

Biddulph High School Curriculum Intent

To deliver a broad and enriching curriculum through engaging and challenging lessons that provide a wide range of opportunities for all students to achieve their potential.

Students will all be prepared to take their next steps in a diverse and ever changing future ready to make a positive contribution to society.

Through a broad programme of extracurricular activities students will have the opportunities to showcase their talents and experience new challenges.

We value individuals and all that they can offer as well as supporting each other with kindness and empathy.

Curriculum Intent for Computing



“Those who can imagine anything, can create the impossible.” Alan Turing

Our aim in the Computing department is centred around equipping students for their future, regardless of the individual pathway they may decide to choose, ensuring that students are prepared for the challenge of a rapidly developing and changing technological world. We will equip learners with the key technical skills to support their learning across the curricula, for future studies and ultimately for their chosen career pathway. We believe in delivering a mixture of both ICT and Computer Science in our curriculum to develop core employability skills, such as problem solving and critical thinking. We also develop “Internet Citizens” who understand the importance of being responsible in the digital world. Our curriculum is mapped from KS3 to KS5 ensuring that students have the opportunity to grow both their knowledge and technical skills. We will provide a variety of extra curricula activities including entering national competitions, providing opportunities for students to acquire further technical qualifications and conferences/ visits to inspire students to follow a future in technology.

All teachers will follow the schemes of work provided by the department. This will ensure that all students receive the same high-quality provision. All units of work will provide a clear outline of the knowledge and skills required and assessments will ensure that this knowledge has been retained and that skills can be evidenced.

Teachers will ensure that gaps are closed through regular monitoring within the classroom. DINT activities will allow for interleaving and recap of previous learning. Misconceptions will be identified through effective questioning and the regular inspection of student work.

Computing Long Term Overview						
Year Group	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
BTEC National Diploma in IT						
12	Unit 1: Information Technology Systems	Unit 1: Information Technology Systems				
12	Unit 2: Creating systems to manage information	Unit 2: Creating systems to manage information	Unit 2: Creating systems to manage information	Unit 2: Creating systems to manage information	Unit 2: Creating systems to manage information	
12			Unit 3: Using social media in Business	Unit 3: Using social media in Business	Unit 3: Using social media in Business	Unit 3: Using social media in Business
12	Unit 4: Programming	Unit 4: Programming	Unit 4: Programming	Unit 4: Programming	Unit 4: Programming	Unit 4: Programming
12					Unit 9: Project Planning	Unit 9: Project Planning
13	Unit 5: Data Modelling	Unit 5: Data Modelling	Unit 5: Data Modelling	Unit 5: Data Modelling	Unit 5: Data Modelling	
13	Unit 6: Website Development	Unit 6: Website Development	Unit 6: Website Development	Unit 6: Website Development	Unit 6: Website Development	
13	Unit 11: Cyber Security	Unit 11: Cyber Security				

Computing: BTEC IT National Diploma Medium Term Overview

Y12/13	Autumn/Spring/Summer Term 1/2/3/4/5/6		No of Lessons: approx. 18/2week
Overview	Unit 1: Information Technology Systems (120) External Exam Unit 2: Creating Systems to Manage Information (90) External Exam Unit 3: Using Social Media in Business (90) Internal Assessment Unit 4: Programming (90) Internal Assessment Unit 5: Data Modelling (60) Internal Assessment Unit 6: Website Development (60) Internal Assessment Unit 9: IT Project Management (90) Internal Assessment Unit 11: Cyber Security and Incident Management (120) External Exam		
Assessment			
<u>Essential Knowledge (what must students know):</u> Unit 1: Information Technology Systems A Digital devices in IT systems The concepts and implications of the use of, and relationships among, the devices that form IT systems. A1 Digital devices, their functions and use The features and uses of digital devices in IT systems to meet the needs of individuals and organisations. <ul style="list-style-type: none"> Digital devices that form part or all of IT systems: <ul style="list-style-type: none"> multifunctional devices personal computers mobile devices servers entertainment systems digital cameras – still, video navigation systems 		Learning outcomes <ul style="list-style-type: none"> AO1 Demonstrate knowledge and understanding of information technology terms, standards, concepts and processes Command words: complete, draw, give, identify, name, state Marks: ranges from 1 to 6 marks AO2 Apply knowledge and understanding of information technology terms, standards, concepts and processes Command words: calculate, complete, demonstrate, describe, draw, explain, produce Marks: ranges from 1 to 10 marks AO3 Select and use information technologies and procedures to explore likely outcomes and find 	Lessons: A1 Digital devices, their functions and use A2 Peripheral devices and media A3 Computer software in an IT system A4 Emerging technologies A5 Choosing IT systems B1 Connectivity B2 Networks B3 Issues relating to transmission of data C1 Online systems C2 Online communities D1 Threats to data, information and systems D2 Protecting data E1 Online services E2 Impact on organisations E3 Using and manipulating data

<ul style="list-style-type: none"> o data capture and collection systems o communication devices and systems. • The function and use of digital devices for: <ul style="list-style-type: none"> o education and training o personal o social o retail o organisational use – business operations, internal and external dissemination of information o creative tasks. <p>A2 Peripheral devices and media The features and uses of peripheral devices and media in IT systems to meet the needs of individuals and organisations.</p> <ul style="list-style-type: none"> • Peripheral devices used with other digital devices to form part of an IT system: <ul style="list-style-type: none"> o input devices o output devices o storage devices. • Manual and automatic data processing. • Accessibility devices. • Characteristics and implications of storage media used to form part of an IT system. <p>A3 Computer software in an IT system The concepts and implications of the use of, and relationships between, hardware and software that form large- and small-scale IT systems and their impact on individuals and organisations.</p> <ul style="list-style-type: none"> • Types of operating system: <ul style="list-style-type: none"> o real-time operating system o single-user single task o single-user multi-tasking o multi-user. • The role of the operating system in managing: 	<p>solutions to problems in context Command words: calculate, demonstrate, develop, explain, produce Marks: ranges from 1 to 6 marks</p> <ul style="list-style-type: none"> • AO4 Analyse and evaluate information, technologies and procedures in order to recommend and justify solutions to IT problems Command words: analyse, demonstrate, discuss, produce, write Marks: ranges from 6 to 12 marks • AO5 Make connections between the application of technologies, procedures, outcomes and solutions to resolve IT problems Command words: evaluate, produce, write Marks: ranges from 6 to 12 marks <p>Level 3 Pass Learners are able to apply knowledge and understanding of key information technology concepts to a range of familiar vocational contexts. They can apply knowledge and understanding of IT systems to deconstruct problems in common situations and apply standard IT conventions to produce solutions with supporting reasoning. Learners can identify the impact of effective and ineffective uses of IT systems and recommend ways in which IT can be developed and/or improved. They can explore and make judgements on the</p>	<p>F1 Moral and ethical issues F2 Legal issues</p>
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<ul style="list-style-type: none"> o networking o security o memory management o multi-tasking o device drivers. • Factors affecting the choice and use of user interfaces: <ul style="list-style-type: none"> o graphical o command line o menu based o adapted. • Factors affecting the choice of operating system. • Factors affecting use and performance of an operating system. • Utility software: <ul style="list-style-type: none"> o the purpose, features and uses of utility software o factors affecting the choice, use and performance of utility software. • Application software: <ul style="list-style-type: none"> o the purpose, features and uses of application software o factors affecting the choice, use and performance of application software. • The principles and implications of open source and proprietary operating systems and software. • The impact and features of user interfaces in computer software. • The features of common file types and formats used for: <ul style="list-style-type: none"> o images o videos o application software. • The implications on IT systems, individuals and organisations of the use and selection of file types and formats. <p>A4 Emerging technologies</p>	<p>impact of the use of IT on individuals and organisations.</p> <p>Level 3 Distinction Learners are able to analyse complex information, data and situations, in vocational contexts, in order to draw conclusions and make valid observations. They can synthesise their knowledge and understanding of IT systems to deconstruct complex problems, drawing on various sources of information to develop effective solutions. Learners can evaluate the effectiveness of IT systems and make justified recommendations for further developments and future actions. They can make valid, justified judgements on the impact of IT on individuals, organisations and wider society.</p>	
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<p>How emerging technologies can be used by individuals and organisations.</p> <ul style="list-style-type: none"> • The concepts and implications of how emerging technologies affect the performance of IT systems. • Implications of emerging technologies on the personal use of IT systems. • Implications of emerging technologies on the use of IT systems in organisations. <p>A5 Choosing IT systems</p> <p>How the features of an IT system can affect its performance and/or the performance of a larger IT system.</p> <ul style="list-style-type: none"> • Factors affecting the choice of digital technology: <ul style="list-style-type: none"> o user experience – ease of use, performance, availability, accessibility o user needs o specifications o compatibility o connectivity o cost o efficiency o implementation – timescales, testing, migration to new system(s) o productivity o security. <p>B Transmitting data</p> <p>The concepts, process and implications of transferring data within and between IT systems.</p> <p>B1 Connectivity</p> <ul style="list-style-type: none"> • Wireless and wired methods of connecting devices and transmitting data within and between IT systems. 		
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- How the features of connection types can meet the needs of individuals and organisations.
- The implications of selecting and using different connection types.
- The impact of connection types on the performance of an IT system.

B2 Networks

The concepts and implications for individuals and organisations of connecting devices to form a network.

- The features, use and purpose of different networks:
 - o personal area network (PAN)
 - o local area network (LAN)
 - o wide area network (WAN)
 - o virtual private network (VPN).
- Factors affecting the choice of network:
 - o user experience – ease of use, performance, availability, accessibility
 - o user needs
 - o specifications
 - o connectivity
 - o cost
 - o efficiency
 - o compatibility
 - o implementation: timescales, testing, downtime
 - o productivity
 - o security.
- How the features of a network and its component parts affect the performance of an IT system.

B3 Issues relating to transmission of data

How the features and processes of data transmission affect the use and performance of IT systems.

- Protocols used to govern and control data transmission for common tasks:

<ul style="list-style-type: none"> o email o voice and video calls over the internet o web pages o secure payment systems. • Security issues and considerations when transmitting data over different connection types and networks. • Factors affecting bandwidth and latency. • The implications of bandwidth and latency on the use and performance of an IT system. • Types of compression: <ul style="list-style-type: none"> o lossy o lossless. • The applications and implications of data compression. • The use and implications of codecs when using and transmitting audio and video in digital format. <p>C Operating online The implications for individuals and organisations of using online IT systems.</p> <p>C1 Online systems The features, impact and implications of the use of online IT systems to store data and perform tasks.</p> <ul style="list-style-type: none"> • The personal and professional uses and applications of cloud storage. • The personal and professional uses and applications of cloud computing. • The impact and implications on individuals of using cloud storage and computing. • The impact and implications on organisations of using cloud storage and computing. • Systems that enable and support remote working: 		
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<ul style="list-style-type: none"> o VPNs o remote desktop technologies. • Factors affecting the use and selection of online systems: <ul style="list-style-type: none"> o security o cost o ease of use o features o connectivity. C2 Online communities The features of online communities and the implications of their widespread use for organisations and individuals. • Ways of communicating and interacting with online communities: <ul style="list-style-type: none"> o social media o blog, microblog, vlog o wiki o chatrooms o instant messaging o podcasts o forums. • The implications for individuals of using and accessing online communities: <ul style="list-style-type: none"> o user experience – ease of use, performance, availability, accessibility o meeting needs o cost o privacy o security. • The implications for organisations of using and accessing online communities: <ul style="list-style-type: none"> o employee and customer experience – ease of use, performance, availability, accessibility 		
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<ul style="list-style-type: none"> o customer needs o cost o implementation – timescales, testing o replacement or integration with current systems o productivity o working practices o security. <p>D Protecting data and information The issues and implications of storing and transmitting information in digital form.</p> <p>D1 Threats to data, information and systems The implications of accidental and malicious threats to the security and integrity of data, held in, and used by, IT systems.</p> <ul style="list-style-type: none"> • The characteristics of threats to data: <ul style="list-style-type: none"> o viruses and other malware o hackers o phishing o accidental damage. • The impact of threats to data, information and systems on individuals. • The impact of threats to data, information and systems on organisations. <p>D2 Protecting data The features, uses and implications of systems and procedures used to protect the data of individuals and organisations.</p> <ul style="list-style-type: none"> • Processes and implications of techniques for protecting data and systems: <ul style="list-style-type: none"> o file permissions o access levels o backup and recovery procedures o passwords 		
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<ul style="list-style-type: none"> o physical access control o digital certificates o protocols. • The features, characteristics and implications of using antivirus software to protect data. • The features, characteristics and implications of using firewalls to protect data. • The features, applications and implications of encryption methods used to protect: <ul style="list-style-type: none"> o stored data o data during transmission. • The role of current legislation in protecting data and IT systems from attack and misuse. • The impact on individuals and organisations of legislation designed to protect data and IT systems. • The purpose, role and impact, on individuals and organisations, of codes of practice for the protection of data produced by the Information Commissioner's Office (UK) and professional bodies. <p>E Impact of IT systems</p> <p>The uses, issues and implications of IT systems and their impact on individuals and organisations.</p> <p>E1 Online services</p> <p>How the features of online services are used to meet the needs of individuals and organisations.</p> <ul style="list-style-type: none"> • The features and implications of using online services to support: <ul style="list-style-type: none"> o retail o financial services o education and training o news and information o entertainment and leisure 		
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<ul style="list-style-type: none"> o productivity o booking systems. • The uses, impact and implications for individuals and organisations of: <ul style="list-style-type: none"> o transactional data o targeted marketing o collaborative working. E2 Impact on organisations • The features and implications of IT systems used by organisations for: <ul style="list-style-type: none"> o stock control o data logging o data analysis o general office tasks o creative tasks o advertising o manufacturing o security. • The impact and implications for organisations of IT systems in terms of: <ul style="list-style-type: none"> o user experience – ease of use, performance, availability, accessibility o employee and customer needs o cost o implementation – timescales, testing, downtime o replacement or integration with current systems o productivity o working practices o staff training needs (initial and ongoing) o user support o security. E3 Using and manipulating data 		
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The uses, processes and implications for individuals and organisations of accessing and using data and information in digital form.

- Sources of data:
 - o primary
 - o secondary.
- Judging and ensuring the reliability of data.
- The characteristics and implications of methods of collecting data and opinions:
 - o survey
 - o questionnaire
 - o focus groups
 - o interview.
- Reasons for ensuring data accuracy.
- Methods of ensuring data accuracy:
 - o verification
 - o validation.
- Methods of extracting and sorting data.
- Numerical and data modelling.
- Presenting data and results.
- The characteristics and implications of user interfaces for data collection and processing systems:
 - o ease of use
 - o accessibility
 - o error reduction
 - o intuitiveness
 - o functionality
 - o performance
 - o compatibility.

F Issues

The concepts, impacts and implications of issues resulting from the use of IT systems.

F1 Moral and ethical issues

<p>The implications, for individuals, organisations and wider society, of moral and ethical factors of using information technology.</p> <ul style="list-style-type: none"> • The moral and ethical factors of the use of information technology: <ul style="list-style-type: none"> o privacy o environmental o unequal access to information technology o online behaviour and netiquette o globalisation o freedom of speech and censorship o acceptable use. • The purpose and role of codes of practice produced by professional bodies for the use of IT systems. • The impact of codes of practice on individuals and organisations. <p>F2 Legal issues</p> <p>The legal issues relating to the use of IT systems and the implications for individuals, organisations and wider society.</p> <ul style="list-style-type: none"> • The role of current legislation (and subsequent additions and amendments) in protecting users and their data from attack and misuse: <ul style="list-style-type: none"> o computer misuse legislation o police and justice legislation (computer misuse) o copyright, designs and patents legislation o copyright regulations (computer programs) o display screen equipment health and safety regulations o data protection legislation o consumer rights legislation. • Guidelines and current legislation (and subsequent additions and amendments) designed to ensure the accessibility of IT systems: <ul style="list-style-type: none"> o disability discrimination legislation 		
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<ul style="list-style-type: none"> o equality legislation o British Standards Institute (BSI) codes of practice o Open Accessibility Framework (OAF) o Web Content Accessibility Guidelines (WCAG) 1.0 and 2.0 <p>World Wide Web Consortium (W3C®).</p> <ul style="list-style-type: none"> • The moral and ethical factors of the use of IT systems: <ul style="list-style-type: none"> o health and safety o copyright o computer misuse o protection of data o privacy o accessibility. <p>Unit 2: Creating Systems to Manage Information</p> <p>Learning Aim A: The purpose and structure of relational database management systems</p> <p>A1 Relational database management systems</p> <ul style="list-style-type: none"> • Types of relational database management systems (RDBMS) and their characteristics. • RDBMS based on relational models: <ul style="list-style-type: none"> o relational data structures – relation, attribute, domain, tuple, cardinality and relational database o relational algebra sets – symbols, union, intersect, join, select o database relations – entity relationship, generic, semantic o relational keys – super key, candidate key, primary key, foreign key o integrity constraints – entity integrity, referential integrity o entity relationships – one-to-one, one-to-many, many-to-many. 	<p>Learning Aims:</p> <p>AO1 Demonstrate knowledge of database development terminology, standards, concepts and processes.</p> <p>AO2 Apply knowledge and understanding of database development terminology, standards, concepts and processes to create a software product to meet a client brief.</p> <p>AO3 Analyse information about database problems and data from test results to optimise the performance of a database solution.</p> <p>AO4 Evaluate evidence to make informed judgements about the success of a database's design and performance.</p>	<p>A1 Relational database management systems</p> <p>A2 Manipulating data structures and data in relational databases</p> <p>A3 Normalisation</p> <p>B1 Relational database design</p> <p>B2 Design documentation</p> <p>C1 Producing a database solution</p> <p>C2 Testing and refining the database</p> <p>D1 Database design evaluation</p> <p>D2 Evaluation of database testing</p> <p>D3 Evaluation of the database</p>
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A2 Manipulating data structures and data in relational databases

Use of RDBMS software tools and structured query language (SQL) for defining,

modifying and removing data structures and data:

- updating, inserting, deletion
- retrieval of data for queries, reports
- administration of users
- security, integrity, recovery.

A3 Normalisation

The role of normalisation to develop efficient data structures:

- anomalies – update, insertion, deletion
- primary keys, foreign keys, composite keys
- indexing
- referential integrity
- data dictionary – tables, fields, data types, validation
- cascading update
- deletion techniques
- joins, unions, intersects
- stages of normalisation:
 - o un-normalised form (UNF)
 - o first normal form (1NF)
 - o second normal form (2NF)
 - o third normal form (3NF).

Learning Aim B: Standard methods and techniques to design relational database solutions

B1 Relational database design

- Selection of RDBMS and SQL software, tools, techniques and processes.

AO5 Be able to develop a database solution to meet a client brief with appropriate justification.

Level 3 Pass

Learners are able to use their knowledge and understanding of database design and development terminology, standards, concepts and processes and apply problem-solving skills to design and develop a solution in context. Learners demonstrate their understanding of how to use standard database constructs to develop a functioning solution that evidences testing and evaluation.

Level 3 Distinction

Learners are able to evaluate a given problem and develop a detailed and complex solution to meet all requirements of the brief. They apply an in-depth understanding of database constructs, using test results to produce an optimised solution. Learners are able to evaluate the quality, performance and usability of their database with supporting justification.

- Database design: conceptual, logical and physical modelling and entity relationship modelling.
- Relational algebra: one to many, one to one, many to many, AND, OR, NOT, >, <, ≥, ≤
- RDMS and SQL software selection.
- Application design: user interface, software applications.
- Database implementation techniques: prototyping, data conversion, testing.
- Quality, effectiveness and appropriateness of the solution: correctness of data, relationships between data, data integrity, normalisation.

B2 Design documentation

The features and characteristics of relational database design techniques and their application to solve problems:

- requirements of the brief (audience, purpose and client's requirements)
- security and legal considerations:
 - o Data protection legislation
 - o The European Union (EU) Directive on Data Protection (legislation must be current and applicable to England, Wales, Northern Ireland)
- data structure designs:
 - o data dictionaries and their use: tables, field attributes, validation
 - o use of naming conventions
 - o entity relationship diagrams
 - o normalisation
- user interface design:
 - o data entry/input – verification, validation, calculated fields, masks, directed input
 - o reports – fields, queries, presentation of data, calculations

- o task automation – imports, updates, deletions
- extracting and presenting data:
 - o queries using multiple criteria, form values and wild cards
 - o action queries
 - o calculated queries
 - o reports
- design and use of test plans: to check correctness of data, functionality, accessibility, usability.

Learning Aim C: Creating a relation database structure

C1 Producing a database solution

- Select and configure appropriate RDBMS and SQL tools to produce a database solution to meet client's requirements:
- creating, setting up and maintaining data tables
- creating links, relationships between data tables
- applying data validation rules
- generating outputs – user-generated queries, automated queries, reports
- user interface – navigation, data-entry forms, sub-forms
- automated functions
- populating the database:
 - o importing
 - o adding data
 - o manipulating data
- devising and using SQL statements to extract, manipulate and modify data.

C2 Testing and refining the database solution

- Different types of testing: referential integrity, functionality, security.

- Selection and use of appropriate test data: erroneous data, extreme data.
- Recording appropriate test documentation.
- Using testing outcomes to improve and refine a database solution.

Learning Aim D: Evaluating a database development project

The characteristics, concepts, impact and implications of testing methodologies to monitor and evaluate database design, the database created, testing processes and success of the solution.

D1 Database design evaluation

- Evaluating a design against the given requirements:
 - use and application of an entity-relationship diagram, data dictionary, normalisation
 - coverage of functionality requirements and identification of any omissions
 - identification of design strengths and potential further improvements to meet given requirements.

D2 Evaluation of database testing

Evaluating the application of test data to ensure that the database solution meets requirements.

- Different types of testing:
 - normal test data
 - erroneous test data
 - extreme test data.
- Recording of actual results and analysis.

- Commenting on results.
- Test records:
 - o completion of test records
 - o taking of and storing screenshots of tests.
- Making use of testing outcomes.
- Using iterative processes to improve accuracy, readability and robustness.
- Identifying and recording which tests were successfully met and which test data issues were not resolved.

D3 Evaluation of the database

Evaluating the software outcome against the given requirements.

- Strengths and weaknesses of the database:
 - o solution fitness for purpose
 - o intuitiveness and ease of use
 - o constraints of the database software used
 - o maintainability of the database
 - o extent to which database meets the given requirements.

Unit 3: Using social media in Business

Learning aim A: Explore the impact of social media on the ways in which businesses promote their products and services

A1 Social media websites

- Developments in social media affect the way businesses promote products and services:
 - o social media websites are constantly evolving and new features are introduced regularly
 - o features, structure and target audience of different social media websites,

A Explore the impact of social media on the ways in which businesses promote their products and services

B Develop a plan to use social media in a business to meet requirements

C Implement the use of social media in a business

Learning aim A

For **distinction** standard, learners will produce a comprehensive, well-balanced evaluation of how a business uses social media, making realistic and well-explained business-related observations on the

A1 Social media websites

A2 Business uses of social media

A3 Risks and issues

B1 Social media planning processes

B2 Business requirements

B3 Content planning and publishing

B4 Developing an online community

B5 Developing a social media policy

B6 Reviewing and refining plans

C1 Creating accounts and profiles

C2 Content creation and publication

<ul style="list-style-type: none"> • How businesses can use social media websites to support their business aims and needs, including: <ul style="list-style-type: none"> o creating an image or brand o promoting products and/or services o communicating with customers o customer service o resolving queries and managing issues. • Features of social media websites tailored to business needs, including: <ul style="list-style-type: none"> o advertising o linking to previous e-commerce site search history and display of search-related adverts o website and mobile device integration o relationship to search engine optimization (SEO) o profile on the sites, describing the business to visitors o usage data indicating profile of followers and effectiveness of posts, o audience profiles (age, gender, income) of social media websites. <p>A2 Business uses of social media</p> <ul style="list-style-type: none"> • Posting different content formats, e.g. text, images, video, links, polls and quizzes. • Content focus and meaning, e.g. information, promotion, humour, special offers and customer service. • Developing an audience and encouraging people to follow or 'like' the business through the creation and use of engaging content. • Keywords and their use in posted content. • Developing contacts by following and linking relevant businesses and individuals, 	<p>benefits and disadvantages, while considering their target customers or audience. Learners will provide real-life, relevant examples of how businesses have used social media effectively and how some businesses have not managed the risks involved effectively. Learners must articulate their arguments fluently and their views concisely, providing an evaluation that makes reasoned, valid judgements. The evidence will demonstrate high-quality written/oral communication through the use of accurate and fluent technical vocabulary, to support a well-structured and considered response that clearly connects chains of reasoning.</p> <p>For merit standard, learners will present a reasoned and well-explained assessment of a range of different ways that a business can use social media to interact with the target audience for their products and/or services. The discussion will be balanced and supported by clear examples. Learners will focus their comments on the business uses of the sites and not personal uses. The evidence must be technically accurate and demonstrate good-quality written or oral communication.</p> <p>For pass standard, learners will provide detailed information, supported by real-life examples, covering all the ways that</p>	<p>C3 Implementation of online community building</p> <p>C4 Data gathering and analysis</p> <p>C5 Skills, knowledge and behaviours</p>
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<p>and sharing content posted by others.</p> <ul style="list-style-type: none"> • Direct and indirect advertising. • Links to other commercial information, e.g. company website, e-commerce websites. • Relationship between social media website and company website, e.g. using: <ul style="list-style-type: none"> o social media buttons on the company website o company website links within social media posts that encourage visits to e-commerce site to make purchases o social media news feeds on the company website. <p>A3 Risks and issues</p> <ul style="list-style-type: none"> • Negative comments on social media sites and damage to reputation. • Time constraints on social media interaction, return on time investment. • Unforeseen consequences of posted content. • Security issues related to increased company profile as a result of use of social media: <ul style="list-style-type: none"> o dangers of virus infection o potential for blackmail/ransom o theft of company-sensitive information or personal information. <p>Learning aim B: Develop a plan to use social media in a business to meet requirements</p> <p>B1 Social media planning processes</p> <p>Processes to consider when planning the potential use of social media in a business, including:</p> <ul style="list-style-type: none"> • the specific business requirements • content planning and publishing • developing online communities • enforcing social media policies. <p>B2 Business requirements</p>	<p>businesses can use social media (as listed in the unit content). They will research the different audience profiles for the main social media sites, explain how the different sites appeal to their different audiences and relate it to how different business can use social media. The evidence may have some inaccuracies and include a limited range of examples.</p> <p>Learning aims B and C</p> <p>For distinction standard, learners will draw on and show synthesis of knowledge across the learning aims in order to evaluate both the plan to use social media and its implementation. Learners must provide a reasoned and realistic review of the outcomes, identifying both the positive and negative aspects. For example, they can explain why some things they planned to do did not happen or did not work out as they had expected. Learners also need to show that they have considered the legal and ethical implications of the material that they posted on social media sites. Learners will make reasoned, appropriate suggestions as to how the use of social media could be improved in the future. They will undertake a detailed examination of the data collected on the interaction achieved and the profile of the people who have interacted with their social media posts. This information will link</p>
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<ul style="list-style-type: none"> • Working with a client to set requirements for the use of social media and the potential benefits for the business when compared to traditional promotion methods. • Establishing timescales and responsibilities for the use of social media within a business. • Identifying criteria for measuring success of the use of social media within a business. • Selection of social media websites to use by matching site profiles to requirements in terms of a business use of social media. • Identifying targets for the use of social media, number of followers, 'likes' and shares. <p>B3 Content planning and publishing Planning posts and other content to be published on social media websites, including:</p> <ul style="list-style-type: none"> • identifying a target audience (e.g. age, gender, interests, income) • linking type of content to target audience to ensure it is engaging • researching keywords (e.g. Google AdwordsTM) and creating keyword strategies to help users identify content • researching the best time to publish content and creating a publishing schedule (type of content, frequency, day and time). <p>B4 Developing an online community Working with a client to develop a strategy to encourage online community building, including:</p> <ul style="list-style-type: none"> • use of promotional techniques, e.g. requesting feedback, surveys, special offers and creating links between social media websites and company e-commerce site • monitoring social media website streams and responding to queries, requests 	<p>clearly to a discussion of how well the data matches their intentions. For example, learners may discover that the age and location profile of the people interacting with their posts does not match the target audience of the business concerned. In this case, they would need to discuss possible reasons for the mismatch and how this issue could be resolved. Learners will take individual responsibility for their own work, for example identifying potential issues and resolving these, reviewing their work and making improvements, keeping their work safe and secure and showing responsible use of quoted materials. Creativity will be shown, for example, through evidence of taking innovative approaches to problem solving and the originality of their solution. The evaluation of behaviours will consider learners' use of 'soft skills' in relation to the vocational context of the project, such as liaising with clients and time management. Learners will evaluate their own behaviours throughout the project and the impact they had on the outcomes. Learners will refer to tangible evidence to support their evaluation, such as meeting notes, correspondence and time plans.</p> <p>For merit standard, learners will provide a clear, accurate and well-reasoned justification of the choices they made in the planning of the use of social media. Learners</p>	
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<p>and complaints.</p> <p>B5 Developing a social media policy</p> <p>Working with a client to create a social media policy applicable to businesses, including:</p> <ul style="list-style-type: none"> • company philosophy (identifying and reflecting this in posted content) • promotion of honesty and respect in posted content • ways to ensure confidentiality of information • methods of dealing with security issues • separation of company and personal content • legal and ethical considerations. <p>B6 Reviewing and refining plans</p> <p>Working with a client and other relevant stakeholders to improve the quality, effectiveness and appropriateness of the plans, including:</p> <ul style="list-style-type: none"> • gathering feedback from a client and potential users • communicating with a client, e.g. email, verbal communication • scheduling and documenting meetings • agreeing and adjusting timescales • refining ideas and solutions. <p>Learning aim C: Implement the use of social media in a business</p> <p>Selection and use of appropriate social media website tools and techniques to implement a plan.</p> <p>C1 Creating accounts and profiles</p> <ul style="list-style-type: none"> • Sign-up, creation and administration of social media website business accounts. • Creation and set-up of a company profile. • Customisation and configuration of the company profile, including privacy settings, colour schemes, images, text and other assets that follow branding guidelines. <p>C2 Content creation and publication</p>	<p>will show a clear link to the required business objectives. Learners also need to show that they have considered the legal and ethical implications of the material that they posted on social media sites. The usage data collected by learners will also assess how effective each of their posts has been at achieving their stated aim and how effective it has been in encouraging interaction with the audience. Learners will apply their knowledge through selection and application of appropriate tools and techniques to optimise the effectiveness of their future posts and other social media features. They will make accurate and reasoned suggestions as to how the outcomes could be improved if the task were to be repeated.</p> <p>For pass standard, learners will produce a plan that meets the business requirements and identifies the target audience. The plan will also identify timescales and keywords, and include a content-posting schedule. Learners will show an awareness of legal and ethical implications of the content they plan to post. Learners will review their plan, and ask others such as the client/employer and customers/audience to assist them in this process and provide evidence of their review. Learners will select a variety of social media websites and implement their plan and interact with their followers. Some simulation may be required in order to</p>	
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<ul style="list-style-type: none"> • Carry out research in order to produce engaging content for the intended target audience. • Produce, publish and manage content. • Improve visibility of published content. • Methods to encourage audience interaction, e.g. use of images, phrasing of text content, timing of posts to coincide with times when followers are online. • Integration of information across company e-commerce website and social media websites. • Adapting and testing content on different device platforms, e.g. mobile phones, tablets and notebooks. <p>C3 Implementation of online community building</p> <ul style="list-style-type: none"> • Implementation of an online community building strategy, including: <ul style="list-style-type: none"> o use of hashtags, sharing and tagging o finding and joining groups and contributing information o following people and businesses. • Monitoring and responding to comments; importance of prompt responses. • Using tools and techniques to automate content posting. <p>C4 Data gathering and analysis</p> <p>Gathering and interpreting data on social media websites using dedicated tools, e.g. Facebook Insights, Twitter Analytics, Google Analytics and TweetReachTM.</p> <ul style="list-style-type: none"> • Identifying interaction relating to individual posts. • Identifying audience profiles, e.g. age, location. • Monitoring number of 'likes' and 'shares'. • Comparison of intended target audience versus actual audience. • Identification of posts and types of content which create the highest levels of interaction. • Identifying the number of visitors who 'click through' to company e-commerce website. 	<p>provide the interaction and fellow learners can play the role of 'customers' for each other. Learners can provide evidence in the form of annotated screenshots showing how they have implemented the plan they have created. Learners must collect and review a range of data using features such as Facebook Insights, Google Analytics and Twitter Analytics, showing the interaction that individual posts have created and the profile of their audience. This data will be used to optimise their future posts, for example by adjusting the wording, content and timing of posts, as well as demonstrating use of any other new features.</p>	
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C5 Skills, knowledge and behaviours

- Planning and recording, including the setting of relevant targets with timescales, how and when feedback from others, such as customers and social media followers, will be gathered.
- Reviewing and responding to outcomes, including the use of feedback from others, e.g. customers and social media followers who can provide feedback on the quality and suitability of the features against the business requirements.
- Demonstrating own behaviours and their impact on outcomes, to include professionalism, etiquette, supportive of others, timely and appropriate leadership, accountability and individual responsibility.
- Evaluating outcomes to help inform high-quality justified recommendations and decisions.
- Evaluating targets to obtain insights into own performance.
- Media and communication skills, including:
 - o the ability to convey intended meaning, e.g. written (email, design documentation, recording documentation, reports, visual aids for presentation use); verbal communication requirements (one to one and group, informal and formal situations)
 - o use of tone and language for verbal and written communications to convey intended meaning and make a positive and constructive impact on audience, e.g. positive and engaging tone, technical/vocational language suitable for intended audience, avoidance of jargon

o responding constructively to the contributions of others, e.g. supportive, managing contributions so all have the opportunity to contribute, responding to objections, managing expectations, resolving conflict.

Unit 4: Programming

Learning aim A: Examine the computational thinking skills and principles of computer programming

A1 Computational thinking skills

Application of computational thinking skills involved in analysing problems and processes, in order to identify solutions that can be developed into software applications.

- Decomposition:
 - o identifying and describing problems and processes
 - o breaking down problems and processes into distinct steps
 - o describing problems and processes as a set of structured steps
 - o communicating the key features of problems and processes to others as relevant.
- Pattern recognition:
 - o identifying common elements or features in problems or systems
 - o identifying and interpreting common differences between processes or problems
 - o identifying individual elements within problems
 - o describing patterns that have been identified

Learning aims

In this unit you will:

- A Examine the computational thinking skills and principles of computer programming
- B Design a software solution to meet client requirements
- C Develop a software solution to meet client requirements

Learning aim A

Evidence for this assignment will be in the form of a written response that investigates computational thinking skills and the principles and purpose of different programming languages. The report will make use of specific examples of code implementation (and the chosen paradigm) to explore how the example code has been implemented to meet specific needs. The code base used by learners in their investigation must be of sufficient complexity to allow analysis of the implementation of a range of programming constructs, including standard and language-specific techniques, logical structures and mathematical principles.

A1 Computational thinking skills
A2 Uses of software applications
A3 Features and characteristics of programming languages
A4 Constructs and techniques and their implementation in different languages
A5 Principles of logic applied to program design Principles, including:

B1 Software development life cycle
B2 Software solutions design

C1 Software solutions development
C2 Testing software solutions
C3 Improvement, refinement and optimisation of software applications
C4 Review of software solutions
C5 Skills, knowledge and behaviours

<ul style="list-style-type: none"> o making predictions based on identified patterns. • Pattern generalisation and abstraction: <ul style="list-style-type: none"> o identifying information required to solve an identified problem o filtering out information required to solve an identified problem. • Representing parts of a problem or system in general terms by identifying: <ul style="list-style-type: none"> o variables o constants o key processes o repeated processes o inputs o outputs. <p>A2 Uses of software applications The uses and implications of software applications in solving problems and fulfilling needs, including:</p> <ul style="list-style-type: none"> • gaming and entertainment • productivity • information storage and management • repetitive tasks or dangerous tasks • social media • search engines. <p>A3 Features and characteristics of programming languages</p> <ul style="list-style-type: none"> • The uses and applications of different types of high and low-level programming languages, developed to assist in the solution of particular problems, such as: <ul style="list-style-type: none"> o procedural, e.g. C, Perl®, Python™ o object-orientated, e.g. C++, C#®, Java® o event-driven, e.g. Visual Basic® o machine, e.g. Assembler o mark-up, e.g. HTML. 	<p>For distinction standard, learners will provide an evaluation of how computational thinking skills are used to find solutions to problems and how this can impact software design and the applications developed. They will provide a clear and balanced evaluation of the use of different programming languages (in identified programs) to solve different, specific problems. Learners will provide a detailed analysis of the programming principles used in the identified programmes. They will evaluate the success of their implementation in terms of the quality of code produced, and in a wider context where applicable. Quality will be considered in terms of the degree to which user requirements are met, the robustness of the code, its maintainability, efficiency, portability and ease of use. Learners will provide an evaluation of the identified programming languages. They will consider the principles they have analysed and explain why specific programming languages are used and what advantages they may offer to the programmer and the end user. Learners must articulate their arguments and views fluently and concisely, providing an evaluation that makes reasoned and valid judgements. The evidence will demonstrate high-quality written/ oral communication through the use of accurate and fluent technical vocabulary to support a</p>	
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<ul style="list-style-type: none"> • Factors to compare and contrast in programming languages, including: <ul style="list-style-type: none"> o hardware and software needed for running and developing a program o special devices required o performance o preferred application areas o development time o ease of development. <p>A4 Constructs and techniques and their implementation in different languages</p> <ul style="list-style-type: none"> • Programming languages, constructs and techniques, including: <ul style="list-style-type: none"> o command words o constants and variables, local and global variables o data types – character, string, integer, real, Boolean o statements – assignment, input and output, sequence, iteration, selection o logical operations. • Other constructs, such as: <ul style="list-style-type: none"> o subroutines, functions and procedures o string handling, including examining single characters and substrings o arrays – two-dimensional and three-dimensional, splitting and joining o file handling – open, read, write, close, database o data structures o event handling. • Documentation of code. <p>A5 Principles of logic applied to program design</p> <p>Principles, including:</p> <ul style="list-style-type: none"> • iteration – repetition of a computational procedure applied to the result of a previous application 	<p>well-structured and considered response that clearly connects chains of reasoning.</p> <p>For merit standard, learners will analyse how computational thinking skills can impact software design, highlighting features of decomposition, pattern recognition and pattern generalisation and abstraction. Learners will show a clear understanding of how different programming languages are implemented to solve problems. They will provide a balanced and reasoned analysis of the strengths and weaknesses of the identified code in solving the problems and the quality of the implementations. They will analyse the strengths and weaknesses of the identified languages and how they affect the requirements of the user and the development of a program to meet defined needs. The evidence will be technically accurate and demonstrate good-quality written or oral communication.</p> <p>For pass standard, learners will explain how computational thinking skills are used to find solutions to problems. They will explain the range of programming languages available, as given in the unit content. Learners will explain how each differs in terms of constructs, techniques, use and requirements. They must choose one example program that has been created to solve a particular problem/meet a specific</p>	
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<ul style="list-style-type: none"> • mathematical logic – inference, consistency, completeness, verification by truth tables • propositional dynamic logic to demonstrate the function of algorithms • use of sets, e.g. properties and interrelationships of sets of data, search/filter sets of data. <p>A6 Quality of software applications How the design and implementation of a software application affects quality, including:</p> <ul style="list-style-type: none"> • efficiency/performance, e.g. the system resources consumed by the program, CPU cycles, processor time, memory space, accessing storage media • maintainability, e.g. ease with which a program can be modified by its present or future developer in order to carry out corrective, perfective or adaptive maintenance • portability, e.g. range of computer hardware, operating systems and platforms on which the source code can be run/compiled/interpreted • reliability, e.g. accuracy and the consistency of its outputs • robustness, e.g. quality of coding and testing to ensure that extreme and erroneous data can be processed without causing the program to crash • usability, e.g. ease with which an end user can use the program. <p>Learning aim B: Design a software solution to meet client requirements</p> <p>B1 Software development life cycle Application of the software development life-cycle stages, including:</p> <ul style="list-style-type: none"> • assessment of the requirements for an identified problem • design specification, e.g. scope, inputs/outputs, user interface, timescales • develop code • implementation 	<p>need, and provide descriptions of how programming constructs and the principles of software design have been applied to develop a solution to meet the required needs of users. Learners will also consider how computational thinking skills may have been applied when exploring the principles of software design. They will explain how different software design methods can be used to produce effective applications. This can be achieved by using supporting examples. The evidence may have some inaccuracies and may include limited use of examples to illustrate the explanations.</p> <p>Learning aims B and C Learners must develop a program to solve a specific problem. The problem must be of significant complexity to allow learners to demonstrate the application of a range of appropriate problem solving and programming skills.</p> <p>For distinction standard, learners will draw on and show synthesis of knowledge across the learning aims to produce a detailed evaluation of the planning, development and refinement of the solutions in line with client requirements. They must explain methodologies applied throughout the process and justify their use in ensuring the requirements of the client are met. Learners must provide a thorough evaluation of the</p>	
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- test, e.g. white box and black box testing, refinement, optimisation
- maintenance, e.g. corrective, adaptive and increased functionality.

B2 Software solutions design

- Problem definition statements, to include: intended users, full summary of the problem to be solved, constraints, benefits, nature of interactivity, complexity of problem.
- Purpose and any other requirements as defined in a client brief.
- Features of software:
 - o description of main program tasks, input and output formats
 - o diagrammatic illustrations, to include screen layouts, user interfaces, navigation
 - o algorithms and processing stages, to include flowcharts, pseudocode and events
 - o data structures
 - o data storage
 - o control structures
 - o data validation
 - o error handling and reporting.
- Choice of language.
- List of pre-defined programs and/or code snippets.
- List of ready-made and/or original assets such as a digital animation, digital graphic, digital audio and video.
- Feedback from others to help refine alternative design ideas/prototypes and make decisions.
- Test plan with test data to include typical, extreme and erroneous data.
- Technical and design constraints, e.g. connectivity, memory storage, programming languages.

effectiveness of the final program, including a systematic evaluation of the techniques, principles and constructs applied in their program. They will provide well-considered, justifiable suggestions for future improvements to the program. Evaluation of behaviours will consider learners' use of 'soft skills' in relation to the vocational context of the project, such as managing and liaising with other members of the team or clients and time management. Learners will evaluate their own behaviours throughout the project and the impact they have on the outcomes. Learners must refer to tangible evidence to support their evaluation such as meeting notes, correspondence and time plans.

For **merit** standard, learners will apply their knowledge through the selection and application of appropriate methodologies to plan, develop and test an effective, optimised computer program. Learners will use feedback from others to identify how their design could be improved and produce a solution design. Learners must provide a clear, accurate and well-reasoned justification for the decisions made throughout the development of the program, linking decisions to their effectiveness in meeting user requirements. In doing this, learners will optimise the effectiveness and efficiency of their solution

<p>Learning aim C: Develop a software solution to meet client requirements</p> <p>C1 Software solutions development The process of software development, including:</p> <ul style="list-style-type: none"> • the development environment to produce code • the development and refinement of software programs using a suitable programming language • library routines, standard code and user generated subroutines used to add to the efficiency of a program. <p>C2 Testing software solutions Testing of the programs, including:</p> <ul style="list-style-type: none"> • test plan • test data – typical, extreme and erroneous data • selection and use of appropriate types of testing to test part or all of a program, e.g. functional testing, stability, compatibility. <p>C3 Improvement, refinement and optimisation of software applications Methods of improving, refining and optimising, e.g.:</p> <ul style="list-style-type: none"> • annotated code to allow effective repair/debugging of the program and maintainability • program compilation for a designated platform or environment • review – quality of a program in terms of reliability, usability, efficiency/performance, maintainability, portability • eliciting feedback from users • making use of the outcomes of testing and feedback • documenting changes to the design and solution. <p>C4 Review of software solutions Evaluation of software solutions, including:</p> <ul style="list-style-type: none"> • suitability for audience and purpose 	<p>in line with the user requirements. They will take feedback from others into account and explain how they decided to accept or reject recommendations. Learners must optimise their computer program by making use of testing and feedback throughout development to improve and refine their code to fully meet client requirements, for example improving data validation procedures, the efficiency of the code or the usability of the program.</p> <p>For pass standard, learners will apply their understanding of the software development life cycle to design and develop a computer program to meet identified requirements. Learners must apply an understanding of client requirements and provide planning documentation that demonstrate the possible solutions to the identified problems. They will seek feedback on their design and use this feedback to improve the quality of their design solution for the problem. Learners must produce evidence that the finished program has been tested using a number of different appropriate testing methods to ensure they are functional. They must produce solutions that meet the requirements of the client; however some small issues may persist. Learners must provide a review of whether their work meets client requirements, considering both positive and negative aspects of the</p>	
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<ul style="list-style-type: none"> • ease of use • quality of the software solution, e.g. reliability, usability, efficiency/performance, maintainability, portability • constraints of the programming language • other constraints, e.g. time, programmer knowledge, rules of languages vary with implementation • strengths and weaknesses of the software solutions • improvements that can be made • optimising software solutions, e.g. improving robustness, improving efficiency of the code, adding additional functionality. <p>C5 Skills, knowledge and behaviours</p> <ul style="list-style-type: none"> • Planning and recording, including the setting of relevant targets with timescales, how and when feedback from others will be gathered. • Reviewing and responding to outcomes, including the use of feedback from others, e.g. IT professionals and users who can provide feedback on the quality of the program and its suitability when assessed against the original requirements. • Demonstrating own behaviours and their impact on outcomes, to include professionalism, etiquette, supportive of others, timely and appropriate leadership, accountability and individual responsibility. • Evaluating outcomes to help inform high-quality justified recommendations and decisions. • Evaluating targets to obtain insights into own performance. • Media and communication skills, including: <ul style="list-style-type: none"> o the ability to convey intended meaning, e.g. written (email, design documentation, 	<p>outcomes, although their review may be unbalanced and/or superficial. They will use relevant feedback, such as client feedback, to make suggestions regarding possible alternative solutions that could be implemented</p>	
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recording documentation, reports, visual aids for presentation use); verbal communication requirements (one to one and group informal and formal situations)

- o use of tone and language for verbal and written communications to convey intended meaning and make a positive and constructive impact on audience, e.g. positive and engaging tone, technical/ vocational language suitable for intended audience, and avoidance of jargon
- o responding constructively to the contributions of others, e.g. supportive, managing contributions so all have the opportunity to contribute, responding to objections, managing expectations and resolving conflict.

Unit 5: Data Modelling

Learning aim A: Investigate data modelling and how it can be used in the decision-making process

A1 Stages in the decision-making process

- Understanding the scenario.
- Identifying information and sources:
 - o information required
 - o information that is already available
 - o additional information needed
 - o sources of additional information
 - o requirements for verifying the information sources.
- Factors affecting the quality of information:
 - o currency of data, accuracy of data, external factors.
- Analysing the information.

Learning Aims:

In this unit you will:

- Investigate data modelling and how it can be used in the decision-making process
- Design a data model to meet client requirements
- Develop a data model to meet client requirements

Learning aim A

A1 Stages in the decision-making process
A2 Spreadsheet features used to support data modelling
A3 Using data modelling to consider alternatives
A4 Evaluating models
A5 Documenting and justifying decisions

B1 Functional specification

<ul style="list-style-type: none"> Identifying alternatives. Identifying consequences of implementing the alternatives. Making a decision. Justifying the decision. Communicating decision(s) to others (e.g. client, supervisor, project sponsor), as appropriate. <p>A2 Spreadsheet features used to support data modelling</p> <ul style="list-style-type: none"> Entering and editing data. Formatting data. Using formulae and functions. Validation (and verification) of data. Analysing and interpreting data. Presenting data. <p>A3 Using data modelling to consider alternatives</p> <ul style="list-style-type: none"> Identifying the inputs required for the model. The range of outputs that can be produced. Benefits and limitations of alternative solutions. Impact/consequences of alternative solutions. Identifying the alternative solution(s) that produce the best decision or compromise. <p>A4 Evaluating models</p> <p>Factors to consider in the evaluation of the model:</p> <ul style="list-style-type: none"> how well the model reflects the scenario being modelled the decisions that can be made, using the model whether the model can be improved whether or not there are other factors that could be used to extend the model. <p>A5 Documenting and justifying decisions</p> <p>Requirements for documenting and justifying the model:</p> <ul style="list-style-type: none"> summarising the situation 	<p>For distinction standard, learners will produce a comprehensive, detailed explanation of the stages involved in the decision-making process, considering how a systematic approach using valid information leads to informed decisions that can be justified. Learners will evaluate the use of advanced features and functions of a spreadsheet in data modelling, and clearly show how this contributes to the decision-making process.</p> <p>Learners' evidence will demonstrate high-quality written/oral communication, through use of accurate and fluent technical vocabulary to support a well-structured and considered response that clearly connects chains of reasoning.</p> <p>For merit standard, learners will produce a detailed explanation of the stages involved in the decision-making process and show clear understanding of how a systematic approach using valid information leads to informed decisions. Learners will analyse how advanced features and functions of spreadsheet software in data modelling can contribute to the decision-making process. The evidence will be technically accurate and demonstrate good-quality written/oral communication.</p>	<p>B2 Spreadsheet model design B3 Reviewing and refining data model designs B3 Reviewing and refining data model designs</p> <p>C1 Developing a data model solution C2 Testing the data model solution C3 Reviewing and refining the data model solution C4 Skills, knowledge and behaviours</p>
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- identifying information sources used
- indicating the factors considered
- indicating method used to reach a decision
- justifying the choice of information sources, factors considered and methods used.

Learning aim B: Design a data model to meet client requirements

B1 Functional specification

Designing a functional specification to meet requirements:

- nature of the problem
- functions the model must perform
- user interface
- constraints
- success criteria.

B2 Spreadsheet model design

A design which shows how the spreadsheet model will look and work.

- Producing worksheet structure diagrams that show:
 - o layout and presentation
 - o processing
 - o data entry and validation
 - o navigation
 - o output.
- Producing a test plan to show:
 - o test data
 - o purpose of the test
 - o expected result.

B3 Reviewing and refining data model designs

Working with clients and others to improve the quality, effectiveness and appropriateness of designs.

For **pass** standard, learners will produce an explanation of the stages involved in the decision-making process, and show understanding of how a systematic approach using valid information leads to informed decisions. Learners will show understanding of advanced features and functions of spreadsheet software in data modelling. The evidence may have some inaccuracies and make limited use of examples.

Learning aims B and C

For **distinction** standard, learners will provide evidence of designing and developing a data model for a specified scenario that meets client requirements. Learners will draw on and show synthesis of knowledge across the learning aims to evaluate how the decisions and processes applied throughout the design, development and testing stages, impact on the effectiveness of the final solution.

Learners must produce detailed designs for a data model, which will include a range of alternative solutions. Learners will evaluate the alternatives and their impact and consequences, selecting, and justifying the selection of the alternative(s) that produce the best decision or compromise. Learners will develop their final design using a range of appropriate, advanced spreadsheet

<ul style="list-style-type: none"> • Gathering feedback from client(s) and potential users on the extent to which the design meets requirements. • Communicating with clients, e.g. email, verbal communication. • Scheduling and documenting meetings. • Agreeing and adjusting timescales. • Refining ideas and solutions. • Updating design specification documentation, based on review and feedback. <p>Learning aim C: Develop a data model to meet client requirements</p> <p>C1 Developing a data model solution</p> <ul style="list-style-type: none"> • Processing features and requirements: <ul style="list-style-type: none"> o formulae, e.g. add, subtract, divide, multiply o functions e.g. SUM, AVERAGE, COUNT, COUNTIF, LOOKUP, INDEX, GOAL SEEK o logical functions e.g. IF, NOT, AND, OR, WHATIF o nested IF functions o data manipulation, e.g. sorting, grouping, filtering, pivoting data o importing and exporting data o autofill o replication o relative and absolute cell referencing o using macros and buttons to initiate procedures. • Data entry and validation requirements and methods: <ul style="list-style-type: none"> o use of data entry forms o restricting data input to acceptable values o protecting cells by hiding, locking and password protecting o ease of use techniques, e.g. list boxes and drop-down menus 	<p>features and functions. They will carry out comprehensive testing and seek user feedback which will be used to refine and improve their data model. They will evaluate the final design and produce well-considered, justifiable suggestions for future improvements to the data model.</p> <p>Learners will produce an evaluation that is a systematic and accurate review of their own skills and performance and the impact that this had on the effectiveness of the solutions. Learners will take individual responsibility for their own work, for example identifying potential issues and resolving them, reviewing their work and making improvements, keeping their work safe and secure and showing responsible use of quoted materials. Creativity will be shown, for example, by evidence of taking innovative approaches to problem solving, and the originality of their solution.</p> <p>For merit standard, learners will provide evidence of designing and developing a data model for a specified scenario that meets client requirements. They will justify how the decisions made and processes applied throughout the design, development and testing stages impact on the effectiveness of the final solution.</p>	
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<ul style="list-style-type: none"> o automated data transfer between sheets or applications o adding user prompts and messages. • Layout and presentation considerations: <ul style="list-style-type: none"> o font size and style, merging cells, colours, borders, shading, conditional formatting, headers and footers, graphics. • Output requirements: <ul style="list-style-type: none"> o worksheet layout, graphics, colours, borders and shading, charts and graphs. <p>C2 Testing the data model solution Using formative and summative testing to test data models, including functionality and acceptance.</p> <ul style="list-style-type: none"> • Testing to establish whether: <ul style="list-style-type: none"> o the solution meets all of the requirements of the functional specification o the underlying logic of the model is correct o all the functions and formulae work correctly. • Other factors to consider: <ul style="list-style-type: none"> o selection and use of appropriate test data, e.g. valid, invalid, erroneous, extreme o selecting suitable users for solution testing o gathering feedback from users, e.g. effectiveness, presentation, performance and purpose o designing and completing test documentation. <p>C3 Reviewing and refining the data model solution Making improvements and/or refinements to the model in order to meet client requirements.</p> <ul style="list-style-type: none"> • Refining the model to take account of issues raised during testing. • Refining the model to take account of the feedback and client requirements. • Factors that could be used to extend the model. 	<p>Learners will produce detailed designs for a data model that will include a range of alternative solutions. Learners will analyse the alternatives and their impact, selecting the alternative(s) that</p> <p>produce the best solution. Learners must develop their final design using a range of advanced spreadsheet features and functions. They will carry out testing and seek user feedback, which will be used to refine and improve their data model. Learners will analyse the final design and provide reasoned justification of how it fulfils its purpose and meets client requirements.</p> <p>For pass standard, learners will provide evidence of designing and developing a data model for a specified scenario that meets client requirements, although some small issues may persist. They will explain how the decisions made and processes applied throughout the design, development and testing stages impact on the effectiveness of the final solution.</p> <p>Learners will produce designs for a data model that will include a range of alternative solutions. Learners will consider the alternatives and their impact, selecting the alternative(s) that produce the best solution. Learners must develop their final design</p>	
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C4 Skills, knowledge and behaviours

- Planning and recording, including setting relevant targets with timescales, how and when feedback from others will be gathered.
- Reviewing and responding to outcomes, including the use of feedback from others, e.g. professionals who can provide feedback on the quality of the data model and its suitability against the design requirements.
- Demonstrate own behaviours and their impact on outcomes to include professionalism, etiquette, support of others, timely and appropriate leadership, accountability and individual responsibility.
- Evaluating outcomes to help inform high-quality, justified recommendations and decisions.
- Evaluating targets to obtain insights into own performance.

Media and communication skills, including:

- o the ability to convey intended meaning, e.g. written (email, design documentation, recording documentation, reports, visual aids for presentation use); verbal communication requirements (one to one and group informal and formal situations)
- o use of tone and language for verbal and written communications, to convey intended meaning and make a positive and constructive impact on audience, e.g. positive and engaging tone, technical/vocational language suitable for intended audience, avoidance of jargon

using a range of spreadsheet functions, carry out testing and seek user feedback. The results of testing and user feedback can be used to refine and improve their data model. Learners must review the extent to which the final design meets client requirements, although the review may be unbalanced.

o responding constructively to the contributions of others, e.g. supportive, managing contributions so all have the opportunity to contribute, responding to objections, managing expectations, resolving conflict.

Unit 6: Website Development

Learning aim A: Understand the principles of website development

A1 Purpose and principles of website products

- Purpose of websites, including the features of:
 - o content-based (Web 2.0 technologies)
 - o product and/or service-based
 - o target audience, e.g. social networker, seekers, gamers, buyers, age profile, gender
 - o requirements, e.g. user-friendly, consistent, navigational, customisable, flexible.
- Principles of website design, e.g. usability, white space, site layout, accessibility, spacing, navigation, typography, alignment, clarity, consistency/intuitiveness, accuracy, content, media, simplicity.
- Media and objects, e.g. position, colour, contrast, size, appropriateness.
- Creativity and innovation, e.g. unconventional layouts, white space, 'outside of the box' thinking, golden ratio.
- Search engine optimisation, e.g. indexing (meta tags), use of keywords, importance of updates, limiting crawling.

Learning Aims:

In this unit you will:

- Understand the principles of website design
- Design a website to meet client needs
- Develop a website to meet client requirements

Learning aim A

For **distinction** standard, learners will give a detailed and balanced evaluative report that explains how the two sites meet user requirements. This must be explored further by identifying the requirements of the websites, for example it has a secure login, and why these are important for the user. Learners will discuss what overall impact the site will have on the organisation, including positive and negative outcomes. The report will demonstrate high-quality written/oral communication through use of accurate and

A1 Purpose and principles of website products

A2 Factors affecting website performance

B1 Website design

B2 Common tools and techniques used to produce websites

C1 Client-side scripting languages

C2 Website development

C3 Website review

C4 Website optimisation

C5 Skills, knowledge and behaviours

A2 Factors affecting website performance

- Where scripts run (on the web server – server-side scripts, or the local client machine – client-side scripts).
- Browser compliance, e.g. which elements are supported by different browsers.
- Server-side factors, e.g. bandwidth availability, number of hits, file types.
- Client-side factors, e.g. upload and download speeds, browser, cache memory, processor speed, interactivity.

Learning aim B: Design a website to meet client requirements

B1 Website design

Understanding the steps involved in developing a design for a client website.

- Problem definition statement requirements: intended audience, full summary of the problem to be solved, constraints, benefits, nature of interactivity, complexity of the website.
- Purpose requirements as defined in a client brief for their interactive website.
- Application of website design principles by professionally created websites.
- Initial design ideas/prototypes (illustrating design principles) and the requirements for an interactive website, including:

fluent technical vocabulary to support a well-structured and considered response that clearly connects chains of reasoning.

For **merit** standard, learners will show a clear understanding of how the two sites employ different principles of website design to develop websites that are creative and high performing. Learners will give a detailed analysis of how user needs and principles of website design impact on the design and development of a website. The report must provide a balanced discussion, supported by reasoned examples. It will be technically accurate and demonstrate good-quality written/oral communication.

For **pass** standard, learners will give a detailed comparison of two websites, for example Asda and Tesco – two similar commerce sites, with an explanation of who the site is aimed at and its purpose. Learners will explain the use of design principles in each website to compare their application. The evidence may have some inaccuracies and the comparison may be unbalanced.

Learning aims B and C

For **distinction** standard, learners will draw on and show synthesis of knowledge across the learning aims to evaluate how the decisions and methodologies applied throughout the design, development,

<ul style="list-style-type: none"> o diagrammatic illustrations, e.g. storyboard, mood board, wireframe, site maps o realistic representations o search engine optimisation o alternative design ideas/prototypes, including compatibility with mobile/tablet devices. • Client-side scripting design tools and techniques, e.g. pseudocode, flow charts (including use of British Computer Society (BCS) standard flow chart symbols) used to develop original code. • Effective use of ready-made and/or original assets, e.g. a digital animation, digital graphic, digital audio and video, or any other combined assets. • Obtaining and using feedback from others to help refine alternative design ideas/prototypes and make decisions. • Testing plan requirements and its completion with test data, to test functionality. • Identifying technical and design constraints and working around them. • Legal and ethical considerations applicable to the equivalent legislation in England, Wales and Northern Ireland: <ul style="list-style-type: none"> o copyright, designs and patents legislation and its requirements in terms of protecting software products and digital media, such as images, music and films. o data protection legislation and the requirements it places on organisations to keep data about living individuals secure. <p>B2 Common tools and techniques used to produce websites</p>	<p>maintenance, optimisation and testing stages of their website impacted on the overall outcomes. They will consider whether the website meets client requirements, including achieving its stated purpose and appealing to the target audience. Learners will justify their designs and provide a discussion on why alternative designs were not used. Learners will give a detailed and balanced evaluation of how effectively their completed website meets the client requirements, including appealing to the target audience and meeting its stated purpose, in comparison to alternative solutions. Their evaluation will be supported by evidence from all stages of the project to reach conclusions and suggest developments. The evaluation must contain a systematic and accurate review of their own skills, performance and behaviours and the impact that this had on the development of the final website. Learners will take individual responsibility for their own work, for example identifying potential issues and resolving them, reviewing their work and making improvements, keeping their work safe and secure, and showing responsible use of quoted materials. Creativity will be shown, for example, by taking innovative approaches to problem solving and through the originality of their solution.</p>	
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Use of tools and techniques and their suitability for different client requirements.

- HTML, HTML5 and subsequent updates.
- Tables.
- Forms, text field, text area, buttons, radio buttons, check boxes.
- Navigation, menus, hyperlinks (internal and external), anchors.
- Interactive components, e.g. hot spots, pop-ups, buttons, menus, rollover images.
- Colour schemes, styles and templates.
- CSS, e.g. background colour, background images, text formatting, borders, padding, heading styles, element position.
- Embedded multimedia/digital asset content, e.g. digital animation, digital graphics, digital audio, digital video.
- Accessibility features, e.g. alternative tags, zoom features, text-to-speech.
- The World Wide Web Consortium (W3C®) standards for accessibility and HTML compliance.
- Platform compatibility, e.g. browser, operating system, mobile devices.
- Exporting and compressing of digital assets into suitable file types.

Learning aim C: Develop a website to meet client requirements

C1 Client-side scripting languages

- Embedding of original client-side scripts into web pages to provide more interactivity and improve the usability of the website.
- Types of web-scripting languages, e.g. JavaScript®, VBScript®.

For **merit** standard, learners will apply their knowledge through selection and application of appropriate methodologies to design, develop, maintain and test an effective, optimised website to meet client requirements. Learners will produce comprehensive designs, including alternative solutions. When developing their website, learners will produce an optimal solution to meet client requirements as closely as possible. Learners will also gather and analyse feedback on their website in order to make improvements. Learners will record the changes that are made and produce subsequent versions of the website as appropriate. Learners will give a clear analysis of the success of their solution, giving accurate and reasoned suggestions as to how the solution could be improved, they will discuss alternative solutions that could be implemented if the task were to be repeated. They will consider how decisions they made during the project affected the outcomes and justify why these decisions were made. They will give an evaluation of how their skills and behaviours affected the outcomes of the website.

For **pass** standard, learners will apply understanding through the planning and development of the website to meet client requirements. Learners will produce detailed designs for their website, including user

- Uses of scripting languages, e.g. alerts, confirming choices, browser detection, creating rollovers, checking/validating input, handling forms.
- Constructs, e.g. syntax, loops, decision making, functions, parameter passing, handling events, methods.

C2 Website development

Creation of interactive websites, including:

- use of CSS, e.g. HTML tags, CSS frameworks, box model, access CSS from HTML, doc types
- use of original client-side scripting
- compatibility with mobile and tablet devices
- effective use of tools and techniques
- the uploading of files to a web server or host computer/device.

C3 Website review

Reviewing interactive websites:

- quality in comparison with other similar websites
- suitability for intended purpose and audience
- suitability against the client's requirements, including optimisation
- legal and ethical constraints
- strengths and improvements.

C4 Website optimisation

Optimising an interactive website, including:

- performance and user testing
- obtaining and evaluating feedback from others
- checking interactivity
- checking compatibility

requirements, visual designs and technical documentation. Learners will carry out and document a number of tests and reviews of the website (including use of test users and appropriate test plans, schedules and test data) to ensure that the solution works and meets the identified criteria. They will give evidence that different types of testing have been carried out and that important problems and errors identified have been responded to. Learners' websites will be functional and meet the identified requirements but there may be some performance issues and/or the implemented solution may not be as efficient or effective as it could be. Learners will review how the decisions they made during planning and development affected the website. Learners will explain the extent to which the website meets the initial project brief. They will consider both positive and negative aspects of the website, although their review may be unbalanced and/or superficial. They will make reference to the possible alternative solutions that could be implemented.

- refinements and making improvements to meet client needs to optimise the website.

C5 Skills, knowledge and behaviours

- Planning and recording, including the setting of relevant targets with timescales, how and when feedback from others will be gathered.
- Reviewing and responding to outcomes, including the use of feedback from others, e.g. IT professionals and users who can provide feedback on the quality of the website and their suitability against the original requirements.
- Demonstrate own behaviours and their impact on outcomes to include professionalism, etiquette, supporting others, timely and appropriate leadership, accountability and individual responsibility.
- Evaluating outcomes to help inform high-quality, justified recommendations and decisions.

Unit 9: IT Project Management

Learning aim A: Investigate the principles and methodologies of IT project management as used in industry.

A1 Project definitions

Typical IT projects include: software application development, installing IT systems and networks, and information collection and analysis. Understand that:

- a project has a defined beginning and end point in time, and a defined scope of work to be

Learning aims

In this unit you will:

A Investigate the principles and methodologies of IT project management as used in industry

B Carry out a project initiation for an IT project

A1 Project definitions

A2 Characteristics of project management methodologies

A3 Project management structures

<p>completed for a given objective and/or benefit</p> <ul style="list-style-type: none"> project management is the art of planning, organising and controlling project activities so that the project is completed successfully within the budget, time and quality constraints, and that problems are resolved to an appropriate standard and appropriate risks are mitigated project life cycle has the following five main stages and the structure in which these are implemented will vary depending on which project management methodology is being applied. <ol style="list-style-type: none"> 1. Initiating: the first stage of a project that outlines the justification and requirements. 2. Planning: provide details about how the project work will be carried out, how it will be monitored and controlled. 3. Executing: the human and machine resource required to undertake tasks within the constraints of time, cost and quality. 4. Monitoring and controlling: to monitor and control the project in accordance with the initiation and planning documents. 5. Closing: once the project is complete, it can be formally closed down and a review held to learn from both the successes and the mistakes made during the project. <p>A2 Characteristics of project management methodologies Understand that the characteristics of different project management methodologies make them suitable for delivering certain types of project. Projects IN Controlled Environments (PRINCE2®)</p>	<p>C Carry out the planning, execution, monitoring and controlling of an IT project, using an appropriate methodology</p> <p>D Undertake the closure of a project by reflecting on the success of personal performance and the project outcome</p> <p>Learning aim A For distinction standard, learners will evaluate three different projects delivered using different project management methodologies as covered in the unit content. The evaluation will cover a comprehensive range of benefits and limitations of using a methodology based on the context. Learners will evaluate the structures used in the delivery of the project and how they play an important role in the management of the project, given the context. A supported judgement will be given that leads to a conclusion. For example, an Agile methodology may be chosen for a complex management tool for the banking industry because it is more flexible to use in a dynamic sector with unclear user requirements, and it offers shorter iterations of development and planning. Overall, the evidence, such as a report, will be easy to read and understand by a third party. It will be logically structured, use appropriate technical language (including definitions) throughout</p>	<p>B1 Project idea generation and solution creation B2 Feasibility study B3 Project requirements C1 Project phasing C2 Typical project management processes D1 Lessons learned from implementing an IT project</p>
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<ul style="list-style-type: none"> • The methodology is suitable for the vast majority of projects, regardless of industry or market, size or complexity. • Understand what is involved at each stage of the PRINCE2 methodology, including: <ul style="list-style-type: none"> o starting up a project (SU), e.g. forming the project board, appointing project manager and team, preparing project brief, defining the approach, outlining business case, learning from previous experience and preparing the next stage o initiating a project (IP), e.g. planning, refining the business cases, risk planning, project controls, project files, project initiation documentation o directing a project (DP), e.g. authorisation of initiation, authorisation of project, authorisation of a stage, ad hoc direction, closing project o controlling a stage (CS), e.g. work packages, assessing progress, capturing and examining issues, managing and controlling risk, reviewing stages, escalating issues, reporting, delivering packages o managing product delivery (MP), e.g. accept, execute and deliver work packages o managing a stage boundary (SB), e.g. planning and updating a stage and the project board, updating business case, updating registers, exception plans o closing a project (CP), e.g. decommissioning a project, benefits and project end reviews. • Benefits, including scalability, project size, training requirements, qualified personnel. 	<p>and use a high standard of written language, i.e. consistent use of correct grammar and spelling, and consistent reference of information sources.</p> <p>For merit standard, learners will compare at least three different project management methodologies used to deliver projects. The comparison will cover the benefits and limitations of each, and give reasons why they might be used during the management of a project. For example, PRINCE2 is a structured project management methodology that focuses on product outputs resulting from the project. In Agile, the focus is also on product outputs following a short sprint or iteration that, unlike PRINCE2, provides greater opportunities to assess the direction of a project throughout the development life cycle. Learners will compare the different structures used in the IT projects. Overall, the evidence will be logically structured, technically accurate (including definitions) and easy to understand.</p> <p>For pass standard, learners will explain the characteristics of and structures used in three IT projects delivered using different project management methodologies. For example, they will explain that Agile is a software development methodology where, in its initial stages, the users, business</p>	
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<ul style="list-style-type: none"> • Limitations, including cost of training and qualification, absence of people or contact management. Rapid application development (RAD) • The methodology is ideally suited for short-term, large-scale enterprise applications that require high budget resources. • Understand what is involved in each phase of the methodology, including: <ul style="list-style-type: none"> o requirements planning, e.g. discussing and agreeing business needs, defining the project's scope, identifying constraints, identifying requirements, agreement between users, managers and IT staff on key issues and obtaining management authorisation. o user design, e.g. user analysis, systems analysis, developing models and prototypes, showing all processes, inputs and outputs, computer-aided software engineering <p>(CASE) tools:</p> <ul style="list-style-type: none"> – business and analysis modelling, e.g. entity relationships modelling – development, design and construction, e.g. GNU Debugger – verification and validation, e.g. code analysis – configuration management, e.g. content management system (CMS) – metrics and measurement, e.g. complexity analysis, Big O – project management, e.g. Gantt, schedules o construction phase, e.g. programming and application development, unit integration, system testing and cutover, e.g. data conversion, testing, migration from old system, user training. <ul style="list-style-type: none"> • Benefits, to include quality, risk control, time and budget. 	<p>managers and IT staff discuss requirements of the project before development. They will describe the requirements of the project and document the outcome. The product should be designed and developed in a continuous phase. Overall, the evidence will be well structured, with some use of appropriate technical language (including definitions), although there may be some inaccuracies with terms used. Some parts of the evidence may be considered in greater depth than others.</p> <p>Learning aims B and C</p> <p>For distinction standard, learners will include at least two possible IT solutions to the given theme or an initial idea in their evidence. The comprehensive research evidence and feasibility study will provide at least two realistic alternative solutions to an IT problem. The evidence will be at a consistent breadth and depth. It will identify and evaluate the project risks and constraints and suggest viable methods of controlling the risks. For example, for a simulated IT project, learners might identify the lack of skilled resource in the development team as a risk and might identify the need to recruit an experienced developer to lead the development. They would also recognise that this initial cost would be offset if the project is successfully completed. A range of criteria will allow a</p>	
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<ul style="list-style-type: none"> • Limitations, to include scarce resources, less control, new approach, poor design, lack of scalability for large systems. <p>Waterfall</p> <ul style="list-style-type: none"> • The methodology is ideally suited for websites, database software or network software. • Understand what is involved in each phase of the methodology, including: <ul style="list-style-type: none"> o requirements, e.g. capturing product requirements and documenting them o analysis, e.g. generation of models, schema and business rules o design, e.g. User Interface (UI) designs, mock-ups, planning of the architecture o implementation, e.g. the development, unit testing and integration of the software o testing, e.g. discovery of issues and defects, fixes of uncovered issues o operation, e.g. installation, migration and delivery of software • Benefits, to include suitability for short-term static projects, simple to understand and outputs being visible at each stage. • Limitations, to include difficulty to explicitly define user requirements at the start of a project and small changes that can cause major delays and/or costs to the project. <p>Agile</p> <ul style="list-style-type: none"> • The methodology is ideally suited for medium- and long-term projects where user requirements can change and outputs are required at timed intervals. • Understand what is involved in each phase of the methodology, including: 	<p>good evaluation of the solutions and the justification of the preferred solution will be supported by logical chains of reasoning. Learners' preferred solution or a simulated project will be implemented over the project life cycle using an appropriate methodology. Learners will perform consistent and effective project management processes using an appropriate methodology. For example, for a simulated IT project, learners might produce an initial software requirements specification that outlines the functional and non-functional requirements of the project. Using the Agile methodology, they would then produce user stories that facilitate planning of time and resource required to complete the work. Overall, the evidence will be easy to read and understand by a third party. It will be logically structured and use technical terms with a high standard of written language, i.e. consistent use of correct grammar and spelling, and consistent reference of information sources.</p> <p>For merit standard, learners will cover at least two possible solutions to an IT problem in their research evidence. Each solution will be investigated consistently (to a similar breadth and depth) and most of them will be realistic. High-level evidence will be given, scoping out each alternative solution to the IT problem. Learners will undertake a</p>	
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<p>o iteration 1 phase – where potential projects are analysed before being selected for development, funding provided, and roadmaps produced for technology and the business</p> <p>o iteration 0 phase – where the initial modelling, planning and organisation takes place, e.g. prototypes of the products are created and initial requirements and a release plan are defined</p> <p>o construction iterations phase – a series of time-constrained iterations consisting of prioritised work items in a ‘sprint’ where a product is produced, daily meetings to discuss team progress and end of iteration reviews to demo to stakeholders</p> <p>o transition and release phase – where the product is released into production as a working system</p> <p>o production phase – where the product is delivered to the customer, including the phases of support and maintenance</p> <p>o retirement phase – where the product is removed from development.</p> <ul style="list-style-type: none"> • Benefits, to include flexibility in constantly changing applications, clear visible outputs during each iteration of development and appropriate planning of resources ensures first to the market and continual releases. • Limitations, to include teamwork from all stakeholders required to ensure the process is successful, full commitment and effort is required in projects and the need for experienced 	<p>feasibility study on the potential solutions and will assess each of them in turn. The study will be supported by research evidence of consistent breadth and depth across the two solutions. The risks and constraints associated with each solution will have been given. Enough criteria will have been used in the assessment to make an informed recommendation for the preferred solution. For example, as part of a simulated IT project, learners might suggest that part of the project is outsourced to lower initial costs and satisfy the constraints of an inexperienced development team. Learners’ preferred solution or a simulated project will be implemented over the project life cycle using an appropriate methodology. Learners will perform soundly appropriate project management processes. For example, if following the waterfall methodology as part of a simulated project, learners would produce development tasks based on the functional and non-functional requirements that facilitate time and resource planning. Overall, the evidence will be logically structured, technically accurate and easy to understand. However, learners may not fully appreciate the number of iterations required to scope out two different solutions.</p> <p>For pass standard, learners will research at least two potential solutions to an IT problem on a given theme. The research will</p>	
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development teams to make decisions during the project.

A3 Project management structures

- User requirements, including:
 - o a 'functional requirement' of the system, including the definition of inputs, the process and the outputs, e.g. a calculation, data manipulation process, what it is required to accomplish
 - o a 'non-functional requirement' to satisfy in the system, including quality attributes of the system, e.g. performance or maintainability of a system.
- Project job roles and responsibilities:
 - o project manager, including developing project plans, managing the stakeholders, managing communication across the team, managing individuals, risks, schedules, budgets, conflicts and delivery
 - o systems architect, including design and implementation of hardware and infrastructure, providing definitions of hardware and how it meets the requirements of the system
 - o electronics engineer, including designing electronic components, circuits and systems, providing interfaces for software implementation and development of firmware
 - o product owner, including role as key stakeholder, identifying priority requirements, work items, release dates, has a vision for the product to be built
 - o lead developer, including responsibility for underlying architecture, serving as mediatory between management and the development team body, acting as a

be patchy in some areas, it may not support all the solutions given and at least one solution may not be realistic. The evidence will scope out the solutions and may include benefits, diagrams, storyboards, flow charts and other technical information. The feasibility study will assess each of the alternative solutions in turn and cover the associated risks and constraints. The study will be supported by the research, although the depth and breadth of evidence will be inconsistent across the two solutions and the study will not contain enough criteria to make an informed decision on which solution to develop. A preferred solution will be selected. For example, as part of a simulated IT project, learners may have mistakenly suggested a project is feasible based on the amount of potential profit from the project, ignoring the lack of experience and resources available. Learners will implement either their preferred solution or a simulated IT project through the life cycle stages of planning, executing, monitoring, controlling and using an appropriate methodology. They will deliver the project management processes such as planning, risk and issue management, and monitoring and controlling quality. They should suggest solutions to any problems that occur during the project. Although there will be evidence of a range of project management processes being used, there

<p>mentor to more junior developers</p> <ul style="list-style-type: none"> o developer, including writing software code, applying developer written unit tests o quality assurance (QA) test lead, including responsibility for test plans and test suites, delegating work to testers and acting as a mentor to more junior testers o QA tester, including testing functional and non-functional requirement testing against the product, carrying out more general testing o IT support technician, including logging and resolving user issues/faults and the operation of the IT services to meet the user's and organisation's needs, e.g. the operation of hardware and software and security systems o user, including using the product during deployment, producing requirements based on usability and testing, feeding back to stakeholders such as project managers and product owners. <ul style="list-style-type: none"> • QA, including key and continuous process during the development life cycle, ensuring product meets quality standards defined by the product owner and customer. • Operational test environment – a pre-release environment close in performance and architecture to live or a deployment environment. • Live deployment – the operational deployment environment for the final product to be released to. <p>Learning aim B: Carry out a project initiation for an IT project</p> <p>B1 Project idea generation and solution creation</p>	<p>will be some inconsistencies and/or omissions in their use. For example, as part of a simulated IT project, learners' project plan may not be updated at appropriate times during the project and so was not used to monitor and control timely implementation of the project. Overall, the evidence will be well structured, with some use of appropriate technical language, although there may be some inaccuracies with terms used. Some parts of the evidence may be considered in greater depth than others.</p> <p>Learning aim D</p> <p>For distinction standard, learners will demonstrate effective project management skills and relevant behaviours throughout the project initiation and implementation (planning, execution and monitoring and control). For example, all work will be completed on time, the practical activities will be planned out in advance and problems encountered will be solved. Also, the lessons learned evidence will demonstrate a consistently good technical understanding and analysis of the project, and examples of where improvements could be made will be given. Overall, the evidence will include a balanced view about the actions taken and project management processes applied. The report will be easy to read and understand</p>	
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<p>Identification of a suitable problem, perhaps based on a given theme, and creation of alternative solutions, including:</p> <ul style="list-style-type: none"> • researching a given project theme or initial idea and identifying problems to be solved, using tools, e.g. the internet, journals, databases, libraries, publicly available company information • creativity tools to solve problems, e.g. rewording problems, challenging assumptions, thinking in reverse, mind mapping, drawing a diagram, group discussion, brainstorming and Edward De Bono's Six Thinking Hats® • a specification that scopes out the alternative technical solutions, including: <ul style="list-style-type: none"> o graphic solutions, e.g. sketches, diagrams, photographs and storyboards o an outline of the required processes, e.g. information, systems, assemblies, high-level flow chart o an outline of costings, e.g. spreadsheet, material cost, budgets o initial technical information, e.g. outline performance parameters. <p>B2 Feasibility study</p> <p>A study into the feasibility of the project, identifying the resources and skills required to produce the IT product, service or system, and ensure it is economically viable. Criteria that could be used in an assessment include:</p> <ul style="list-style-type: none"> • technical assessment, including assessing and evaluating the technical resources available • economic assessment, including assessing the cost, benefits and viability of the project 	<p>by a third party and the correct and consistent use of technical IT language will be evident.</p> <p>For merit standard, learners will give examples in their evidence of where improvements could be made to the application of:</p> <ul style="list-style-type: none"> • project management skills, e.g. that additional progress reviews were required to monitor and control progress against time • relevant behaviours, e.g. that problems needed to be better anticipated to prevent them from impacting on the project outcome. Overall, the suggested improvements should be reasonable and practical and technical terminology used accurately. <p>For pass standard, learners will produce evidence, such as a lessons learned report of around 300 words in length, which will explain:</p> <ul style="list-style-type: none"> • what project management skills were applied, such as using techniques and documentation to manage the project • how behaviours were used, such as time management and planning to ensure the activity was completed within the appropriate time. Overall, the evidence will be well structured, with some use of appropriate technical language, although there may be some inaccuracies with terms used. Some parts of the evidence may be considered in greater depth than others. 	
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- legal assessment, including assessing the current and relevant legal requirements, e.g.
the data protection legislation, health and safety at work legislation or other relevant international equivalents
- operational assessment, including the assessment of how well the proposed solution meets
the requirements and solves the problems of the project
- scheduling assessment, including the assessment of the likelihood of the project being a
success, estimating the time required to complete the project
- sustainability assessment depending on the product or service proposed,
e.g. environmental impact, waste material, power usage, choice of material,
recycling and reuse
- security assessment, e.g. analysis of secure servers, software source control,
'penetration' testing
- usability assessment, e.g. the appropriate design of user interfaces
ensuring smooth and
consistent integration with any required systems.

B3 Project requirements

Documentation to outline the project requirements, including:

- introduction to the project, e.g. purpose of the document,
definitions, project overview
and references
- overall description, e.g. project perspective, functions and
characteristics of the software
- requirements specification, e.g. designs, interfaces, functionality,
design constraints, time,
budget and scope constraints

- success criteria of the project, how the project could be tested and what the overall goals of the project are.

Learning aim C: Carry out the planning, execution, monitoring and controlling of an IT project, using an appropriate methodology

C1 Project phasing

- The division of larger user requirements into more specific functional and non-functional requirements, generation of requirements specification documentation and acceptance of the documentation by the key stakeholders and the client.
- Understand that implementation covers the planning, execution, monitoring and controlling stages of the project life cycle.

C2 Typical project management processes

Typical project management processes, including:

- the development of risks and issues and tasks for development
- prioritising work according to an ongoing plan and project charts
- analysis and management of barriers or constraints that arise during the development of the project
- regular meetings during implementation and with the customer to monitor progress
- ensuring the project is within budget and has appropriate resources.

Planning and monitoring project-management processes

Tools to plan and monitor a project:

- resource plan, e.g. the internet, humans, peers, books and equipment
- time plan, to include a Gantt chart and critical path analysis to set priorities for different activities
- project contingency, e.g. an amount of time or additional budget that is included in the

<p>plan to manage unforeseen events</p> <ul style="list-style-type: none"> • project constraints, including time, budget, scope, sustainability, ethical and legal • monitoring and control of the project at appropriate intervals, including logbook of problems and solutions, support, activities and communications, and progress against the plan and milestones. <p>Risk and issue processes</p> <ul style="list-style-type: none"> • The purpose of risk and issue management: <ul style="list-style-type: none"> o avoiding 'crisis management' o improving the probability of success and increasing competitive advantage. • A risk is a future event that could adversely impact on the project processes or outcome, and an issue is a current event that is adversely or positively impacting on the project process(es) or outcome. • The risk or issue severity = probability of occurrence × expected impact on the project, e.g. on the customer's requirements, delivery to time and to budget. • Risks and issues should be assessed throughout the delivery of the project and medium, high and extreme severity risks and issues should be managed. • Management (monitoring and control) of risks and issues (mitigation), including: <ul style="list-style-type: none"> o identification and severity of risks and issues during the project o prevention to eliminate the threat of a risk occurring o reduction to reduce the likelihood of a risk occurring or to reduce the impact of a risk or issue o acceptance to do nothing about a risk or issue or transference to transfer the risk to a 		
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<p>third party, e.g. a cloud service provider.</p> <p>Execution and management processes for a project</p> <ul style="list-style-type: none"> • The execution phase requires the management of processes through the project to ensure success of the project and to manage the project's resources and to avoid chaos during the project. • Processes to manage throughout the execution phase, including: <ul style="list-style-type: none"> o time, e.g. a process for recording time against tasks, timesheets, updated project plans o cost, e.g. identify each cost in the project, expenses, keep a central record of costs o quality, e.g. set quality targets, define how to measure quality, report on the quality level o change, e.g. requests for change, evaluate the feasibility, manage the approval of change o risks and issues e.g. slippage of time or quality of work o acceptance, e.g. facilitate testing, document the results, request acceptance and approval. <p>Learning aim D: Undertake the closure of a project by reflecting on the success of personal performance and the project outcome</p> <p>D1 Lessons learned from implementing an IT project</p> <ul style="list-style-type: none"> • Scope of the lessons learned should cover: <ul style="list-style-type: none"> o project management skills, e.g. proper use of project management processes, o understanding of particular roles and use of management documentation for analysis o and progress management 		
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o behaviours applied during the project, e.g. time planning, communication and problem-solving skills.

- Understand relevant behaviours for project management, including:
 - o time planning and management to complete all the different activities in an appropriate time and sequence, how and when feedback from others will be gathered
 - o communication and literacy skills to follow and implement instructions appropriately, interpret documentation and communicate effectively with others, including the use of feedback from others in writing and orally
 - o problem-solving skills, e.g. logical thinking, investigating the source of the problem, breaking down problem into manageable chunks, and identifying one or more solution(s) to a problem
 - o other behaviours and their impact on the project outcome, to include professionalism, etiquette, leadership, and taking responsibility for one's actions.

Unit 9 Cyber Security and Incident Management

Cyber security threats, system vulnerabilities and security protection Methods

A1 Cyber security threats

All systems are vulnerable to attack from external and internal threats.

- Understand how internal threats occur, including:

Assessment outcomes

AO1 Demonstrate knowledge and understanding of technical language, security threats, system vulnerabilities and security protection methods, and implications resulting from successful threats

A1 Cyber security threats

A2 System vulnerabilities

A3 Legal responsibilities

A4 Physical security measures

A5 Software and hardware security measures

B1 Network types

B2 Network components

<ul style="list-style-type: none"> o employee sabotage and theft, including of physical equipment or data, and damage such as fire, flood, power loss, terrorism or other disaster o unauthorised access by employees and other users to secure areas and administration functions, including security levels and protocols o weak cyber security measures and unsafe practices, including security of computer equipment and storage devices, security vetting of visitors, visiting untrustworthy websites o accidental loss or disclosure of data, including poor staff training and monitoring. • Understand how external threats function, including: <ul style="list-style-type: none"> o malicious software (malware), including spyware, adware, ransomware; viruses, including worms, rootkits and trojans o hacking, including commercial, government, individuals o sabotage, including commercial, government, terrorism, individuals o social-engineering techniques used to obtain secure information by deception. • Understand that the impact of a credible threat is likely to result in some form of loss, such as: <ul style="list-style-type: none"> o operational loss, including manufacturing output, service availability and service data o financial loss, including organisational, compensation and legal liability o reputation loss, including lack of service and employee or customer information o intellectual property loss, including new product design or trade secret. 	<p>AO2 Apply knowledge and understanding of security threats, system vulnerabilities and security protection methods and implications in order to risk assess systems and select appropriate tools to secure them</p> <p>AO3 Analyse forensic evidence data and information to identify security breaches and manage security incidents</p> <p>AO4 Evaluate protection methods and security documentation to make reasoned judgements and draw conclusions about their efficacy</p> <p>AO5 Be able to plan a secure computer network and manage security incidents with appropriate justification</p> <p>Level 3 Pass Learners are able to apply their knowledge and understanding of cyber security in unfamiliar scenarios in order to identify common risks and use familiar security protection measures to improve the security of an existing networked system. They can give adequate justification for some aspects of their design. Learners can design tests for basic security procedures. Learners are able to analyse straightforward forensic evidence related to security incidents to produce plausible conclusions. They are able to identify common security weaknesses in a given scenario and suggest</p>	<p>B3 Networking infrastructure services and resources</p> <p>C1 Assessment of computer system vulnerabilities</p> <p>C2 Assessment of the risk severity for each threat</p> <p>C3 A cyber security plan for a system</p> <p>D1 Internal policies</p> <p>D2 External service providers</p> <p>E1 Forensic collection of evidence</p> <p>E2 Systematic forensic analysis of a suspect system</p>
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<ul style="list-style-type: none"> • Understand that the impact level of a successful attack on an organisation is determined by the value of the loss, and that the value may not always be a monetary one. • Know that cyber security threats vary over time and cyber security organisations provide regular updates on the current and changing threat landscape. <p>A2 System vulnerabilities</p> <ul style="list-style-type: none"> • Understand that different types of computer and/or system are exposed to different threats and that they contain different vulnerabilities. Possible vulnerabilities include: <ul style="list-style-type: none"> o network, including firewall ports and external storage devices o organisational, including file permissions or privileges, password policy o software, including from an untrustworthy source, downloaded software, illegal copies, SQL injection and new zero-day exploits o operating system, including unsupported versions, updates not installed o mobile devices reliant on Original Equipment Manufacturers (OEMs) to update system software o physical, including theft of equipment, Universal Serial Bus (USB) storage devices with sensitive data, collection of passwords and other information by social-engineering methods o process of how people use the system, including leaks and sharing security details o security implications of cloud computing and of the Internet of Things (IoT) devices. 	<p>improvements. Learners will use some appropriate technical language to communicate their ideas.</p> <p>Level 3 Distinction Learners are able to apply knowledge and understanding of cyber security in unfamiliar scenarios in order to identify common and uncommon risks and use a range of security protection measures to comprehensively secure an existing networked system. They can give a valid and supported justification for their design. Learners can design tests for a range of security procedures. Learners are able to analyse more complex forensic evidence related to security incidents to produce coherent and convincing conclusions together with alternative possibilities. They are able to identify a range of security weaknesses in a given scenario and make valid, realistic and justified suggestions for improvement</p>	
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- Understand where to find up-to-date sources of information on specific known hardware and software vulnerabilities.
- Attack vectors, including: Wi-Fi, Bluetooth®, internet connection, internal network access.

A3 Legal responsibilities

Understand how the current and relevant United Kingdom legislation or other international equivalents apply to different systems, including:

- data protection legislation, requirements for organisations to keep data secure
- computer misuse legislation, its definitions of illegal practices and applications
- telecommunications regulations (lawful business practice, interception of communications), requirements to allow companies to monitor an employee's communication and internet use while at work
- fraud legislation, requirements to deal with services using IT-based methods to steal information for fraudulent purposes
- health and safety at work legislation – duties of employers, employees, the Health and Safety Executive (HSE) and others, general prohibitions.

A4 Physical security measures

Understand the use and effectiveness of physical security measures, including:

- site security locks, card entry, biometrics, closed-circuit television (CCTV), security staff, alarms, protected cabling and cabinets
- data storage, data protection and backup procedures, including planned automated

backup, on- and off-site data storage and cloud storage.

A5 Software and hardware security measures

- Understand the use and effectiveness of software and hardware security measures, including:
 - o antivirus software and detection techniques, including virus signatures, heuristics techniques used to identify potentially suspicious file content, techniques for dealing with identified threats
 - o software and hardware firewalls and the filtering techniques they use, including:
 - packet filtering and inspection
 - application layer awareness
 - inbound and outbound rules
 - network address
 - o user authentication:
 - user login procedures
 - strong password
 - text and graphical password
 - biometric authentication
 - two-step verification
 - security tokens, including USB-based and near field keys
 - knowledge-based authentication, including question and response pairs
 - Kerberos network authentication for Windows® and Linux®-based operating systems
 - certificate-based authentication
 - o access controls and the methods to restrict users' access to resources, including applications, folders, files and physical resources
 - o trusted computing.
- Understand the purpose and uses of encryption, including:

<ul style="list-style-type: none"> o safe password storage o digital rights management (DRM) o file, folder, disc encryption o communications encryption: <ul style="list-style-type: none"> – built into devices, including smartphones and tablets – The Onion Router (Tor) – virtual private networks (VPNs) – digital certificates and certificate authorities – Hypertext Transfer Protocol Secure (HTTPS) – public/private keys. • Precautions that can be taken to protect a wireless local area network (WLAN) from unauthorised access, including: <ul style="list-style-type: none"> o MAC address filtering and hiding the service set identifier (SSID) o wireless encryption – Wired Equivalent Privacy (WEP), Wi-Fi Protected Access 2 (WPA2) and Wi-Fi Protected Setup (WPS), mitigating known wireless vulnerabilities o consideration of security issues during network and system design to ensure security is built-in from the development stage. <p>B Use of networking architectures and principles for security Understand the security implications of different networked systems, including how to secure them in organisational contexts.</p> <p>B1 Network types</p> <ul style="list-style-type: none"> • Applications and features of networks: <ul style="list-style-type: none"> o local area network (LAN), WLAN, wide area network (WAN), storage area network (SAN), personal area network (PAN) o intranet, extranet, internet, cloud o wired and wireless integration. 		
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- Applications and features of network topologies:
 - o physical topologies, including star, extended star, hierarchical, wireless mesh, ad-hoc (mix of wired and wireless for bring your own device (BYOD))
 - o logical topologies, including Ethernet standards for wired and wireless (802 family).
 - Applications and features of network architecture:
 - o peer to peer
 - o client/server
 - o thin client.
 - Modern trends, including applications and features of: virtualisation, cloud computing, BYOD, software-defined networking (SDN), storage-defined networks and the IoT.
 - Be able to interpret and amend network schematic diagrams using suitable software.
- B2 Network components**
- Application and features of hardware components, including:
 - o end-user devices, including mobile
 - o connectivity devices, including switches, routers, access points, multi-functional devices, USB hubs and modems
 - o connection media, including cable, wireless (Wi-Fi, Bluetooth, and infrared (IR)), fibre and Li-Fi.
 - Applications and features of external media and storage, including flash drives and optical media.
 - Applications and features of software components, including:
 - o network and device operating systems
 - o network monitoring, management and troubleshooting tools, including performance

<p>monitor, events and logs viewer, vulnerability scanners and packet sniffers</p> <ul style="list-style-type: none"> o network applications, including database, document management and network discovery tools. <p>B3 Networking infrastructure services and resources</p> <ul style="list-style-type: none"> • Understand the application and function of: <ul style="list-style-type: none"> o Transmission Control Protocol/Internet Protocol (TCP/IP) o ports o packets o network address translation (NAT), including the structure of IPv4 and IPv6 addressing and RFC 1918 private addresses. • Understand the application of network operating systems, including domains and sub-domains. • Understand the application of network devices to configure networks, including network segmentation. • Understand the function and application of network infrastructure services, including: <ul style="list-style-type: none"> o domain name system (DNS) o directory services (DS), including active directory, open directory, OpenLDAP o authentication services o Dynamic Host Configuration Protocol (DHCP) o routing o remote access services. • Understand the function and application network services and resources: <ul style="list-style-type: none"> o file and print services o web, mail and communications services. <p>C Cyber security protection plan</p>		
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Understand that as threats and system vulnerabilities are constant and ever changing, a culture of continuous improvement is needed to protect organisations and individuals from the impact of loss.

C1 Assessment of computer system vulnerabilities

Understand that:

- the types and uses of tools and methods to assess the vulnerabilities in computer systems, including port scanners, registry checker, website vulnerability scanners, vulnerability detection and management software, and assessing user vulnerabilities
- the purpose of independent third-party review of a system and network designs before implementation
- the applications and features of penetration testing for common threats, those in the Open Web Application Security Project (OWASP) top 10.

C2 Assessment of the risk severity for each threat

- A risk is a threat that could result in some form of loss at some point in time.
- Risk severity = probability of the threat occurring × expected impact level/value of the loss.
- Measures for risk severity include:
 - o risk severity = low, medium, high and extreme
 - o probability of the threat occurring = unlikely (approximately every year), likely (approximately every week or month) and very likely (approximately once or more a day)
 - o impact level/value of the loss = minor, moderate and major.
- Be able to use the following risk severity matrix:

<p>Probability of threat occurring</p> <p>Very likely Medium High Extreme</p> <p>Likely Low Medium High</p> <p>Unlikely Low Low Medium</p> <p>Minor Moderate Major</p> <p>Impact level/value of the loss</p> <ul style="list-style-type: none"> • Risk assessment approach: <ul style="list-style-type: none"> o risk assessments are carried out during system design (review) and at regular intervals during operation (audit) and following a security breach, as threats are constant and ever changing o a risk assessment method: <ul style="list-style-type: none"> – identify possible threats and assess the probability of different threats occurring – assess the vulnerabilities of a computer-networked system to specific threats – assess the impact level/value of the potential loss – determine the risk severity (low, medium, high and extreme). <p>C3 A cyber security plan for a system</p> <p>A plan for a networked system, including:</p> <ul style="list-style-type: none"> • cyber security protection measures to be taken (actions) for the most severe (medium, high and extreme) risks with the largest impact level/loss value and that are most likely to occur, to include: <ul style="list-style-type: none"> o hardware protection measures, including firewalls, routers, wireless access points o software protection measures, including anti-malware, firewall, port scanning, access rights and information availability 		
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<p>o physical protection measures, including locks, CCTV, alarms, data storage and backups</p> <p>o alternative risk management measures, including risk transfer to a third party (commissioning a service provider), risk avoidance by stopping an activity and risk acceptance</p> <ul style="list-style-type: none"> • a justification about how each planned protection measure would protect the system from attack • an overview of any technical and financial constraints • an overview of legal responsibilities • an overview of usability of the system, including the degree to which security restrictions impact on the efficiency of the system in terms of the ease of completing tasks and the user experience • outline cost–benefit analysis of implementing the protection measures • test plan to check that the protection measures work as intended, including the test description, expected outcome, and possible further action following the test. <p>D Cyber security documentation</p> <p>Understand the governance policies and documents needed to establish and maintain security on an ongoing basis.</p> <p>D1 Internal policies</p> <p>General IT policies</p> <ul style="list-style-type: none"> • The purpose and content of general security-related IT policies and their effectiveness, including: 		
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<ul style="list-style-type: none"> o understanding the requirements to prepare a cyber security policy using the Plan-Do-Check-Act loop derived from part of the International Organization for Standardization (ISO) 27001:2013 o organisation policies and their application, including policies on internet and email use, security and password procedures, staff responsibilities, staff IT security training o security audits and their application to check compliance against policies o backup policy – selection of data, methods (full and incremental), frequency and storage o data protection policy – to ensure organisational compliance with the relevant legislation. Incident response policy • The purpose and content of an incident response policy and associated procedures: <ul style="list-style-type: none"> o assembling the Computer Security Incident Response Team (CSIRT), roles in the team, including team leader, incident lead, associate members o incident reporting procedures, including what constitutes a security incident, and how to report it and to whom o initial assessment of the incident, including identifying if this is a real incident, the type of attack and its severity o communicating the incident to the CSIRT and other relevant individuals o containing the damage and minimising the risk o protect people's safety: <ul style="list-style-type: none"> – protect sensitive data and other data, protecting the most valuable first 		
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<ul style="list-style-type: none"> – protect hardware and software – minimise disruption to computing resources o identifying the type and severity of the compromise, including the nature of the attack, its intent, its origin and the systems and files that have been compromised o protecting evidence and creating backups for evidence and data recovery, including the removal and storage of original hard disks o notifying external agencies, if appropriate, and discussing options with legal representatives, contact external agencies such as law enforcement, external security and virus experts o recovery of systems and identification of the point in time when the compromise occurred and restore backups from before that point in time o compile and organise incident documentation, including documentation created by the CSIRT identifying the details of the breach and actions taken o know the importance of preserving and collating documentation that may be needed to prosecute offenders o review outcomes to update policies and improve training. <p>Disaster recovery policy</p> <ul style="list-style-type: none"> • Understand the topics typically covered in a disaster recovery plan and their purpose: <ul style="list-style-type: none"> o identification of critical systems, definitions of recovery time objective (RTO) and recovery point objective (RPO) o prevention, response and recovery strategies for critical systems, including: 		
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<ul style="list-style-type: none"> – people responsible – facilities and equipment required – data backup location and format – network connectivity and bandwidth – suppliers of equipment and people o definition of recovery procedures for each critical system o disaster recovery plan structure following ISO 27031/24762 or other relevant international equivalents, including: <ul style="list-style-type: none"> – introduction – roles and responsibilities – incident response procedures – activating the disaster recovery plan – procedures to be followed. <p>D2 External service providers</p> <ul style="list-style-type: none"> • External service provider (ESP) agreements will include: <ul style="list-style-type: none"> o cloud o hardware o software. • Understand the implications of ESP agreements, including: <ul style="list-style-type: none"> o legal ownership and jurisdiction, including geographical location, data movement across borders, procedures when an agreement ends o security protection, including data security obligations, privacy, encryption, liability for data breaches, liability for data loss or damage (accidental or deliberate), disaster recovery procedures o dispute resolution, including statutory requirements, and problems encountered by <p>data and processing residing in multiple jurisdictions.</p> <ul style="list-style-type: none"> • Many or all of these points are covered by the data protection laws. 		
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E Forensic procedures**E1 Forensic collection of evidence**

Understand the forensic collection of evidence following a security incident and its purpose:

- desktop forensics:
 - o meeting requirements for desktop forensics, including:
 - confiscation of devices
 - taking an image of the system
 - using a forensic analysis tool
 - reviewing files and settings
 - reviewing system logs
 - reviewing user activity
 - malware analysis and alerts
 - o the challenges of live forensics:
 - changing data in situ
 - recovering corrupted data and preventing data corruption
 - capturing data in active memory
 - losing temporary files
- network forensics:
 - o agreeing a network-testing methodology with forensic supervisory and investigatory authority
 - o scanning of local infrastructure:
 - ensuring permission is granted
 - ensuring that testing protocol will not disrupt a live system
 - passive and active analysis tools
 - o reviewing and analysing firewalls, infrastructure devices, including switch, router, wireless access point, client or server logs
 - o analysing malware activity and alerts.

E2 Systematic forensic analysis of a suspect system

- Requirements for maintaining an accurate record, made at the time, or as soon after the

<p>incident as possible.</p> <ul style="list-style-type: none"> • Retaining snapshots of the system. • Requirements for the recording of all findings and considering how reliable the evidence is. • Requirements for the recording of any alterations that have been intentionally and unintentionally imposed by the investigator. • Requirements for the creation of visual evidence of findings. • Ensuring the evidence is relevant and not a false positive. • Evaluation of the findings to determine whether or not they: <ul style="list-style-type: none"> o provide evidence of a crime and/or an incident o show that the system has been externally and/or internally compromised o strongly support one possible cause more than other possible causes. • Make recommendations to prevent security incidents from reoccurring in the future, including improvement(s) to the: <ul style="list-style-type: none"> o content of cyber security documentation (policies and/or agreements) o adherence of cyber security documentation (policies and/or agreements) o security protection measures (physical, software and/or hardware). 		
<p>Careers Links: Students will look at roles such as designers and learn project planning tools that would support future jobs in Computing.</p>	<p>Enrichment: NA</p>	