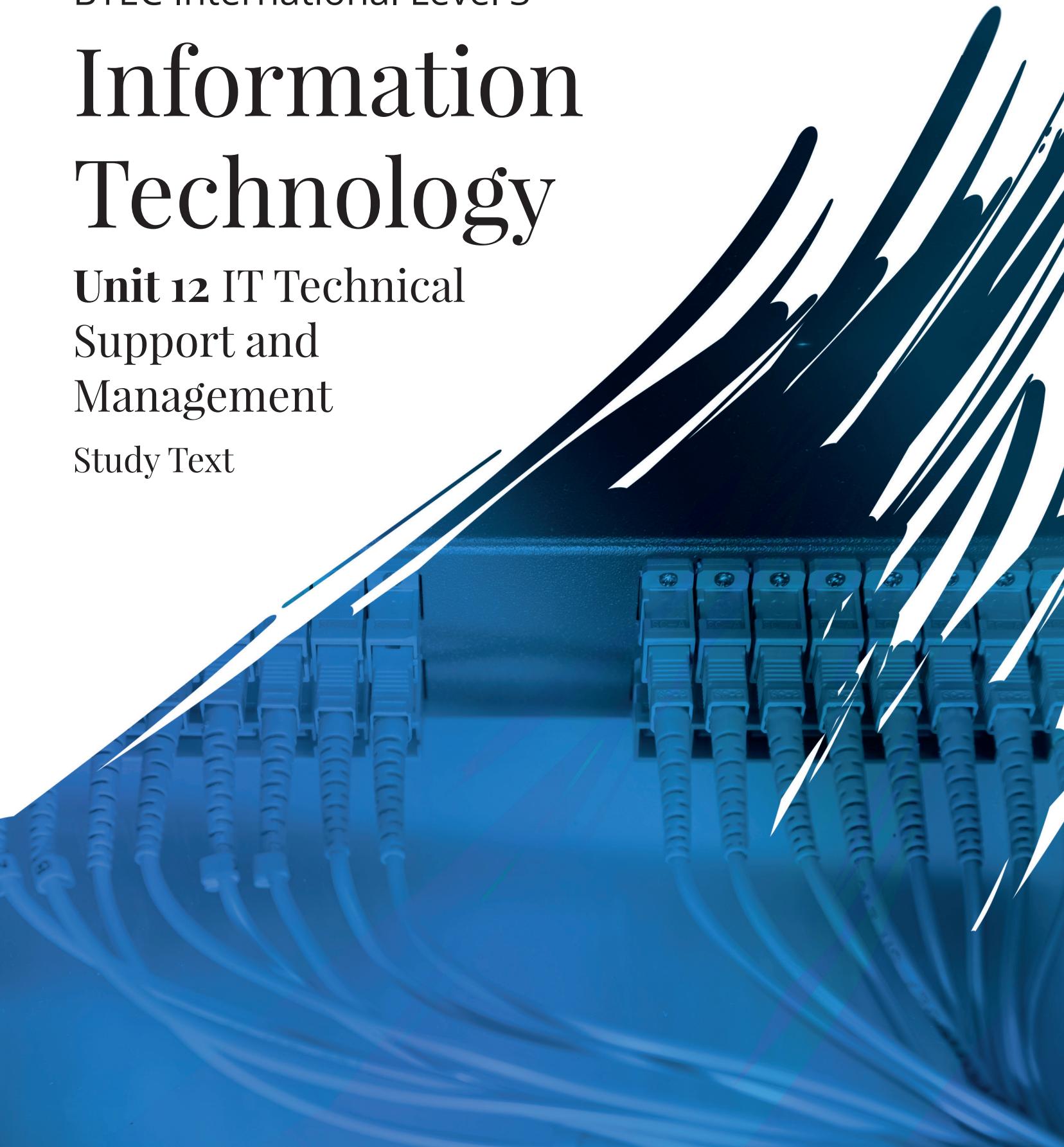


BTEC International Level 3

Information Technology

Unit 12 IT Technical
Support and
Management

Study Text





Published by Pearson Education Limited, 80 Strand, London, WC2R 0RL.

btecworks.com/level3

Copies of official specifications for all Edexcel qualifications may be found on the website:
qualifications.pearson.com

Text © Pearson Education Limited, 2020

Typeset by Florence Production Ltd, Devon, UK

Produced by Florence Production Ltd, Devon, UK

Original illustrations © Pearson Education Ltd

Illustrated by Florence Production Ltd, Devon, UK

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First published 2020

23 22 21 20

10 9 8 7 6 5 4 3 2 1

British Library Cataloguing in Publication Data

A catalogue record for this book is available from the British Library

ISBN 978 1 292 356495

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Acknowledgements

Author credit: Alan Jarvis

The author and publisher would like to thank the following individuals and organisations for permission to reproduce the following:

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Getting to know your unit

Most modern companies use IT and for many it has become essential for their business. Many of their employees that use the IT systems on a day-to-day basis will not be IT experts. This means that if there are problems with the system they need support to resolve them. Many companies run large and complex networks. Problems with the system can be quite common and need to be resolved quickly so their employees can get on with their work.

It is the job of an IT support technician to provide the support to end users, develop the system to meet future demands and protect the systems from security issues. They will need to ensure that, should there be a disaster that has a major impact on the organisation's IT systems, there are plans in place to provide alternative systems.

In this unit you will look at the IT support and management needs of different organisations, carry out some routine IT support tasks and create a plan to provide support and management to meet the needs of a particular organisation.

Assessment

You will be assessed by a series of assignments set by your teacher.

How you will be assessed

To pass this unit you need to complete one or more assignments. There are practice assessment activities throughout this unit to help you prepare for the final assessment. Completing them will mean that you have undertaken useful research and preparation, which will be relevant when it comes to your final assignment.

To achieve the tasks in your assignment, check that you have met all the Pass grading criteria. These criteria require clear explanations in your own words, for example explaining the safe working practices required in the support and management of IT systems. You also need to produce evidence of practical activities such as screenshots and photos. Check against the criteria as you work your way through your assignment.

To gain a Merit or Distinction, you should make sure that you present the information in your assignment in the style required by the relevant assessment criterion. For example, Merit criteria require you to compare the support and management requirements of different IT systems. Distinction criteria require you evaluate the support needs of different IT systems, optimise the performance of a system and evaluate the IT support and management plan produced.

The assignment set will consist of tasks designed to meet the criteria in the table. They may include a written assignment and include activities such as:

- carrying out practical activities
- reviewing and refining your support plan with the help of others
- producing a report using your own research that examines the job roles and tools used in IT support and management.

Assessment criteria

This table shows you what you must do in order to achieve a Pass, Merit or Distinction grade.

Pass	Merit	Distinction
Learning aim A Examine the IT system support and management needs and characteristics of different organisations, which are essential to their operation		
A.P1 Explain the purpose and nature of safe working practices required in the support and management of different IT systems. Assessment practice 12.1 A.P2 Explain the job roles and system and network tools used in the support and management of different IT systems. Assessment practice 12.1	A.M1 Compare the support and management needs and characteristics of different IT systems, showing how they would meet the client's requirements. Assessment practice 12.1	A.D1 Evaluate the support needs and characteristics of different IT systems, justifying where improvements may be possible. Assessment practice 12.1
Learning aim B Carry out routine support and management activities on IT systems		
B.P3 Complete at least six routine IT support activities safely, using some appropriate processes and behaviours. Assessment practice 12.2 B.P4 Monitor the performance of the IT system safely against the client's requirements, using some appropriate processes and behaviours. Assessment practice 12.2	B.M2 Complete at least six routine IT support activities safely and monitor the system's performance to meet the client's requirements, using appropriate processes and behaviours. Assessment practice 12.2	B.D2 Complete at least six routine IT support activities safely and optimise the system's performance to meet the client's requirements, using processes and behaviours effectively. Assessment practice 12.2
Learning aim C Develop a plan to support and manage a new IT system using industry standards and methods		
C.P5 Produce an IT support and management plan that adequately meets most of the client's requirements. Assessment practice 12.3 C.P6 Review the IT support and management plan with others to identify and inform improvements. Assessment practice 12.3	C.M3 Justify, using feedback from others, the decisions made for an IT support and management plan, explaining how it will meet the client's requirements and be fit for purpose. Assessment practice 12.3	C.D3 Evaluate, using feedback from others, the refined IT support and management plan, justifying how it fully meets the client's requirements and is fit for purpose. Assessment practice 12.3



Getting started

What IT issues and problems have you come across in your use of IT at home and at school or college? How did you resolve them? Did you use an IT support service? How was their support provided (in person, over the phone, by email, etc.)? Was their assistance helpful? How could it have been improved?

Learning aims

In this unit you will:

- A}** Examine the IT system support and management needs and characteristics of different organisations, which are essential to their operation
- B}** Carry out routine support and management activities on IT systems
- C}** Develop a plan to support and manage a new IT system using industry standards and methods

A} Examine the IT system support and management needs and characteristics of different organisations, which are essential to their operation

Organisations use IT for a wide variety of tasks and often rely heavily on those systems to run their business, therefore any issues with those systems need to be dealt with quickly to avoid a serious impact on the organisation.

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

Purpose and nature of IT system support and management

What are the main roles of the IT system support function in an organisation?

Support users

The primary purpose of IT support and management is to enable a company's employees to carry out their jobs effectively using IT. Those employees (the IT users) have a range of different skill levels. Some of them may have very little IT skills. Others may have a reasonable level of skills in using IT and may have been using IT in the workplace for many years (so-called intermediate level IT skills). There may also be some expert users, either with a very high level of skills in one particular application or across the range of systems. The IT support staff themselves are, of course, systems users and some of these may have the right to access all areas of the system (known as administrators). All levels of users can have technical problems when using the company's systems and it is the primary role of the IT system support team to record, investigate and resolve those issues for the users.

Ensure continuity of systems

The IT support team also need to ensure the company systems are running and providing a more or less continuous service to the users. The systems can include the following:

- **Servers** – these are typically used as the main shared computing resource, providing data storage, running shared applications (such as email, database, etc.)

- **Virtual personal computers** – these are computers where the applications run on servers rather than on a desktop computer or laptop. To access **virtual** computers, end users can use a number of different devices including thin client devices, tablets and mobile phones.
- **Cloud storage** – where user data files are stored on the internet allowing them to be accessed anywhere (where an internet connection is available) and from a variety of different devices.

Discussion

In a small group discuss why cloud computing has become very popular recently and what the benefits are. What impact does cloud computing have on IT support in a particular organisation?

- **Mobile devices** – workers who need to travel for their job are often provided with mobile phones or tablets by their employer. Due to the risk of mobile devices being lost or stolen the IT department will usually ensure extra security features are included to protect company data, such as encrypting data stored on them and enabling remote wiping of data.
- **Laptops** – these may be used inside the organisation or some users may be able to take laptops out. Where laptops are used outside the company, the same security considerations apply as with mobile devices. For example, whole disk encryption is commonly used (such as Microsoft® BitLocker) to protect company data on laptop hard disks.
- **Bring Your Own Device (BYOD)** – some companies allow users to access company systems using their own devices, although usually require them to install additional security software on the device.
- **Network systems** – these are used to support the functionality of the network and include devices such as switches, routers, wireless access points and firewalls. Ideally end users will be unaware of these devices unless there is a problem with them.
- **Processes** – many company systems run software to support business functions such as financial management and accounting, email communication and stock control. Applications such as accounting and stock control typically use database systems and may store very large amounts of data. For example, a supermarket stock control system will keep track of many thousands of items in multiple stores and communicate with other company systems such as stock ordering systems and financial management systems to automatically order goods and pay suppliers. Such systems are essential to the efficient running of the business.

Improving performance

Another key role of the IT support function is to maintain and improve the performance of the company systems. This is done by monitoring the performance of systems,

II Pause point Why are laptops and other mobile devices such as tablets and mobile phones likely to need more support and management than desktop computers? What issues are likely to affect these devices and how can the IT support department deal with them? What are the advantages and disadvantages of BYOD from the point of view of both the individual employee and the company?

Hint The issues are not just to do with security.

Extend How can a company IT usage policy relate to these issues?

Key terms

Virtual – the software emulation of a hardware device, typically a computer. A virtual computer runs on software emulated hardware rather than physical hardware.

Cloud – the use of internet-based remote services to provide a range of IT facilities including storage and applications.

BYOD – end users' own personal devices, typically mobile phones, which they use to access company systems.

Link

For more on network systems see **Unit 1: Information Technology Systems – Strategy, Management and Infrastructure**.

identifying bottlenecks that can be alleviated by upgrades and adjusting the configuration of devices such as network routers. IT support technicians also carry out preventative maintenance tasks such as disk defragmentation and deleting temporary files in order to keep the system running efficiently.

Link

For more on how to secure and protect systems see **Unit 11: Cyber security and incident management**.

Secure and protect systems

Security is a major concern for company IT systems and the IT support department has an important role in keeping the systems safe. This includes providing a range of protection methods such as firewalls, malware protection, user authentication, etc. plus carrying out regular data backups and restoring data, should there be any loss for whatever reason.

Support and management needs across the system life cycle

Systems, both hardware and software, usually go through a life cycle, from design to building, testing, implementation and use. Finally systems are replaced and decommissioned. The type and amount of support required at the different stages of the lifecycle varies.

Design, build and test

During this stage of the life cycle the IT support role is to work on building the system. Depending on the nature of the system being built, this can include tasks such as installing software, configuring system hardware and software and setting up user accounts. User training may also be needed so end users are aware of how to use the new system.

Operational use

Once the system is set up and in operational use then the support becomes focused on day-to-day user support. They will provide a fault logging system and manage the faults that are reported. The typical problems that users may have can range from simple password resets if users have forgotten their passwords to more complex issues with software errors, such as functions that do not work as expected.

Decommissioning

When a system is no longer needed it can be decommissioned. The most important aspect of decommissioning is the deletion of any company data from the system. Simply using operating system delete function or formatting the disks is not considered sufficient as data deleted in this way is easily recovered. Disks must either be permanently deleted using **data wiping software** or they must be physically destroyed. Hardware needs to be disposed of or repurposed according to the company policy on recycling of hardware, this is covered in a later part of this unit.

Key term

Data wiping software – a software-based method of completely erasing the data from a hard drive, sometimes called data sanitisation software, disk wipe software or hard drive eraser software.

Support resources

To provide IT support, resources are needed, such as the following:

- Human resources, in the form of IT support technicians. The number of support technicians needed will depend on the number of IT end users in the company and on the IT skill level of the end users. For example, in a software development company where many of the end users are skilled in IT, fewer support technicians are likely to be required than in a bank where the IT skill level of many of the users may be limited. The number of technicians may also depend on the complexity of the work end users are carrying out.

- Software licences are needed for the different software applications used. Part of the IT support department's responsibilities is to ensure that software licencing rules are adhered to and unlicensed software is not used.
- Hardware devices including desktop and laptop computers, networking equipment, such as switches and routers, and may include mobile devices, such as tablets and mobile phones. In most cases it is the IT support department's responsibility to purchase, set up, keep track of and maintain all these hardware items.
- Capacity requirements – IT support needs to keep track of the number of IT devices (PCs, laptops, etc.) and their capacity (such as hard disk and network bandwidth capacity) and upgrade them to meet the demand if necessary.

Organisational change

Companies sometimes need to or choose to reorganise in order to improve the way in which they do business. Such reorganisation can include changing the structure of the business, moving staff into different roles or making some workers redundant. These changes might be necessary so the company can work more efficiently, improve profits, or expand and reduce the size of a company's workforce. IT systems may need to change too to support such organisational changes.

User need

As mentioned earlier, the demand for IT support from end users can vary depending on their IT skill level and the complexity of the tasks they are using IT for.

Support provided

Providing IT support costs money and the IT support department is a business expense (sometimes called an overhead). In other words, they do not directly contribute to the company profits. A company will always look to reduce its overheads. However, since many companies cannot operate without IT systems and employee productivity may depend on having efficient IT systems it is an essential overhead. The business will always be looking to find a balance between the service provided by IT support and how much it costs. IT systems can also have a significant impact on the environment, so this also needs to be considered.

Organisational needs

The type of IT systems used will impact on the level of support required. For example, a media company using IT to edit video will typically have a much higher demand for the performance and capacity of IT systems compared to a lawyer's office using IT for office tasks such as word processing. It is also likely that the kind of issues and problems faced by video-editing users will be more complex than word processing users.

II Pause point What IT systems (including end user computing, networks, file storage, etc.) do you use on a regular basis? How are these systems supported? Who do you (or your teacher) contact if there are problems? Do you have any IT related systems at home (internet, mobile phone, TV services)? What impact does the failure of IT systems have on you?

Hint Think about the systems you use in your school or college.

Extend How could the IT systems that you use and their support be improved?

Safe working practices in IT support and management

Skills

- Personal responsibility
- Social responsibility

Local regulations

It is essential that every organisation follows local health and safety regulations as the consequences of not doing so can be severe. There could be legal action if accidents happen and the company is found not to have followed rules, staff working hours may be lost if they're injured and staff may leave the company if they feel it is unsafe and health and safety rules are not followed.

Health and safety hazards

When carrying out maintenance tasks on computer equipment there are several hazards that support technicians need to be aware of the following:

- **Electrocution** – as with all mains powered electrical equipment there is a danger of electrocution from unprotected or damaged wiring and power supplies.
- **Electrostatic discharge (ESD)** – some computer components such as CPU and memory chips are sensitive to **static electricity**. Static can easily build up on a support technician's body through contact with everyday items (for example walking across a carpet can cause a build-up of static in your body) and then be discharged through the components when they touch them during installation or maintenance. ESD may not cause immediate damage to the components, in some cases latent defects may be caused, which can mean the component will fail later in its life.
- **Ergonomics** – all IT users including end users and support technicians are subject to the health dangers of working for long periods at desks or workstations that are unsuitable, for example if chairs or monitors are not adjustable. This can cause a variety of issues such as back pain, wrist injury (from excessive keyboard use), eye strain, etc.
- **Fire** – as with any electrical machinery there is a danger of fire caused by overheating, faulty wiring, etc.
- **First Aid training** – accidents and medical emergencies can occur at any time so first aid training is a sensible precaution. Should an IT support technician witness such an event they can take the correct action promptly until professional help arrives.

Hazard mitigation

- **Electrocution** – if any mains electrical plug, socket or wiring is found to be damaged (e.g. missing, worn or cut insulation, loose connectors, etc.) it should not be used and should be referred to a qualified electrician. If computer cases need to be opened, they should first be disconnected from the power supply.
- **ESD protection devices** – when carrying out maintenance tasks such as installation or upgrade of electronic components ESD protection methods should be used, including an earthing wrist band and an ESD bench mat for placing components on while working.
- **Fire** – comprehensive fire precautions should be in place, including clearly signposted fire exits, smoke detectors, fire alarms and fire extinguishers suitable for electrical fires (CO₂ or dry powder extinguishers). Local regulations may also require other fire precautions for offices and public buildings such as emergency lighting and regular fire drills, etc.

Discussion

What sort of precautions could be taken to protect people from health and safety hazards?



Figure 12.1 Anti-static ESD wristband

- **Ergonomics** – IT users should remember to take regular breaks from screen work. They should also sit on an adjustable chair and monitor to allow equipment to be positioned to use comfortably. Unless ergonomics are considered there is a danger that IT users can suffer from a variety of health-related issues such as back injury, wrist strain and eyesight problems.

Link

For more on ergonomics see **Unit 1: Information Technology Systems – Strategy, Management and Infrastructure**.

Case study

Enterprise mobility management

Many businesses provide employees with mobile devices such as smartphones to connect to company systems on the move, however these devices present some additional support challenges that desktop computers do not. This has given rise to a type of software and processes known as Enterprise Mobility Management (EMM). EMM software products such as AirWatch allow businesses to configure mobile devices before they are supplied to employees and ensure updates are applied to devices as required. Due to the security issues associated with mobile devices EMM systems allow the security of mobile devices to be centrally enforced and managed. This typically involves requiring users to be authenticated by passwords or fingerprint scans, encryption of data and the ability to remotely wipe all the data from the device if it is lost or stolen. Other security features that can be provided by EMM software include preventing installation of certain types of apps, monitoring for malware threats, remote access to the device and other security policies. When accessing corporate systems, the EMM software ensures the device uses encrypted data transfer over the network using a VPN or the HTTPS protocol.

Check your knowledge

- 1 If an organisation allows employees to use their own devices (BYOD), users with Android™ based smartphones may have many different versions of Android™ installed. What support issues might this cause?
- 2 What kind of device restrictions do you think an organisation might want to place on a smartphone used to connect to its corporate systems? (For example, the apps that can be installed, the networks it can connect to, etc.)

Job roles in IT technical support and management

There is a hierarchy of job roles within a typical large IT support department.

First line support

First line support is the lowest level of technical support. Support technicians working in first line support are typically junior or trainee support technicians. They are the first person to deal with a support request. First line support is focused on collecting and recording user details and the symptoms of a problem so the nature of the user's problem can be identified. If support requests are received by telephone, the first line

Skills

Cognitive skills/cognitive processes and strategies

- Analysis
- Interpretation
- Self-evaluation

support technician may use a pre-defined script to collect information from the user. They are then able to diagnose very simple faults such as no power, inability to log on and forgotten passwords.

Second line support

If a support request is not resolved by first line support, it is passed (or **escalated**) on to the second line support. Here more senior support technicians will review the information collected by the first line support and prioritise the request. Requests will usually be prioritised on the basis of their impact on the organisation, so for example:

- if a server computer is down (or a network device) that is impacting on multiple people then this would be regarded as the highest priority
- if a single user's computer is suffering a problem that prevents them from doing their work this would be the next level of priority
- minor problems, which do not prevent users from doing their work, would be regarded as low priority.

Different organisations may have different definitions of priority and additional priority levels may be defined.

As well as prioritising the support request, the second line support technician would be expected to fix most of the support requests that, while more technical in nature, are not very complex or involved. Within the second line support team, support technicians may have different areas of expertise.

Third line support

Third line support is where the most complex issues are escalated if second line support cannot resolve them. Third line support technicians typically have an in-depth understanding and a lot of experience in a particular area (or areas). Third line support technicians also take a broader view of the IT systems. Rather than focusing on day-to-day issues, they consider strategic priorities (such as expanding capacity, reducing costs or ensuring watertight security) and planning to meet them.

Infrastructure architects

In large companies with extensive IT systems an infrastructure architect will be responsible for designing, planning and developing the server systems and networks to support the organisation's use of IT. Infrastructure architects will have high-level skills in server hardware, software and networking and will not normally get involved in dealing with day-to-day end user technical problems.

Network administrators

In a large organisation with a complex network infrastructure there may be some support technicians who are described as network administrators. Their role is to set up, configure, monitor and optimise the organisation's networks including large local area networks and wide area connections to other sites the organisation may have in different locations.



Pause point

Make a list of the skills you think would be necessary for each of the following jobs:

- First line support technician
- Second line support technician
- Third line support technician
- Infrastructure architect.

Hint

Consider both technical and non-technical skills.

Extend

What other job roles do you think you might find within an IT department at a large organisation?

System and network support and management tools

IT support technicians use a range of different software tools to help them install, configure and support an organisation's IT systems.

Network performance monitoring

Ensuring an organisation's network provides an appropriate level of performance is an important task. Microsoft Windows does not have very sophisticated network monitoring software built into it, although you can see the network usage by different applications in Windows Task Manager. You can also use the Windows Performance Monitor app. This app will allow you to monitor CPU and network performance in real time and you can also save data to a log file. The Performance Monitor can be run on an individual desktop computer but typically IT support technicians would run this (or more sophisticated third-party apps) on the server(s). Figure 12.2 shows Windows Performance Monitor with the Networking window maximised.

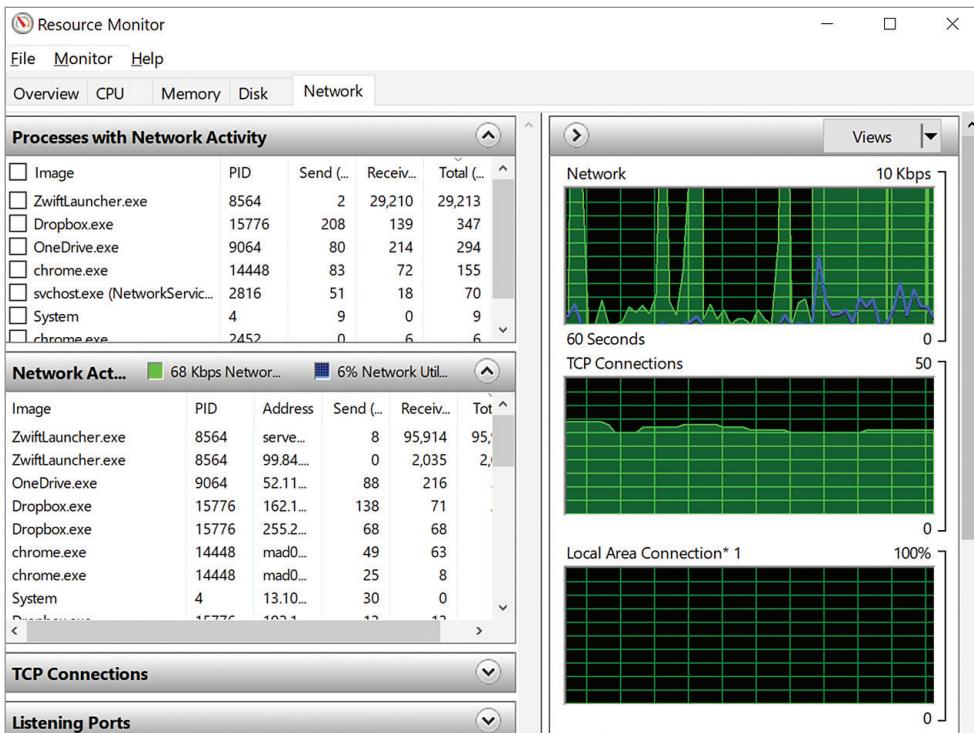


Figure 12.2 Windows Performance Monitor app

Network performance monitors can show the network usage of particular applications (as shown in Figure 12.2) and of the overall network bandwidth available. Even more detailed analysis of network performance, for example by protocol, can be done using network scanner software.

User desktop computing

In many organisations end users require a computing resource at their desk. Traditionally this has been provided by desktop computers, but with the increasing power of server computers and the speed of **Local Area Networks (LAN)** some organisations have implemented **thin client** computing with virtual end user desktops running on a server computer and thin client computers on users' desks. The main benefit of this approach is that it has lower hardware per user costs than traditional desktop computers. Another approach is to provide end user computing using web browser-based software.

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

Key terms

Local Area Networks (LAN)

– a computer network that connects computers within a defined area such as a house, school, laboratory, university campus or office.

Thin client – low specification desktop hardware used to display a virtual desktop that runs on a server. It does not run applications locally.

Key term

Disk image – an exact copy of all the contents of a computer's hard disk including operating system, configuration settings and applications.

Remote deployment

This service allows support technicians to remotely install operating systems over the network. The Windows Server Operating Systems includes the Windows Deployment Service (WDS) that is used for this purpose. Typically, support technicians will create a disk image on one of the computers where software is to be installed by first completing the installation and configuration of all the operating system and application software required by end users and testing the installation to ensure it works as required. They will then create a **disk image**, which is an exact copy of everything on the disk and use WDS to remotely install the image on all the required desktop computers.

Asset management

The IT support department needs to keep track of all the hardware it has and all the software licences that are installed. Typically, asset tracking labels with unique numbers or barcodes are attached to all hardware equipment and details recorded in a database. Software licences must also be tracked to ensure compliance with the rules of the different software that is in use. This can also be done using a database listing where each product and associated licence is installed. Some software is provided with automatic systems for tracking licence usage such as Microsoft Key Management Service (KMS).

Remote desktop

A remote desktop is a very widely used support tool in that it allows a support technician to access a user's desktop remotely. This will allow them to view and diagnose problems users may be having without having to physically be with the user. It also allows the support technician to remotely adjust the user's configuration and apply updates. This saves a lot of time as the support technician can resolve problems without leaving their desk.

Assessment practice 12.1**A.P1, A.P2, A.M1, A.D1**

You have recently taken a job as an IT support technician at a company that provides businesses with outsourced IT support. The company provides IT support to a wide range of companies both large and small and with end users who have a variety of different IT skill levels. Your supervisor has asked you to write a guidebook that new employees of the company can use to help them understand the company's role. Your guidebook should cover the following:

- 1 An explanation of the safe working practices that IT support technicians need to follow, including what the working practices are and why they need to be followed.
- 2 An explanation of the different job roles and the system and network tools used within a typical IT support team who support and manage a variety of IT systems.
- 3 A comparison of the IT support and management needs and the characteristics of different IT systems (for example at a software development company and a telesales company). You should also state how the support and management provided would meet the customer's requirements.
- 4 An evaluation of the support needs and characteristics of different IT systems. You should also identify where possible improvements could be made to the support provided.

Plan

- What information do you need to collect in order to complete this task?
- Where will you find this information?

Do

- I am approaching this task in an organised manner and can explain my reasons for doing so.
- I can adjust my thinking and approach when I lose concentration or momentum.
- I am prepared for critical feedback to help me improve.

Review

- I can explain the methods and tools I used to carry out my research for this task.
- I can describe where I struggled and what I found easy, and why.
- I can recognise progress in my knowledge and the way I learn.

B} Carry out routine support and management activities on IT systems

There are a range of issues that can impact on an organisation's systems and a number of different processes and tools that can be used to provide an efficient and effective support service.

Management of user support requests

IT users in an organisation may raise support issues for a variety of different reasons and typically an organisation will have specified procedures for reporting and dealing with these issues.

IT support issues

Users may report a variety of software and hardware issues.

Software faults prevent the system being used in the way it was intended. These can include the following:

- Error messages that prevent applications launching or features being used, or features simply not working at all or the way the user expected.
- Inability to access network or local resources such as data files and folders.
- Systems that fail to start up, due to missing files, configuration errors, etc.
- Application or resources blocked by security settings – firewalls may block some network applications and file **permissions** and other security settings may prevent users from accessing or using features they require.

Hardware faults also prevent the system being used in the way intended. These can include the following:

- Systems that will not power up and appear to be 'dead'.
- Issues with keyboards, mice and other peripherals.
- Printer errors, low ink or toner and paper jams – printers often create a lot of IT support requests due to paper jams and problems with the quality of print. They also need their ink or toner replaced from time to time and in many companies, this is a task that IT support are required to carry out.

User issues not directly related to hardware or software failings. These can include:

- User error – users making mistakes, such as deleting files that they should not.
- Forgotten passwords – with users required to change passwords quite often, resetting passwords is a common IT support task.
- Inability to find or use an application, data folder or feature. Users may lack skills to use some features of software or may have issues using a feature. An application shortcut may be missing from their desktop or they may have issues accessing **mapped network drives**.
- Legal issues such as breaches of privacy or copyright laws – for example, data protection laws usually require that personal data, such as the names and addresses of customers, should only be available to users who actually need them. This can mean that if an employee's job changes, they may need to ask IT support to grant or revoke their access to personal data.
- Breach of organisation computer use policies – for example visiting non-work-related websites. Many organisations employ software to block the websites that employees should not be visiting. This may sometimes cause IT support issues with legitimate sites blocked in error or unsuitable sites that are not blocked.

Skills

- Analysis
- Interpretation
- Critical thinking
- Problem-solving
- Communication

Key terms

Permissions – File and folder permissions is a feature found in Windows and other operating systems which provides control over the level of access that users or groups of users have to a file or folder. This can range from no access to read-only access through to full control of the file or folder.

Mapped drive – a shared folder that is linked to a drive letter to make it easier to find in the Windows File Explorer.

- Insufficient user training – this may mean that some users are unable to use application features that are required for their job and so may request assistance from IT support.

IT support and management processes

Fault management

An IT support department will have a defined procedure for users to report faults, and although the procedures will vary from one department to another the general features are as follows:

- The issue may be reported by making a telephone call, sending an email or completing an online web form (or any combination of these).
- Almost all support departments will use an electronic database system on which fault reports are recorded. These are often called **support ticket** systems, with each reported issue being called a ticket, and may be identified by a ticket number.
- Each ticket will be assigned priority either by the user themselves (in the case of email or web form) or by the support technician (in the case of telephone-based reporting).
- The ticket may be given some form of classification to identify what it relates to (e.g. hardware, software, networking, etc.).
- The ticket is allocated to a support technician. With telephone-based reporting systems, the first line support technician answering the calls may attempt to fix the problem if it is very simple. If it is not easy to fix, then they will allocate it to a second line support technician. In web form or email-based self-reporting systems, first line support technicians may view the list of newly reported unallocated support tickets and allocate the ones that they think they have the skills to fix themselves. Alternatively, the ticket database system may automatically allocate tickets to first-line support technicians.
- Once the ticket is allocated to a support technician, they begin the process of investigating the issue. If the first line support technician cannot resolve it then it is escalated to a second line support technician.
- The support technician dealing with the issue will keep the end user informed on progress, either by telephone, email or in person.

Key term

Support ticket – each individual user support request is called a ticket.

Theory into practice

This is an example of a simple IT support ticketing database. Issues are recorded using the screen shown in Figure 12.3.

Figure 12.3 Creating a support ticket form

Create Support Ticket	
Employee ID	118
Related asset	Acer
Date reported	31/12/2019 07:44:13
Priority	High
Description	PC will not start up, power light is on but nothing on the screen
<input type="button" value="Submit"/> <input type="button" value="Cancel"/>	

Support technicians can then view a list of all the support tickets that have not yet been allocated to a support technician, shown in Figure 12.4. On this screen the ticket can be allocated to a particular support technician.

The support technician can also list all the unresolved support tickets, as shown in Figure 12.5.

When support technicians work on a ticket, they update the database, using the screen shown in Figure 12.6.

Unallocated tickets

ID	Name	Asset and fault description		Allocate technician
7	Sarah Barton Sarah@neal.co.uk	A002 Acer	PC124 Cannot access shared drive	Mohammed <input type="button" value="Save"/> Select Priority <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/>
37	Amanda Frost Amanda@neal.co.uk	A003 Samsung	LP786 Mapped drive missing	<input type="button" value="Save"/> Select Priority <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/>
39	Robert Willerton Bob@neal.com	A020 HP	A599 Will not power on	<input type="button" value="Save"/> Select Priority <input type="button" value="1"/> <input type="button" value="2"/> <input type="button" value="3"/>

Figure 12.4 Support tickets that have not yet been allocated to a technician

Unresolved tickets

Ticket_ID	Date reported	Employee	Technician	
40	20/12/2019	116 McDonald	2 Jamal	<input type="button" value="Update"/>
41	20/12/2019	110 Wilkins	3 Ahmed	<input type="button" value="Update"/>
42	21/12/2019	121 Keeting	5 Simpson	<input type="button" value="Update"/>
43	21/12/2019	124 Calvin	5 Simpson	<input type="button" value="Update"/>
44	21/12/2019	118 Evans	6 Osteen	<input type="button" value="Update"/>
45	21/12/2019	114 Frost	7 Akbas	<input type="button" value="Update"/>
46	22/12/2019	123 Willerton	2 Jamal	<input type="button" value="Update"/>
47	22/12/2019	117 Browning	1 Platt	<input type="button" value="Update"/>

Figure 12.5 The list of unresolved tickets

Update ticket

Ticket ID	42
Employee ID	121
Reported by	Paul Keeting Paul@neal.co.uk
Asset Details	A008 Acer PC124
Allocated technician	5
Date reported	21/12/2019 18:43:25
Description	No internet
Category	Network <input type="button" value=""/>
Progress	No progress yet
Resolution	<input type="button" value=""/>
Date resolved	<input type="button" value=""/>

Figure 12.6 Updating a support ticket

Service-level agreements (SLA)

SLA is an important concept in IT support. Typically, an IT support department will commit to providing an agreed level of support to end users. This is known as an SLA. The SLA will state the maximum time period that it will take to fix certain categories of problems. For example, an SLA might state that minor problems will be fixed within an hour while more serious or complex problems will be fixed within four hours. Since an IT support department is not revenue-generating with a business (i.e. it costs money to run but does not make any money) it will need to justify its existence to the company directors. It will typically collect performance statistics in order to do this (and to support any expansion or capital expenditure such as employing more support technicians or purchasing equipment). Most ticket database systems will provide a wide range of statistics, such as:

- the number of support requests received at different times of the day
- the number of requests received on different days of the week
- response times, i.e. the time between the user making a support request (via email or web form) and a support technician first responding to the user
- the average time taken to resolve all tickets, and tickets of a particular category or priority
- the percentage of tickets resolved (closed) within the SLA.

This information can also be very useful for the IT support department management to allow them to do staff planning, such as making sure sufficient support technicians are available at certain times of day or certain days of the week to meet the predicted demand for their services.

II Pause point

What do you think a reasonable SLA would be for minor and more serious faults in a medium-sized company? How do you think minor and serious issues could be classified? Apart from staff scheduling what other uses do you think the data that the ticket system collects could be put to?

Hint Think about the length of time taken to resolve different types of fault and how this could be used.

Extend What is the point of having an SLA? What could happen if a support department does not achieve the targets in the SLA? What can an IT department do to ensure targets are met?

Communicating with the user

While technical skills are obviously important for an IT support technician it is also important that support technicians communicate effectively with end users. This can include using listening skills to ensure that correct and detailed information is collected from the end user. The technician should also use a friendly and helpful tone of voice. They should not sound disinterested or bad-tempered. Support technicians should also be careful in their use of technical terms and should adjust their vocabulary depending on the IT skill level of the user they are talking to. They should also take care in providing accurate and realistic information to end users, such as providing realistic estimates of the time a repair is likely to take to complete and any associated costs.

Most IT support departments will collect information about how satisfied their customers are with the service they provide. This information can be used to support the training of IT support staff and demonstrate their performance to the company directors. Data collected from the ticket database is also commonly used for a number of purposes:

- Identification of underlying issues. For example if a lot of users are having issues with a particular application then there may be some underlying configuration with that application, or an update may be required.

- Identification of training requirements. If end users are having a lot of problems using a particular application feature, which is not related to a fault but is due to lack of knowledge, then it may indicate that users would benefit from training in that particular area.
- Analysis of support tickets. This may identify particular hardware or software that causes more support requests than average. This information could be used in the future selection of hardware to avoid makes or models that may be unreliable or of software that is problematic.
- The scheduling of work rotas. If this is done correctly then this will ensure that sufficient support technicians are available at times when demand for support is high.

IT support and management systems

Email and web-form-based systems where the user reports the problem themselves are popular. If users are asked to email details of problems, they may not always send all the required information. Such self-reporting systems might make it difficult for users to report problems if their computer cannot be used. Therefore, many IT support departments also provide a telephone 'hotline'.

Whatever method of reporting is used, it is important that sufficient information is collected about the issue. What could be included:

- Date and time, which are useful to track how long it takes to respond and resolve the issue. This information is needed to track performance against the SLA, and is also useful for highlighting issues that have been outstanding for a longer time than average.
- Person reporting the issue, including their contact details (email, phone number, etc.).
- Location of the faulty equipment.
- Type of device or software that has the issue.
- Details of the issues including any error messages or codes.

As the support technician works on the issue, full details of what they have done to try to resolve the issue, symptoms identified and fixes attempted should be recorded on the ticket database system. Any parts used or configuration changes made should also be recorded. This is important if the support technician needs to pass the ticket on to someone else, either due to escalation of the issues or because their work shift has ended. The support technician taking over the ticket needs a full history of what has been carried out and all information collected. Otherwise time can be wasted asking the user the same questions and trying the same fixes. It is also important that the details of the final solution to the problem are entered into the system as these solutions provide a knowledge base of fixes that can be searched for when problems occur.

Routine support activities

What are the day-to-day support activities that an IT support team carries out?

Supervising the helpdesk and providing technical support

As already mentioned, one of the primary tasks of an IT support technician is to deal with support tickets. This includes:

- taking phone calls from IT users and recording their details on the support ticket database
- allocating and prioritising tickets
- managing multiple live tickets and allocating their time between live tickets based on their priority
- updating progress on tickets using the ticket database

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Problem-solving

- communicating with users, including collecting information on their issue and providing resolution advice and guidance
- researching solutions to issues using the internet, contacting software and hardware manufacturers.

Analysis of systems data

As well as dealing with specific faults, IT support technicians should proactively look for ways of improving system performance (for example, looking at amount of downtime, application monitoring and using system monitoring software) and identifying issues before they become problems that are reported. This can be done using data collected via a number of methods including event logs and system monitoring software.

Account management

IT support technicians also need to deal with user account management tasks, including the following:

- **Creating user accounts** – new IT users need accounts creating and people who leave the company will need accounts disabling. IT support technicians will also need to add users to the correct security group.
- **Resetting forgotten passwords** – because IT security settings often require that user passwords are strong and changed often, forgetting passwords is a common occurrence, and support technicians need to reset user accounts so users can create a new password.
- **Dealing with user access rights** – where shared folders are available, file permissions can be used to control the level of access individual users and groups have to files or folders. For example, company policy and procedure documents may be placed on a shared folder to which the HR department has access. All users may also have access but set to read-only so that they can't change the documents. In some situations, file/folder permissions may need adjusting to give users full access to files they need.
- **Dealing with storage quotas** – it is common practice for user accounts to have a restriction on the size of file storage they have available. This is set by using a server operating system feature called disk quotas. This may need adjusting if a user has a legitimate need for a larger disk space, perhaps due to a project they are working on.

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

Key term

RAM memory – an acronym for ‘random access memory’, a type of computer memory that can be accessed randomly. Any byte of memory can be accessed without touching the preceding bytes. RAM is found in servers, desktop computers, tablets, smartphones and other devices, such as printers.

System management and implementation activities

As well as dealing with support requests, the department will typically also be responsible for the implementation, upgrade and management of the company IT systems.

Systems installation, configuration and upgrades

Systems installation, configuration and upgrades can include:

- **individual systems installation** – including the physical unboxing and connecting of systems and setting of configuration options, including desktop, laptop, networking and mobile devices
- **storage management** – including regular backup of data files held on company servers and restoring of lost files for users when required
- **upgrades to end user or server computers** – such as increasing the amount of **RAM memory** installed, changing hard drives to ones that are faster or have a larger capacity, changing or adding graphics or sound cards to desktop computers
- **peripheral installation and configuration** – including installation (physical and software) of printers, scanners, additional monitors and multi-functional devices (such as a printer and scanner combined), adding them to the network and giving users access to them

- **installation and upgrade tasks** – including the connection of the device (e.g. printer, scanner), testing to ensure it works, disposal of packaging and updating **asset registers** that the company may keep. Devices such as laptop, printers, etc. may need to be labelled, for example with a barcode so they can be easily recognised and linked to their asset register record.

Software management

Software management can include the installation of new software and the upgrading of existing software. It may also include installation of **software patches** and the removal (uninstallation) of software that is no longer required. Where the roll-out of new software is required across all the systems in the company, this may include testing of the software prior to the roll-out, and inclusion in standard software images (see below). Where a roll-out across multiple systems is required typically support technicians will not visit each computer individually. Instead they will use a feature of Windows Server Operating Systems called Group Policy to automatically install software over the network.

Disk configuration

Most organisations that have large numbers of the same model of computer connected to the local area network will create a standard disk image to use on those computers. This disk image includes all the required application software, configurations and device drivers required. This means that if there are any problems with the files or the disk itself on the computer, the new image can be reapplied to the system, ensuring a quick and easy installation without having to install all the individual software applications separately.

Support technicians are also responsible for creating shared folders on the server to allow users to share files, and may also create mapped drives to make accessing the shared folder easier. As part of this process they would also configure the permissions for shared folders to give different groups of users different levels of access.

II Pause point An organisation is opening a new office in a different town to the current office. There will be about 50 employees working in the new office. What installation tasks would the IT support department need to consider? What kind of information would they need to be able to make detailed plans for the installation?

Hint Employees will need desktop computers, plus a number of other things.

Extend What methods could you use to install the software on end user computers in the new offices? Which method do you think would be the best? What are the advantages and disadvantages of the different methods?

Performance of IT systems

Providing a system that works in an efficient manner and provides adequate performance for the system users is another responsibility of IT support technicians. It is also essential that the support technicians keep the system secure by protecting it using multiple layers of security from unauthorised access.

Security optimisation

The IT support team needs to set up and maintain a range of protection. Examples of what this can include:

- **Firewall** – protects the network from external intruders by inspecting incoming and outgoing data to ensure it complies with certain access control rules. These control rules would, for example, allow some applications to send and receive data over the

Key terms

Asset register – a way for a business to accurately record their assets and the value of those assets. In terms of IT, the assets include computers, printers, scanners, tablets, laptops, mobile phones, etc.

Software patch – a fix for a piece of computer programming designed to resolve functionality issues, improve security and add new features.

Skills

Cognitive skills/cognitive strategies and processes:

- Analysis
- Interpretation

Link

For more on security see

Unit 11: Cyber Security and Incident Management.

external network but block others. Setting up and adjusting the access control rules is a task the IT support department would be responsible for.

- **Update and patches** – new software vulnerabilities that can be exploited by hackers are discovered from time to time, so it is essential that operating system and other software is updated with the latest patches. In many cases this is done automatically but the IT support team need to monitor the process and ensure it is happening.
- **Device hardening** – an important task in security optimisation is checking that all devices, especially network devices, are secure, for example by changing the default admin passwords. Many routers can be accessed for configuration via a web or terminal interface and come from the factory with a default administrator password, which is listed in the documentation for the device. Unless this default password is changed anyone can look up the password in the device documentation online, access the device and change its configuration.
- **Permissions** – the IT support team need to set and deal with any issues with file and folder permissions.

Network traffic optimisation

IT support technicians will monitor the network traffic of both the LAN and the external connection(s) to the internet, especially when it is under heavy load. They will look at the data throughput and the speed of transmission with the aim of identifying bottlenecks. If the link to the external internet is the issue with network traffic, they may need to look at the possibility of upgrading their internet connection to one with a higher data throughput. Bottlenecks in the company internal LAN could be resolved by segmenting the network using routers.

Improving system performance

The performance of individual desktop computers or servers may be improved by configuration changes or upgrades. Ideally the performance of the system will be monitored first to identify what is causing the performance issues (e.g. insufficient RAM, slow disk, etc.) Some improvements in performance may be achieved by adjusting the BIOS setting or upgrading/updating **firmware** in devices such as routers using a process called flashing where new firmware is written to a device's flash memory.

Flashing – writing data to flash memory. Flash memory is a memory chip that does not lose its contents when power is removed (unlike RAM memory), commonly used in devices to store firmware, and in USB memory sticks.

Improvements may also be achieved by adjusting operating systems settings, such as virtual memory configuration, visual effects and disk optimisation, for example by removing temporary files and defragmenting magnetic hard disks. Figure 12.7 shows the Visual Effects dialog box, accessed from the control panel, which provides an option to set the visual effects for the best performance. Running antivirus or antispyware scans can also have a detrimental impact on system performance, so scheduling these types of activities outside normal working hours can be helpful.

Better performance may also be achieved through upgrading hardware and/or software. Examples of hardware upgrades:

- **Motherboard/processor** – desktop computers can have their processor upgraded, as long as a processor compatible with the motherboard is used. The motherboard itself can be upgraded and fitted with a new processor. However, these types of upgrades are not often done as they involve quite a lot of time and effort.
- **RAM memory** – this one of the most common types of upgrade and can be done quite easily on desktop and most laptop computers. Increasing the amount of RAM can provide a significant improvement in performance.

Key term

Firmware – a software program permanently etched into a hardware device such as a keyboard, hard drive, BIOS or video cards.

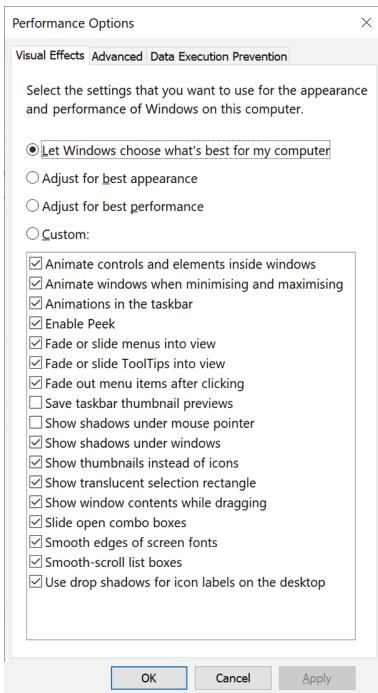


Figure 12.7 Windows Visual Effects

- Video card** – where computers are used for graphics intensive applications such as **Computer Aided Design (CAD)**, or photo/video editing then upgrading a desktop computer's graphics card may give better performance.
- Router** – adding routers to segment a LAN may give better network performance where network bottlenecks have been identified.



Figure 12.9 Network router

Upgrading software can also help improve performance, especially if a new version of a software application has been specifically developed to perform better than a previous version. Installing patches or updates is often done for security reasons but this may also help improve performance and resolve issues that may cause problems. New versions of software will usually automatically replace older versions. However, if for example different software is used to replace an existing application then the existing software needs to be uninstalled using the Windows uninstall procedure from the Control Panel to ensure all the application files are properly removed.

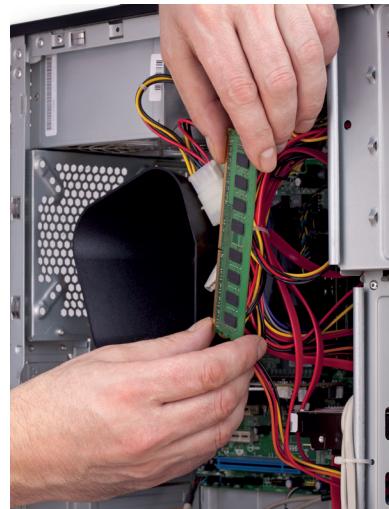


Figure 12.8 Upgrading RAM

Automated system monitoring

Various performance monitoring applications are available. These track and record system and network performance and important aspects of the system (such as available disk space, network availability and system monitoring during support activities) to ensure it works as intended. They can also be configured to automatically alert support technicians when parameters pass a certain threshold. So, for example monitoring software could be set up to issue an alert when available disk space drops below 25 per cent.

Case study

Asset management

One of the challenges for any IT support team looking after a large number of computer systems is keeping track of the systems and their hardware and software configuration.

For example, it can be very important to know which operating system version is installed. This is because older versions of operations systems are no longer supported. Windows XP, which was very widely used in organisations, was no longer supported by Microsoft after 2014, and Windows 7 support ended in January 2020. Windows XP was vulnerable to the WannaCry ransomware attack which occurred in 2017, and many organisations' computers around the world were disabled by this attack.

Support teams can use asset management software (such as Ivanti) that, using an application installed on the end user device, automatically identifies the configuration of the remote device and feeds the information into a central database that the IT support team can use.

This can be used, among other things, to plan upgrades: for example, all computers running Windows 7 can be identified, along with the RAM installed on them, and scheduled for upgrades; and any machine with insufficient RAM can have additional RAM of the correct type ordered. All such upgrade planning can be done remotely without ever having to physically inspect the devices.

Check your knowledge

What other uses can asset management information be put to?

Key term

Computer Aided Design (CAD)

(CAD) – the use of computers to create graphical representations of physical objects to assist in the design process.

Link

For more on system performance see **Unit 1: Information Technology Systems – Strategy, Management and Infrastructure**.

**Pause point**

You are working as an IT support technician and the users are complaining about the poor performance of the system. How would you approach this issue?

Hint What questions would you ask users about the problem? What investigation would you carry out?

Extend What are the options for improving the performance for a group of users? What constraints might there be on possible solutions to the problem?

Skills

Intrapersonal skills/work ethic/conscientiousness:

- Self-direction
- Initiative

Interpersonal skills/teamwork and collaboration:

- Communication
- Collaboration
- Teamwork

Interpersonal skills/leadership:

- Responsibility

Personal behaviours

As well as technical skills, there are a number of other personal behaviours that an IT support technician needs to demonstrate.

Time management

Support technicians will be expected to manage multiple live tickets at the same time and so need to allocate time to each ticket and plan how to prioritise them. It may be that for the current highest priority ticket a support technician is awaiting the response from the user to a question they have emailed them. In that case, the IT support technician will work on the next highest-level priority ticket while they wait for the user to get back to them. Part of the skill of time management is also setting yourself relevant targets for completing tasks and monitoring your progress towards achieving those targets.

Reviewing and responding to outcomes

Listening and taking on board feedback from others is also an important skill. A junior support technician may get feedback from end users and colleagues including their supervisor about how they deal with people and, although at times it may be uncomfortable to hear negative feedback, it should help the trainee develop their skills and provide a better service to the end users.

Behaviours and their impact on outcomes

Support technicians should understand that the way they deal with end users, both in person and over the phone, can have a big impact on the perception end users have of the IT support department and the quality of the service they provide.

Professionalism

IT support technicians should behave in a professional manner at all times. With companies relying on IT systems very heavily, issues with those systems can really impact on the end users' ability to do their job. The IT support team should take any problems seriously and work diligently to resolve problems in an efficient manner. They should carry out their role with care and attention to detail and should do everything they can to protect the end user from consequences of failure in IT systems. For example, they should ensure that as far as possible users do not lose any files or other work as a consequence of an IT failure.

Etiquette

IT support technicians need to be aware of the etiquette within the company and ensure they comply with it. It may include things like how to address senior members of staff and how they should dress. Etiquette can differ significantly from one company to another, for example the behaviour expected in the formal atmosphere of a long-established city bank is likely to be very different to that in a young and casual web development company.

Key term

Etiquette – the customs or behaviours in a company that are considered polite, and may also include behaviours that would be considered impolite. In different companies the etiquette may also be different.

Communication

A major part of an IT support technician's job is to communicate to end users, either in person, over the telephone or in writing by email. Support technicians need to communicate clearly and adjust their use of technical language to match the end users' understanding of IT. They need to listen carefully to what the end user is telling them about the issues they are facing and check their understanding. Their communication should always be polite and include greetings and salutations. Written communication should be free from spelling and grammar errors.

Reflect

Have you had an IT issue at home or school/college? How was it handled? Was it dealt with professionally? Did you have good communication with the person dealing with the issue? How could it have been improved?

Support for others

The IT support department need to work as a team, supporting each other. Different members of the team are likely to have in-depth knowledge in particular areas so a support technician working on a ticket can call on one of their colleagues who may have knowledge or experience in the particular problem that the ticket relates to.

Appropriate leadership

Within the IT support team there are various levels from first line support upwards. IT support technicians at higher levels need to provide appropriate leadership to the lower levels, teaching them by example in areas such as customer service, responsibility and time management as well as supporting them with technical issues.

Responsibility

IT support technicians need to demonstrate a responsible attitude to their jobs. They need to take ownership of the tickets allocated to them and ensure they follow them through to closure. For example, if they come across issues in their work that may not have been reported they should take responsibility for dealing with them and not simply hope someone else will sort them out.



Pause point

Here are two emails support technicians have sent to an end user, Basheer Alqassab, who is the Finance Director in a large company:

To: Basheer Alsqaasab
From: IT Support

Basheer

I have reset your password.
Try to remember the new one as we are too busy to keep resetting them

Mohammed

To: Basheer Alsqaasab
From: IT Support

Hi Basheer!

Thanks for your support call buddy. The file you accidentally deleted (you idiot!) has been restored from the backup.

Try to avoid doing dumb things!!
Catch u later
The techies 😊

Rewrite these emails in a way that demonstrates polite and professional communication skills.

Hint Remember, Basheer is a senior member of staff.

Extend Make a list of guidelines to be used when communicating in writing and verbally with non-technical staff.

Assessment practice 12.2**B.P3, B.P4, B.M2, B.D2**

In this assessment you will need to carry out some routine support and management activities. The activities you carry out can be simulated, in that you do not need to be working as an IT support technician to carry them out.

- Complete seven different routine IT support activities and collect evidence such as screenshots or photos to show you have completed them. The seven activities could be:
 - Configure a device such as connecting a laptop or tablet to a Wi-Fi network or adjusting the rules that apply to a Firewall.
 - Complete a backup of a folder and restore the backed-up file to another location.
 - Upgrade an item of hardware, for example adding more RAM memory to a desktop computer.
 - Install a printer and connect it to a computer or network.
 - Create a network shared folder.
 - Install a software application.
 - Carry out performance monitoring of an IT system. The user of the system has a requirement to transfer large files over the LAN.
- Optimise the system's performance to meet the client requirements.

As you work to complete these tasks you should demonstrate the use of appropriate processes and behaviours by writing up a task diary (illustrated with your screenshots and photos) explaining what you have done, how and why you did it.

Plan

- What does the task involve? What resources will I need to complete it?
- Create an outline plan for each part of the task and allocate timescale so I can be sure to complete the work on time.

Do

- I have decided the tasks I will use for this assessment.
- I have collected all the equipment I need to complete the tasks.
- I will use appropriate methods to collect evidence of the tasks I complete.

Review

- I can explain how I tackled this task.
- I can recognise the progress I have made since the last assessment practice task.
- I can relate my learning to the workplace.

C} Develop a plan to support and manage a new IT system using industry standards and methods

IT system diagrams

There are a number of different types of diagrams that are commonly used to define and illustrate various aspects of computer systems and associated processes.

Route maps

Route maps, also known as network diagrams, are diagrams used in networking to show how different sections of a network are connected. Figure 12.10 shows an example of a route map/network diagram.

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

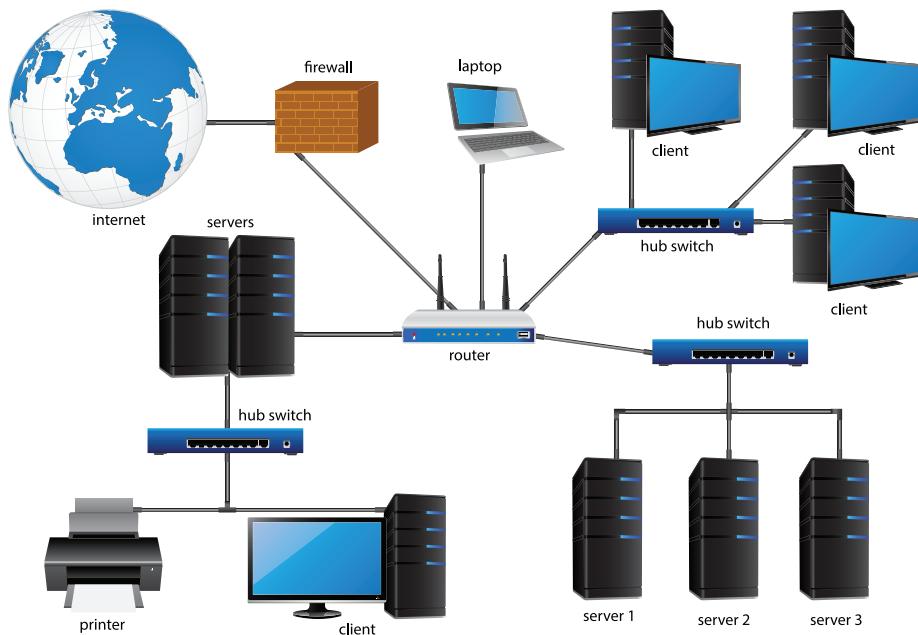


Figure 12.10 A network diagram or route map

Upgrade paths

Upgrade paths are an informal type of diagram or table which shows how you can upgrade hardware and software from one version to another. Table 12.1 shows the upgrade paths from older versions of Windows to Windows 10 upgrade paths.

Table 12.1 Upgrade paths through different versions of Windows

	Windows 10 home	Windows 10 Pro
Windows XP	Custom installation required	
Windows Vista	Custom installation required	
Windows 7 Home	Standard upgrade	N/A
Windows 7 Pro or Ultimate	N/A	Standard upgrade
Windows 8 Home	Standard upgrade	N/A
Windows 8 Pro	N/A	Standard upgrade

Schedules

Schedules are time and date task lists or rotas that can be used for a range of different recurring activities, for example a schedule can be used for system backups or a rota to show which support technicians should be supervising the help desk on a particular day and time. The table below shows an example of a support technician rota.

Table 12.2 An example of a support technician schedule

Support technician schedule					
Week starting 13/1/20					
Times	Mon	Tues	Wed	Thurs	Fri
08:00 to 11:00	Pedro Alfonso	Maria	Miguel		
11:00 to 14:00	Maria Alfonso	Miguel Maria	Pedro Miguel	Alfonso	
14:00 to 17:00	Miguel Pedro	Miguel Maria	Miguel Alfonso		
17:00 to 20:00	Miguel	Pedro	Alfonso	Maria	

Gantt charts

Gantt charts are used in project planning and show a list of tasks that are required to complete the project along with their durations. The tasks are also represented diagrammatically on a calendar to show how they relate to other tasks over the entire duration of the project. Simple Gantt charts can be drawn in software such as Microsoft Excel, and for more sophisticated diagrams you can use project management software such as Microsoft Project. Figure 12.11 shows an example of a Gantt chart.



Figure 12.11 A simple Gantt chart

Reports of network monitoring

Monitoring software will often produce graphs of the network usage over time. For example, Figure 12.12 shows a graph drawn by Windows Performance Monitor showing amounts of data sent and received over time.

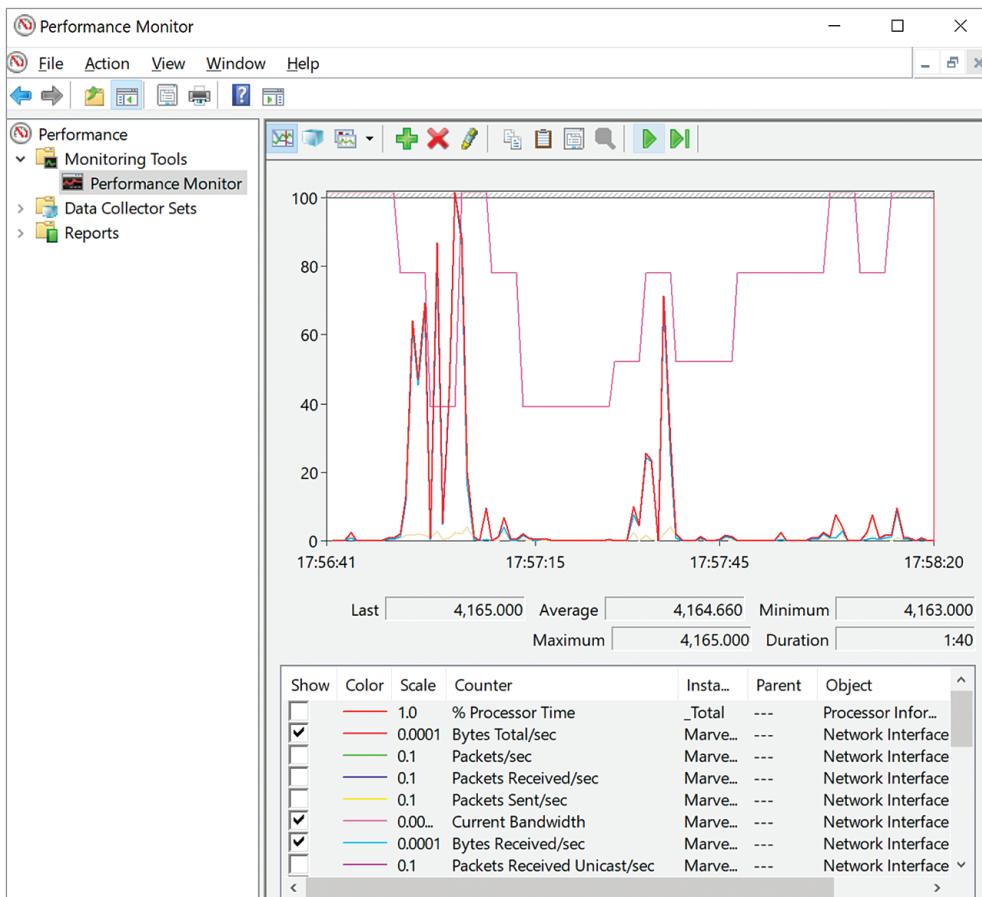


Figure 12.12 Performance Monitor network graph

Maintenance checklists

Maintenance checklists are useful reminders of tasks that must be completed. For example, a checklist may be produced when commissioning a new computer to show all the tasks that need to be completed before handing the computer over to the user.

Issue laptop checklist

Date:

Laptop issued to:

Asset sticker attached	Y/N
Asset number recorded on asset database?	Y/N
Bit locker activated	Y/N
Recovery key saved	Y/N
Latest up dates installed	Y/N
User has signed release documentation	Y/N
Charger and cable included	Y/N
Signed (user)
Signed (IT support)

Figure 12.13 Example of a maintenance checklist

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Decision making
- Critical thinking

Research

What is ISO 27031? Use the internet to find out about this document and discover the main topics it covers.

Incident response and disaster recovery planning

Every organisation that uses IT needs to plan for a disaster that could prevent its IT systems from being used, such as a fire or flood. With many organisations relying heavily on their IT systems to run their business, such planning is essential if the business is going to survive such an incident. This process is sometimes called business continuity planning. An international standard has been created by ISO (the International Organisation for Standardisation) called ISO/IEC 27031. Disaster recovery must be fully planned before any incident occurs and practice implementations of the plan should be completed to ensure it is effective.

Incident management

Should an incident occur, then the disaster recovery plan should be put into action. Initially management will need to identify the type of incident and classify it in terms of its priority and severity. For example, a small fire in one of the network equipment cabinets that has been extinguished is a relatively minor event that will only impact on a small area of the company systems whereas a major fire which has destroyed the server room will have a major impact. The first priority in any disaster situation is to ensure the safety of staff and only once this has been achieved will aspects of business continuity be considered. Once staff are safe, the plan should be put in place and procedures followed to minimise the impact of the incident on the business. This is usually done by setting up alternative computing systems to replace those lost or damaged in the incident.

Identifying areas for IT readiness and critical systems

Not all business systems are critical to the running of the business, therefore the plan should identify which systems are critical and those will need to be the focus of the continuity planning. It is important that the plan defines the order in which systems are recovered, with the most important systems being recovered first.

Measuring continuity, security and readiness for potential disaster

As part of the process of developing a disaster recovery plan and deciding which systems are the highest priority it is useful for the organisation to consider each system or application it uses and decide how quickly they would need the systems to be up and running again after a disaster.

- **Recovery time objective (RTO)** is a term used in disaster recovery to define the amount of time a business can be without a service following a disaster.
- **Recovery point objective (RPO)** is the amount of data (usually in terms of transactions) that can be lost if a disaster occurs. This is essentially the amount of time since the last backup. All new transaction records created between the last backup and the disaster are lost.

These recovery objectives are illustrated diagrammatically in Figure 12.14.

Some organisations, such as those dealing in financial transactions (e.g. a bank) require an RPO of zero (i.e. no transactions at all can be lost) and a very short RTO (often in minutes). In these situations, a **mirrored site** is required with a duplicated computer system.

Backup planning

Backups are essential for any business computing system and a vital part of disaster planning. The RPO that the organisation has agreed upon will define how often backups must be done. Few organisations would find an RPO of more than one day acceptable,

Key term

Site mirroring – where all an organisation's critical computer systems are duplicated in a different geographical location, ready to be used if the primary site becomes unavailable.

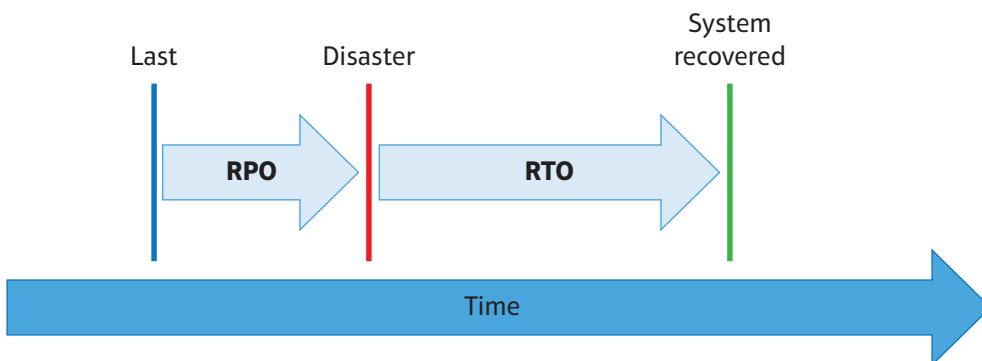


Figure 12.14 Recovery Point Objective (RPO) and Recovery Time Objective (RTO)

so daily backups are performed. Backups must be stored at a different geographical location to the main systems to avoid them being destroyed should a disaster occur. Traditionally backups have been done using removable media such as tapes of USB hard drives, but some organisation are now using cloud-based backups.

Site mirroring

As mentioned above if very short RPO and/or RTO is required an organisation will need to have a mirrored site. Clearly this is a very expensive disaster planning approach but for some organisations who demand the very highest level of IT availability it is the only option. There are a number of types of mirrored site:

- **Hot site** – one that is up and running continuously with data from the main site replicated on the systems at the hot site so it is ready to take over in a matter of minutes.
- **Warm site** – one that has the facilities in terms of networking and server equipment to run the critical applications but is not continually running. To take over from the main site a warm site may need several hours so restore data and get systems up and running.
- **Cold site** – a building where alternative computing facilities could be set up. To get the cold site up and running hardware and software must be installed and backups restored. This would typically take days or even weeks to get up and running.

Disaster recovery procedures

The disaster recovery plan in an organisation will define the procedures to be followed should a disaster cause unplanned downtime. This will include how tasks such as setting up alternative systems, recovering data from back-ups and connecting the network will be done and who will do them. The plan should define the procedures to be taken in different scenarios. For example, if a burst water pipe damages networking equipment

II Pause point

What do you think the RPO and RTO would be for the systems at your school or college? What about your own laptop or desktop computer? How much work would you be willing to lose if your laptop was lost, stolen or damaged so you lost all the data on it? A day's worth of work? Or a week?

Hint Think about how long you would be willing to spend rewriting assignments that had been lost.

Extend What factors discourage individuals and companies from taking disaster recovery precautions?

for one floor of a large office then a possible workaround solution would be to move staff to different floors and provide them with laptops so they can continue to work.

Capacity planning

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

It is important that an organisation's IT systems have the capacity to meet the demands placed on them, otherwise systems may run very slowly or not at all.

Capacity of system

Capacity of system is generally measured in the number of concurrent users that the system needs to support. Consideration also needs to be given to the location of the users. Are they local users on the company LAN or remote users accessing the system over the internet? It is also important to know if they are virtual computer users (in which case the demands on the server will be higher) or if they are using real PC hardware. Finally, the type of work they typically do will be important. For example, the demands placed on a system by users doing basic office tasks such as using email, word processing, etc. will be far less than users doing video editing or other high demand tasks. It may also be important to know when the highest demand on the system will be in terms of different times and days of the week.

Optimisation

It may not always be necessary to add new hardware to increase the capacity of systems. Reorganisation and optimisation of existing equipment may be an option to allow modest capacity increase while ensuring expensive IT equipment is fully utilised, therefore providing the best value for money for the organisation.

Capacity planning

Because it can take time and money to upgrade a system and increase its capacity, planning needs to cover not just the current demands on the system but also the predicted future demands. Typically, detailed plans for upgrades and developments would be produced over a three-year period and outline plans for five and ten years into the future.

Key term

Scalability – the ease with which a computing resource can have its capacity increased or decreased.

Capacity considerations.

When considering options for increasing the capacity of their system an organisation may look at a number of possibilities. The **scalability** of the solutions put forward should be considered. For example, a small organisation with just a few standalone desktop computers might simply plan to add more individual desktop computers as it grows. However, the management of individual desktop computers becomes difficult once there is more than about ten or so, therefore that solution is not very scalable. A much better growth plan might be to change to a client server set up once more than a certain number of desktop computers are in use. Capacity increases also need to consider the availability of a system. Reliance on a single server may cause availability issues if that single server fails. A much better and more scalable solution is to have multiple servers. The need for scalability, which can support both growth and contraction of a server, is one reason why cloud-based solutions are popular as they can be both increased and decreased in capacity with relative ease.

Monitoring of the system

Performance monitoring of the systems, including CPU, memory and disk usage and available capacity, as discussed earlier, can provide useful data to inform capacity projections.

Sustainability and environmental waste planning

Sustainability and environmental issues are of increasing concern and the IT department should take this into account when planning and managing systems.

Sustainability

Computer hardware is made up of a lot of different materials (metals, plastic, chemicals, etc.). It often has quite a short life-span because of rapid developments in technology.

There are a number of ways that sustainability can be considered when implementing IT systems.

The use of external or cloud-based service providers could be considered as an alternative to in-house systems. There are a number of potential benefits from using cloud-based services. From a sustainability point of view the use of shared external systems rather than in-house systems may improve efficiency and reduce overall power consumption and the amount of hardware required due to ability of the cloud or external provider to make use of economies of scale.

Production of electronic waste is a major sustainability issue for IT. Recycling of waste hardware can be difficult because of the complexity involved and the cost of labour required to carry out the recycling. This has meant that a lot of electronics waste ends up in landfill or is exported to countries where labour costs are lower and health and safety rules are less demanding. This has caused serious environmental pollution and risks to health in some developing countries.

Rather than replacing hardware when it is faulty or its performance is inadequate, consideration can be given to upgrading or repairing hardware. In some cases, outdated hardware may also be repurposed as thin client computers or by being donated to schools, charities, etc.

Selection of products – consumables such as printing paper, laser printer toner cartridges and inkjet printer cartridges can be made taking into account products which are recycled or reduce carbon emissions in their manufacture.

Remote working – allowing some workers to work from home where possible is another way to help protect the environment as it cuts down on travel, as does use of video conferencing for meetings where the participants are in different geographic locations. IT support can encourage remote working by ensuring the infrastructure is in place to support it.

Environmental management

The main direct impact of IT systems use is power consumption, but the recycling of electronic components without regard to environmental impact can release harmful chemicals such as lead, mercury and cadmium into the ground, water and air, causing serious pollution. For example, in some developing countries copper is extracted from

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation

Intrapersonal skills/intellectual openness:

- Personal and social responsibility

II Pause point

How could you and your school or college reduce the environmental impact of using IT? Are there any things you could do differently to improve sustainability? What consumable items do the use of IT involve? Could the use of these be changed?

Hint Think of areas such as reducing power consumption, recycling and reuse.

Extend Why can recycling electronic waste cause so much pollution? Why is so much electronic waste exported to developing countries? Are there any ways that the amount of electronic waste can be reduced?

Research

Find out what the requirements of the WEEE regulations are. Are there regulations for the recycling of electronic goods that apply where you live? If there are find out what the requirements are.

Skills

Cognitive skills/cognitive processes and strategies:

- Analysis
- Interpretation
- Decision making

cables by burning the plastic coating off them. This results in air pollution. A more environmentally friendly approach is to use a machine to strip the plastic off the cables and then recycle it.

In many countries there is legislation covering the recycling of electronics goods, for example in Europe the WEEE (Waste Electrical and Electronic Equipment) regulations.

An IT technical support and management plan

Because the IT support provided in an organisation is of vital importance to ensure efficient business operation it needs to be planned in advance. An IT technical support and management plan needs to:

- **have a defined scope** – the plan needs to state which companies (or departments within companies), systems (including hardware and software) and locations it applies to
- **have a purpose** – the purpose needs to be clearly stated, for example, an organisation may state that the purpose of the support and management plan is to decrease the amount of system downtime
- **match client requirements and constraints** – it should be agreed with the client what the requirements of the support are. The clients are essentially the IT users but the requirements are likely to be agreed by senior staff within the company. Requirements may include things like the SLA required and constraints are likely to include the budget for providing the support service.

What should an IT Support and Management plan cover? The following would usually always be included:

- **Disaster recovery** – planning and systems to support business continuity in the event of a disaster.
- **Incident response** – how IT support requests from end users will be recorded and resolved.
- **Capacity management** – monitoring of the current system capacity and planning for future demands.
- **Sustainability and environmental management** – covering topics such as recycling, energy saving, etc.

In addition, there are other areas that could be included in the plan.

Security planning

Security planning covers the security procedures and protection methods to be implemented on the systems. The security plan would include details on the following:

- System access procedures, such as password rules.
- How the system would be protected from malware.
- The methods put in place to protect personal data.
- Protection methods used for email and internet such as filters to block unsuitable websites and emails.
- The use of encryption (for example on laptop computers).
- The use of auditing to provide a trail of evidence should a security incident occur.

Security planning would be linked to the company policy and procedures on computer, email and internet use.

Ergonomics

The plan may define standards for desk furniture, monitors and keyboards for IT users and may set out procedures for the safe use of IT systems including recommendations to the user about issues such as taking regular breaks, having eye tests, taking precautions to help prevent RSI (Repetitive Strain Injury), etc. Safe use of IT systems can include issues related to electrical safety such as keeping liquids (e.g. drinks) away and making sure trailing cables do not pose a trip hazard.

Floor plans

The plan may include floor plans of offices where computers are installed including locations of desks and cabinets and showing where IT equipment including computers, printers, networking equipment and network sockets are located. Floor plans of server rooms and network cabinets may also be included showing the location of servers, network equipment and sockets, power supplies, air conditioning, etc. These plans may be maintained in conjunction with the company building services department.

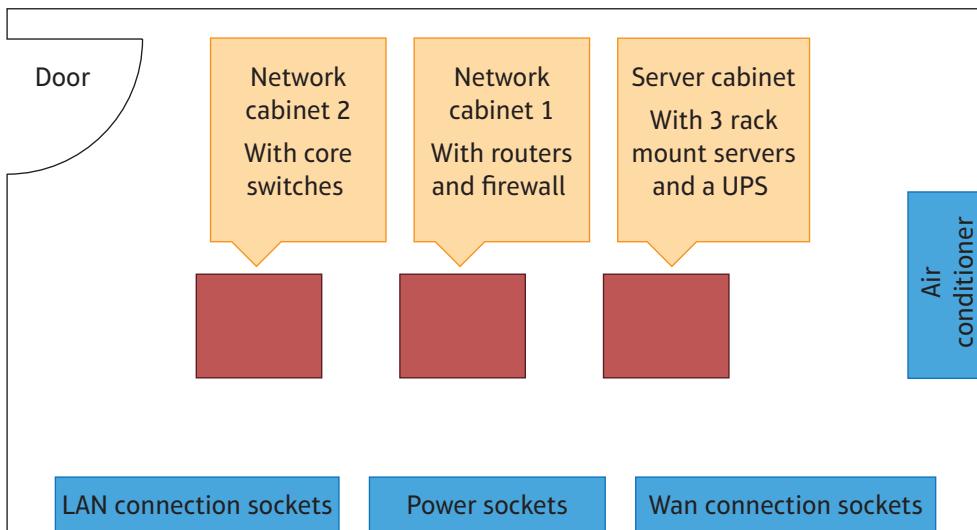


Figure 12.15 Service room diagram

Outsourcing

An organisation may decide to outsource some or all of its IT provision. For example, if the company has a website it may outsource the hosting, development and maintenance of the website to another company. Cloud storage is another type of outsourcing that is commonly used. When using outsourced facilities, it is important that an SLA is drawn up with the supplier of the outsourced facilities to ensure that an appropriate level of service is contractually agreed.

Other procedure and policies

Organisations may have a range of other policies and procedure that relate to the IT support and management plan.

Assessment practice 12.3**C.P5, C.P6, C.M3, C.D3**

Alpha Training Centre runs a wide range of business and IT courses for businesspeople and private individuals. They have 15 classrooms, each of which has 15 learner computers and one computer for the trainer and a video projector and printer. There are also an additional ten computers in the admin office and 15 computers in the trainer's office, and each office has a printer. This makes a total of 265 computers and 17 printers, they also have two server computers. There are 10 full time trainers, and 12 part time and 10 admin staff. At the moment IT support is done by trainers in their spare time but the company are planning on expanding over the next 12 months, adding five more IT classrooms and setting up an IT support department. All the computers including servers run Microsoft Windows applications and all trainees are provided with individual accounts. A wide variety of applications run on the computers.

You have been asked to develop an IT Support and Management plan for Alpha Training. They have stated that their current budget limits the number of IT support staff to three. You need to:

- Write an IT support and management plan that will cover the clients' requirements. The plan should at least include sections on disaster recovery, support incident response, capacity management and sustainability/environmental management.
- Carry out a review of the plan with at least one other person and identify the improvements that you could make to improve the plan.
- Using the feedback you received from other people write a justification of the decisions you made in the plan about how IT support will be provided and how the system will be managed and explain how the plan meets the company requirements.
- Create an updated, refined version of the plan based on the suggestions for improvements you made when the plan was reviewed and write an evaluation of the final plan referring to the feedback you have received including a justification of how the refined plan fully meets the client's requirements.

Further reading and resources**Books**

Meyers, M. *CompTIA A+ Certification All-in-One Exam Guide*, Tenth Edition, McGraw-Hill (2019).

James, S. *IT Help Desk: Your Blueprint To Service Success, Mastering User Support & Troubleshooting Like A Genius*, CreateSpace (2016).

Websites

www.tomshardware.com/uk
www.smartbrief.com

Plan

- I know how I will break down the task and prioritise each component.
- I know what resources I will need to help me to complete this task.
- I have planned what strategies I will deploy to manage my time effectively.
- I have worked out how I will know when I have finished.

Do

- I am flexible in my approach and have analysed which ways work best for me.
- I can identify when I've gone wrong and learn from my mistakes.
- I am open to constructive criticism.
- I can celebrate my successes and explain why they worked well.

Review

- I can explain the methods and tools I used to carry out my research for this task.
- I can describe where I struggled and what I found easy, and why.
- I can recognise progress in my knowledge..

THINK FUTURE



Suresh Benerjee

Trainee IT support technician

Suresh studied IT at college and is now working as a trainee IT support technician in a large school, where he is also completing an Infrastructure Technician apprenticeship.

When he arrives at work, the first thing he does is to check for any issues overnight with the servers. The next thing is to look at the support ticket system to check on any outstanding tickets. And then he looks at his emails, for example for replies to questions he has raised, or orders he has placed for spare parts. Once classes start, the IT support department sometimes get emails from teachers who have problems with their classroom computers, projectors or printers. Any support request about an issue that impacts on a lesson is regarded as high priority. For example, if a teacher reports a classroom projector not working, then Suresh will go to the classroom to investigate it straight away.

When support requests come in, if Suresh knows how to fix the problems, he will allocate them to himself. Otherwise another support technician will take them on. There are only three support technicians in the IT department but they work closely as a team. If there are issues Suresh cannot fix himself, one of the others will either tell him what to do or will take over the support ticket from him.

In school holidays the IT support staff carry out upgrades and installations that they can't do in term time. Last summer Suresh carried out the installation of a new IT classroom mostly by himself, including building, installing and testing all the computers, network equipment and the printer.

Suresh finds the job interesting: no two days are the same. He thinks he is learning a lot as well – not just technical things but also how to deal with people. He says that he was surprised that some people don't know very much about IT and he has had to learn to be patient and give clear non-technical explanations.

Focusing your skills

Working as an IT technician is a varied job with many different aspects. You will need to deal with problems that range from simple to complex as well as with a wide range of people (both in terms of how senior they are in the company and their IT knowledge). Some of the most important skills you will need include:

Communication – you will have to communicate with people in person, over the telephone and by email. You need to develop skills in both speaking and writing and be able to explain complex technical issue in plain language. This includes being able to give detailed instructions.

Technical skills – IT is a dynamic area with rapid changes in technology. You need to work at keeping your knowledge

and skills up to date. This can be done using online resources such as technology blogs and newsletters. You can also make a list of areas in IT where you lack knowledge (such as security issues, server administration, creating user profiles, etc.) and carry out research to develop your skills. The internet is a great resource for this with articles and videos on almost every subject.

If you are able to obtain work experience (or work shadowing) this has many benefits and will provide very useful experience that is difficult to obtain any other way. It will help you understand what the IT Technician role involves, the kind of tasks that are typically carried out and the range of skills needed.

Glossary of key terms

Asset register – a way for a business to accurately record their assets and the value of those assets. In terms of IT, the assets include computers, printers, scanners, tablets, laptops, mobile phones, etc.

BYOD – end users' own personal devices, typically mobile phones, which they use to access company systems.

Cloud – the use of internet-based remote services to provide a range of IT facilities including storage and applications.

Computer Aided Design (CAD) – the use of computers to create graphical representations of physical objects to assist in the design process.

Data wiping software – a software-based method of completely erasing the data from a hard drive, sometimes called data sanitisation software, disk wipe software or hard drive eraser software.

Disk image – an exact copy of all the contents of a computer's hard disk including operating system, configuration settings and applications.

Escalation – the process of passing a support request up to a more experienced and knowledgeable support technician if it cannot be resolved.

Etiquette – the customs or behaviours in a company that are considered polite, and may also include behaviours that would be considered impolite. In different companies the etiquette may also be different.

Firmware – a software program permanently etched into a hardware device such as a keyboard, hard drive, BIOS or video cards.

Local Area Networks (LAN) – a computer network that connects computers within a defined area such as a house, school, laboratory, university campus or office.

Mapped drive – a shared folder that is linked to a drive letter to make it easier to find in the Windows File Explorer.

Permissions – File and folder permissions is a feature found in Windows and other operating systems which provides control over the level of access that users or groups of users have to a file or folder. This can range from no access to read-only access through to full control of the file or folder.

RAM memory – an acronym for 'random access memory', a type of computer memory that can be accessed randomly. Any byte of memory can be accessed without touching the preceding bytes. RAM is found in servers, desktop

computers, tablets, smartphones and other devices, such as printers.

Scalability – the ease with which a computing resource can have its capacity increased or decreased.

Site mirroring – where all an organisation's critical computer systems are duplicated in a different geographical location, ready to be used if the primary site becomes unavailable.

Software patch – a fix for a piece of computer programming designed to resolve functionality issues, improve security and add new features.

Static electricity – is caused by an imbalance of electrical charge between two objects. The effects are felt when the objects are moved close enough for electricity to flow between them, neutralising the imbalance.

Support ticket – each individual user support request is called a ticket.

Thin client – low specification desktop hardware used to display a virtual desktop that runs on a server. It does not run applications locally.

Virtual – the software emulation of a hardware device, typically a computer. A virtual computer runs on software emulated hardware rather than physical hardware.