

Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (5220-32)

May 2019 Version 6-1

Qualification Handbook

Qualification at a glance

Industry area	Digital
City & Guilds qualification number	5220-32
Age group	16-19 (Key Stage 5), 19+
Entry requirements	Centres must ensure that any pre-requisites stated in the <i>What is this qualification about?</i> section are met.
Assessment	<p>To gain this qualification, candidates must successfully achieve the following assessments:</p> <ul style="list-style-type: none"> • One externally set, externally moderated assignment • Two externally set, externally marked test, sat under examination conditions • Optional unit assessments as required
Additional requirements to gain this qualification	Employer involvement in the delivery and/or assessment of this qualification is essential for all candidates and will be externally quality assured.
Grading	<p>This qualification is graded.</p> <p>For more information on grading, please see Section 7: Grading.</p>
Approvals	This qualification requires full centre and qualification approval
Support materials	<p>Sample assessments</p> <p>Guidance for delivery</p> <p>Guidance on use of marking grids</p>
Registration and certification	Registration and certification of this qualification is through the Walled Garden, and is subject to end dates.
External quality assurance	This qualification is externally quality assured by City & Guilds, and its internally marked assignments are subject to external moderation. There is no direct claim status available for this qualification.

Title and level	Size (GLH)	TQT	City & Guilds qualification number	Ofqual accreditation number
Level 3 Advanced Technical Extended Diploma in Digital Technologies (720)	720	1200	5220-32	601/4511/0

Version and date	Change detail	Section
1.1 May 2016	Small typographical errors	Throughout
	TQT added for qualifications	1. Introduction
	Assessment component titles amended	
	Employer involvement guidance updated throughout	4. Employer involvement
	Summary of assessment methods and conditions	5. Assessment
	Moderation and standardisation of assessment updated throughout	6. Moderation and standardisation of assessment
	Awarding individual assessments	7. Grading
	Awarding grades and reporting results	
	Enquiries about results	8. Administration
	Re-sits and shelf-life of assessment results	
	Malpractice	
	Access arrangements and special consideration	
2.0 February 2017	Assessment components updated	5. Assessment
3.0 May 2017	External theory test and revised with updated coverage	5. Assessment
	Assessment Objectives 06 – 08 removed and weightings updated	
	Branding Changes	City and Guilds Logo
4.0 October 2017	Test specification coverage updated	5. Assessment
5.0 January 2018	Test specification coverage updated	5. Assessment
6.0 August 2018	Update to grading details	Section 7 Grading
6.1 May 2019	Wording changed regarding retakes	5. Assessment – Summary of assessment methods and conditions
		8. Administration – Re-sits and shelf-life of assessment results

Contents

1	Introduction	7
	What is this qualification about?	7
	Qualification structure	9
	Total qualification time (TQT)	15
	Assessment requirements and employer involvement	15
2	Centre requirements	21
	Approval	21
	Resource requirements	21
	Centre staffing	21
	Physical resources	21
	Internal Quality Assurance	21
	Learner entry requirements	21
	Age restrictions	21
3	Delivering technical qualifications	22
	Initial assessment and induction	22
	Employer involvement	22
	Support materials	22
4	Employer involvement	23
5	Assessment	26
	Summary of assessment methods and conditions	26
	What is synoptic assessment?	27
	How the assignment is synoptic for this qualification	27
	External exams for stretch, challenge and integration	27
	Optional unit assessments and integration into the synoptic qualification content	28
	Assessment objectives	29
	Exam specification	30
	Exam specifications	31
6	Moderation and standardisation of assessment	38
	Supervision and authentication of internally assessed work	38
	Internal standardisation	38
	Provision for reworking evidence after submission for marking by the tutor	38
	Internal appeal	39
	Moderation	39
	Post-moderation procedures	39
	Centres retaining evidence	40
7	Grading	41
	Grade descriptors	41
	Awarding grades and reporting results	42
8	Administration	44

Unit 301	Project management	47
Unit 302	Information security	52
Unit 303	Networking fundamentals	58
Unit 304	Digital business communication	64
Unit 305	Software development fundamentals	72
Unit 306	Collection and analysis of data	80
Unit 307	Enterprise technologies	87
Unit 310	Application development	91
Unit 311	Code an application using an object oriented programming language	99
Unit 312	Code an application using event driven programming language	104
Unit 313	Code an application using procedural programming language	109
Unit 314	Games development fundamentals	114
Unit 315	3D Computer modelling	118
Unit 316	Computer animation	126
Unit 317	Creative interactive media	133
Unit 318	Mobile application development	142
Unit 319	Human computer interaction and the user experience	149
Unit 320	Information systems development	155
Unit 321	Cloud technologies	161
Unit 322	Create a computer network	166
Unit 323	Manage networks	171
Unit 324	Provide technical support	177
Unit 325	Infrastructure management	184
Unit 330	Set up e-commerce websites	191
Unit 331	Social media	199
Unit 332	Digital media	206
Unit 333	Digital advertising	215
Unit 334	Manage e-commerce websites	223
Unit 335	Database systems for e-commerce websites	230
Unit 336	Threats and vulnerabilities	236
Unit 337	Information availability	245
Unit 338	Governance and risk management	253
Unit 339	Ethical hacking	260
Unit 340	Data encryption	267

Unit 341	Access control	272
Unit 342	Designing and planning communication networks	279
Unit 343	Troubleshooting telecommunications networks	284
Unit 344	Fibre optic cabling	288
Unit 345	PSTN & Data Networks	291
Unit 346	Telecommunication Fundamentals	294
Unit 347	Wireless Technologies	299
Unit 348	Systems Analysis	303
Unit 349	Financial Modelling	309
Unit 350	Business Continuity	316
Unit 351	Data Driven Solutions	324
Unit 352	Change Management	331
Unit 353	Databases	338
Appendix 1	Sources of general information	342

1 Introduction

What is this qualification about?

The following purpose is for the **Level 3 Advanced Technical Extended Diploma in Digital Technologies**.

Area	Description
OVERVIEW	
Who is this qualification for?	This qualification is for you if you are 16 or over and want to experience practical application and development of skills to work with digital technology in specific areas. It will provide you with a step on to the Digital Industries Apprenticeships and/or a computing degree programme.
What does this qualification cover?	<p>The Level 3 Advanced Technical Extended Diploma in Digital Technologies will provide you with the knowledge and skills within a wide range of topics in each specific area, in the pathways below, to allow you to gain a greater depth of competence and follow one of the specific industry roles under these 6 pathways:</p> <ul style="list-style-type: none">• system infrastructure• application development• Web design and social media for e-commerce• cyber security• business analysis• telecoms and cabling. <p>Centres and providers will work with local employers who will contribute to the knowledge and delivery of training. Employers will provide demonstrations and talks on the industry and where possible work placements will also be provided by the employers. This practically based training is ideal preparation for gaining employment in the digital industry or specialist further study.</p>
WHAT COULD THIS QUALIFICATION LEAD TO?	
Will the qualification lead to employment, and if so, in which job role and at what level?	<p>The qualification can provide you with an opportunity to progress into one of the following roles:</p> <ul style="list-style-type: none">• trainee systems/network engineer• trainee application developer• trainee web developer/social media co-ordinator• trainee cyber security co-ordinator• trainee business analyst• trainee telecoms/communication engineer.

Why choose this qualification over similar qualifications?	<p>This qualification is for you if are hoping to specialise by developing the skills and knowledge in one of the six key technology areas as specified above. This qualification will be typically delivered over two years alongside other qualifications in the same area or as part of a wider programme of study.</p> <p>If you are looking for an introductory qualification to develop the basic skills and knowledge required by employers in the Digital Technologies industry then the Certificate size qualification would be appropriate. This will typically be delivered over one year alongside other qualifications in the same area or as part of a wider programme of study.</p>
Will the qualification lead to further learning?	<p>Yes, with this qualification you can explore higher level Apprenticeships such as the Level 4 Higher Apprenticeship for IT, Software, Web & Telecoms Professionals or the Level 4 Higher Apprenticeship in Information Security.</p> <p>If you take the systems infrastructure and application development pathways you will also be able to move onto the specialist Apprenticeships in Software Development or Network Engineering.</p> <p>As this qualification has UCAS points you could also use this to progress onto degrees in areas such as Computing, Digital Marketing and Business.</p>
WHO SUPPORTS THIS QUALIFICATION?	
Employer/Higher Education Institutions	<p>Microsoft Cisco CompTIA IBM Forge Rock</p>
FURTHER INFORMATION	<p>Please refer to the Qualification Handbook, available on the City & Guilds website, for more information on the structure of this qualification, the content of the units, and assessment.</p>

Qualification structure

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Application development)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise technologies	30
310	Application development	60
Optional Group A – Learners must be taught at least 60 GLH from units 311 - 313		
311	Code an application using object oriented programming language	60
312	Code an application using event driven programming language	60
313	Code an application using procedural programming language	60
Optional Group B – Learners must be taught at least 240 GLH from units 311-319		
311	Code an application using object oriented programming language	60
312	Code an application using event driven programming language	60
313	Code an application using procedural programming language	60
314	Games development fundamentals	60
315	3D Computer modelling	60
316	Computer animation	60
317	Creative interactive media	60
318	Mobile application development	60
319	Human computer interaction and the user experience	60
Note – Achievement of the unit selected in Optional Group A cannot be accounted for in Optional Group B.		

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Business Analysis)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise Technologies	30
348	System analysis	60
349	Financial Modelling	60
350	Business Continuity	60
351	Data Driven Solutions	60
352	Change Management	60
353	Databases	60

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Cyber Security)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise technologies	30
336	Threats and vulnerabilities	60
337	Information availability	60
338	Governance and risk management	60
339	Ethical hacking	60
340	Data encryption	60
341	Access control	60

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (System infrastructure)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise technologies	30
320	Information systems development	60
321	Cloud technologies	60
322	Create a computer network	60
323	Manage networks	60
324	Provide technical support	60
325	Infrastructure management	60

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Telecoms and Cabling)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise technologies	30
342	Designing and planning communication networks	60
343	Troubleshooting telecommunications networks	60
344	Fibre Optic Cabling	60
345	PSTN & Data Networks	60
346	Telecommunication Fundamentals	60
347	Wireless Technologies	60

For the **Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) (Web design and social media for e-commerce)** the teaching programme must cover the content detailed in the structure below:

Unit number	Unit title	GLH
Mandatory		
301	Project management	30
302	Information security	60
303	Networking fundamentals	60
304	Digital business communication	60
305	Software development fundamentals	60
306	Collection and analysis of data	60
307	Enterprise technologies	30
330	Set up e-commerce websites	60
331	Social media	60
332	Digital media	60
333	Digital advertising	60
334	Set up e-commerce websites	60
335	Database systems for e-commerce websites	60

Total qualification time (TQT)

Total Qualification Time (TQT) is the total amount of time, in hours, expected to be spent by a Learner to achieve a qualification. It includes both guided learning hours (which are listed separately) and hours spent in preparation, study and assessment.

Title and level	GLH	TQT
Level 3 Advanced Technical Extended Diploma in Digital Technologies	720	1200

Assessment requirements and employer involvement

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (Application development)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification, **as well as** the optional assessment components for their chosen optional units.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
046	Level 3 Digital Technologies (Application Development) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
035 or 535	Level 3 Digital Technologies (Application Development) – Theory exam (2)*
Optional	
311	Code an application using object oriented programming language
312	Code an application using event driven programming language
313	Code an application using procedural programming language
314	Games development fundamentals
315	3D Computer modelling
316	Computer animation
317	Creative interactive media
318	Mobile application development
319	Human computer interaction and the user experience

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (Business Analysis)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
041	Level 3 Digital Technologies (Business Analysis) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
040 or 540	Level 3 Digital Technologies (Business Analysis) – Theory exam (2)*

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (Cyber security)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
043	Level 3 Digital Technologies (Cyber Security) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
042 or 542	Level 3 Digital Technologies (Cyber Security) – Theory exam (2)*

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (System infrastructure)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
039	Level 3 Digital Technologies (Systems Infrastructure) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
036 or 536	Level 3 Digital Technologies (Systems Infrastructure) – Theory exam (2)*

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (Telecoms and Cabling)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
048	Level 3 Digital Technologies (Telecoms and Cabling) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
038 or 538	Level 3 Digital Technologies (Telecoms and Cabling) – Theory exam (1)*

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

To achieve the **Level 3 Advanced Technical Diploma in Digital Technologies (720) (Web design and social media for e-commerce)** candidates must successfully complete **all** the mandatory assessment components, which cover the mandatory content of the qualification.

Component number	Title
Mandatory	
031	Level 3 Digital Technologies - Synoptic assignment (1)*
047	Level 3 Digital Technologies (Web Design & Social Media) - Synoptic assignment (2)*
030 or 530	Level 3 Digital Technologies – Theory exam (1)*
037 or 537	Level 3 Digital Technologies (Web Design & Social Media) – Theory exam (2)*

In addition, candidates **must** achieve the mandatory employer involvement requirement for this qualification **before** they can be awarded a qualification grade. For more information, please see guidance in *Section 4: Employer involvement*.

Employer involvement

Component number	Title
Mandatory	
832	Employer involvement

**Number of mandatory assessments per assessment type*

2 Centre requirements

Approval

New centres will need to gain centre approval. Existing centres who wish to offer this qualification must go through City & Guilds' **full** Qualification Approval Process. There is no fast track approval for this qualification. Please refer to the City & Guilds website for further information on the approval process: www.cityandguilds.com

Resource requirements

Centre staff should familiarise themselves with the structure, content and assessment requirements of the qualification before designing a course programme.

Centre staffing

Staff delivering these qualifications must be able to demonstrate that they meet the following requirements:

- be technically competent in the areas in which they are delivering
- be able to deliver across the breadth and depth of the content of the qualification being taught
- have recent relevant teaching and assessment experience in the specific area they will be teaching, or be working towards this
- demonstrate continuing CPD.

Physical resources

Centres must be able to demonstrate that they have access to the equipment and technical resources required to deliver this qualification and its assessments.

Internal Quality Assurance

Internal quality assurance is key to ensuring accuracy and consistency of tutors and markers. Internal Quality Assurers (IQAs) monitor the work of all tutors involved with a qualification to ensure they are applying standards consistently throughout assessment activities. IQAs must have, and maintain, an appropriate level of technical competence and be qualified to make both marking and quality assurance decisions through a teaching qualification or recent, relevant experience.

Learner entry requirements

Centres must ensure that all learners have the opportunity to gain the qualification through appropriate study and training, and that any prerequisites stated in the *What is this qualification about?* section are met when registering on this qualification.

Age restrictions

These qualifications are approved for learners aged 16 – 19, 19+.

3 Delivering technical qualifications

Initial assessment and induction

An initial assessment of each learner should be made before the start of their programme to identify:

- if the learner has any specific learning or training needs,
- support and guidance they may need when working towards their qualification,
- the appropriate type and level of qualification.

We recommend that centres provide an introduction so that learners fully understand the requirements of the qualification, their responsibilities as a learner, and the responsibilities of the centre. This information can be recorded on a learning contract.

Employer involvement

Employer involvement is essential to maximise the value of each learner's experience. Centres are required to involve employers in the delivery of technical qualifications at Key Stage 5 and/or their assessment, for every learner. This must be in place or planned before delivery programmes begin in order to gain qualification approval. See *Section 4: Employer involvement* for more detail.

Support materials

The following resources are available for this qualification:

Description	How to access
Sample assessments	Available 2016 on the qualification pages on the City & Guilds Website: www.cityandguilds.com
Guidance for delivery	
Guidance on use of marking grids	

4 Employer involvement

Employer involvement is a formal component of Key Stage 5 Technical qualifications. It does not contribute to the overall qualification grading, but is a mandatory requirement that all learners must meet. As such it is subject to external quality assurance by City & Guilds.

Department for Education (DfE) requirements state:

Employer involvement in the delivery and/or assessment of technical qualifications provides a clear 'line of sight' to work, enriches learning, raises the credibility of the qualification in the eyes of employers, parents and students and furthers collaboration between the learning and skills sector and industry.

[Technical qualifications] must:

- *require all students to undertake meaningful activity involving employers during their study; and*
- *be governed by quality assurance procedures run by the awarding organisation to confirm that education providers have secured employer involvement for every student.*

Extract from: **Vocational qualifications for 16 to 19 year olds, 2017 and 2018 performance tables: technical guidance for awarding organisations, paragraphs 89-90**

City & Guilds will provide support, guidance and quality assurance of employer involvement.

Qualification approval

To be approved to offer City & Guilds technicals, centres must provide an Employer Involvement planner and tracker showing how every learner will be able to experience meaningful employer involvement, and from where sufficient and suitable employer representatives are expected to be sourced.

Centres must include in their planner a sufficient range of activities throughout the learning programme that provide a range of employer interactions for learners. Centres must also plan contingencies for learners who may be absent for employer involvement activities, so that they are not disadvantaged.

As part of the approval process, City & Guilds will review this planner and tracker. Centres which cannot show sufficient commitment from employers and/or a credible planner and tracker will be given an action for improvement with a realistic timescale for completion. **Approval will not be given** if employer involvement cannot be assured either at the start of the qualification, or through an appropriate plan of action to address this requirement before the learner is certificated.

Monitoring and reporting learner engagement

Employer involvement is a formal component of this qualification and is subject to quality assurance monitoring. Centres must record evidence that demonstrates that each learner has been involved in meaningful employer based activities against the mandatory content before claiming the employer involvement component for learners.

Centres must record the range and type of employer involvement each learner has experienced and submit confirmation that all learners have met the requirements to City & Guilds. If a centre cannot provide evidence that learners have met the requirements to achieve the component, then the learner will not be able to achieve the overall Technical Qualification.

Types of involvement

Centres should note that to be eligible, employer involvement activities **must** relate to one or more elements of the mandatory content of this qualification.

As the aim of employer involvement is to enrich learning and to give learners a taste of the expectations of employers in the industry area they are studying, centres are encouraged to work creatively with local employers.

Employers can identify the areas of skills and knowledge in their particular industry that they would wish to see emphasised for learners who may apply to work with them in the future. Centres and employers can then establish the type of input, and which employer representative might be able to best support these aims.

To be of most benefit this must add to, rather than replace the centre's programme of learning. Some examples of meaningful employer involvement are listed below. Employer involvement not related to the mandatory element of the qualification, although valuable in other ways, does not count towards this element of the qualification.

The DfE has provided the following examples of what does and does not count as meaningful employer involvement, as follows^{1,2}:

The following activities meet the requirement for meaningful employer involvement:

- *students undertake structured work-experience or work-placements that develop skills and knowledge relevant to the qualification³;*
- *students undertake project(s), exercises(s) and/or assessments/examination(s) set with input from industry practitioner(s);*
- *students take one or more units delivered or co-delivered by an industry practitioner(s). This could take the form of master classes or guest lectures;*
- *industry practitioners operate as 'expert witnesses' that contribute to the assessment of a student's work or practice, operating within a specified assessment framework. This may be a specific project(s), exercise(s) or examination(s), or all assessments for a qualification.*

In all cases participating industry practitioners and employers must be relevant to the industry sector or occupation/occupational group to which the qualification relates.

The following activities, whilst valuable, do not meet the requirement for meaningful employer involvement:

- *employers' or industry practitioners' input to the initial design and content of a qualification;*
- *employers hosting visits, providing premises, facilities or equipment;*
- *employers or industry practitioners providing talks or contributing to delivery on employability, general careers advice, CV writing, interview training etc;*
- *student attendance at career fairs, events or other networking opportunities;*

¹ As extracted from: Vocational qualifications for 16 to 19 year olds
2017 and 2018 performance tables: technical guidance for awarding organisations

² This list has been informed by a call for examples of good practice in employer involvement in the delivery and assessment of technical qualifications - **Employer involvement in the delivery and assessment of vocational qualifications**

³ **DfE work experience guidance**

- *simulated or provider-based working environments eg hairdressing salons, florists, restaurants, travel agents, small manufacturing units, car servicing facilities;*
- *employers providing students with job references.*

Types of evidence

For each employer involvement activity, centres are required to provide evidence of which learners undertook it, e.g. a candidate attendance register. The types of additional evidence required to support a claim for this component will vary depending on the nature of the involvement. E.g. for a guest lecture it is expected that a synopsis of the lecture and register would be taken which each learner and the guest speaker will have signed; expert witnesses will be identified and will have signed the relevant assessment paperwork for each learner they have been involved in assessing; evidence of contribution from employers to the development of locally set or adapted assignments.

Quality assurance process

As the employer involvement component is a requirement for achieving the KS5 Technical qualifications, it is subject to external quality assurance by City & Guilds at the approval stage and when centres wish to claim certification for learners.

Evidence will be validated by City & Guilds before learners can achieve the employer involvement component. Where employer involvement is not judged to be sufficient, certificates cannot be claimed for learners.

Sufficiency of involvement for each learner

It is expected that the centre will plan a range of activities that provide sufficient opportunities for each learner to interact directly with a range of individuals employed in the related industry. Centres must also provide contingencies for learners who may be absent for part of their teaching, so they are not disadvantaged. Any absence that results in a learner missing arranged activities must be documented. Where learners are unable to undertake all employer involvement activities due to temporary illness, temporary injury or other indisposition, centres should contact City & Guilds for further guidance.

Live involvement

Learners will gain most benefit from direct interaction with employers and/or their staff; however the use of technology (e.g. the use of live webinars) is encouraged to maximise the range of interactions. Where learners are able to interact in real time with employers, including through the use of technology, this will be classed as 'live involvement'.

It is considered good practice to record learning activities, where possible, to allow learners to revisit their experience and to provide a contingency for absent learners. This is not classed as live involvement however, and any involvement of this type for a learner must be identified as contingency.

Timing

A learner who has not met the minimum requirements cannot be awarded the component, and will therefore not achieve the qualification. It is therefore important that centres give consideration to scheduling employer involvement activities, and that enough time is allotted throughout delivery and assessment of the qualification to ensure that requirements are fully met.

5 Assessment

Summary of assessment methods and conditions

Component numbers	Assessment method	Description and conditions
031, 039, 043, 043, 046, 047, 048	Synoptic assignment	<p>The synoptic assignment is externally set, internally marked and externally moderated. The assignment requires candidates to identify and use effectively in an integrated way an appropriate selection of skills, techniques, concepts, theories, and knowledge from across the content area. Candidates will be judged against the assessment objectives.</p> <p>Assignments will be released to centres as per dates indicated in the Assessment and Examination timetable published on our website.</p> <p>Centres will be required to maintain the security of all live assessment materials. Assignments will be password protected and released to centres through a secure method.</p> <p>There will be one opportunity within each academic year to sit the assignment. Candidates who fail the assignment will have one re-sit opportunity. The re-sit opportunity will be in the next academic year, and will be the assignment set for that academic year once released to centres. If the re-sit is failed, the candidate will fail the qualification.</p> <p>Please note that for externally set assignments City & Guilds provides guidance and support to centres on the marking and moderation process.</p>
030/530, 035/535, 036/536, 037/537, 038/538, 040/540, 042/542	Externally marked exam	<p>The exam is externally set and externally marked, and will be taken online through City & Guilds' computer-based testing platform.</p> <p>The exam is designed to assess the candidate's depth and breadth of understanding across content in the qualification at the end of the period of learning, using a range of question types and will be sat under invigilated examination conditions. See JCQ requirements for details: http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations</p> <p>The exam specification shows the coverage of the exam across the qualification content.</p> <p>Candidates who fail the exam at the first sitting will have a maximum of two opportunities to retake. If the candidate fails the exam three times then they will fail the qualification. (Note: the third and final retake opportunity applies to Level 3 only.) For exam dates, please refer to the Assessment and Examination timetable.</p>

What is synoptic assessment?

Technical qualifications are based around the development of a toolkit of knowledge, understanding and skills that an individual needs in order to have the capability to work in a particular industry or occupational area. Individuals in all technical areas are expected to be able to apply their knowledge, understanding and skills in decision making to solve problems and achieve given outcomes independently and confidently.

City & Guilds technical qualifications require candidates to draw together their learning from across the qualification to solve problems or achieve specific outcomes by explicitly assessing this through the synoptic assignment component.

In this externally set, internally marked and externally moderated assessment the focus is on bringing together, selecting and applying learning from across the qualification rather than demonstrating achievement against units or subsets of the qualification content. The candidate will be given an appropriately levelled, substantial, occupationally relevant problem to solve or outcome to achieve. For example this might be in the form of a briefing from a client, leaving the candidate with the scope to select and carry out the processes required to achieve the client's wishes, as they would in the workplace.

Candidates will be marked against assessment objectives (AOs) such as their breadth and accuracy of knowledge, understanding of concepts, and the quality of their technical skills as well as their ability to use what they have learned in an integrated way to achieve a considered and high quality outcome.

How the assignment is synoptic for this qualification

The typical assignment brief could be to respond to a design problem for a new engineered product or adapting an existing product.

This will require the candidate to carry out experiments on a prototype to evaluate the suitability of different materials. Learners will produce a design specification, with drawings, for a design that meets the brief and produce a production plan for its manufacture. They will need to produce a report on developing the design into a commercial product.

External exams for stretch, challenge and integration

The external assessment will draw from across the mandatory content of the qualification, using a range of shorter questions to confirm breadth of knowledge and understanding. Extended response questions are included to go into more depth, giving candidates the opportunity to demonstrate higher level understanding and integration through discussion, analysis and evaluation, and ensuring the assessment can differentiate between 'just able' and higher achieving candidates.

Optional unit assessments and integration into the synoptic qualification content

While the mandatory units for this qualification provide the main skills and knowledge required to work in the IT digital environment the optional units provided give centres flexibility when devising programmes to meet local employment needs, where the purpose of the qualification demands this.

The assessments for the optional units will require that the candidate has experienced the full breadth of mandatory learning of the qualification in order to better demonstrate the rounded performance expected at higher grades.

Assessment objectives

The assessments for this qualification are set against a set of assessment objectives (AOs) which are used across all City & Guilds Technicals to promote consistency among qualifications of a similar purpose. They are designed to allow judgement of the candidate to be made across a number of different categories of performance.

Each assessment for the qualification has been allocated a set number of marks against these AOs based on weightings recommended by stakeholders of the qualification. This mark allocation remains the same for all versions of the assessments, ensuring consistency across assessment versions and over time.

The following table explains all AOs in detail, including weightings for the synoptic assignments. In some cases, due to the nature of a qualification's content, it is not appropriate to award marks for some AOs. Weightings for exams (AOs 1, 2 and 4 only) can be found with the exam specification.

Assessment objective (031)	Level 3 Advanced Technical Extended Diploma in Digital Technologies (720) Typical expected evidence of knowledge, understanding and skills	Approximate weighting
A01 Recalls knowledge from across the breadth of the qualification.	Relevant legislation, media file types, available database software	10%
A02 Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.	Gathering and presenting data including data patterns and legislation	20%
A03 Demonstrates technical skills from across the breadth of the qualification.	Database creation, chart creation, use of media file types, website creation, website navigation, use of language, copyright compliance, web browser functionality	40%
A04 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	Bringing primary and secondary research together, website structure and content, evaluation of processes, navigation system	25%
A05 Demonstrates perseverance in achieving high standards and attention to detail while showing an understanding of wider impact of their actions.	Database structure, database fields, reporting structure, language to include tone of voice, media file type preparation. This would also include examples of evaluation such as recognition of data patterns, consideration of the processes	5%

Exam specification

AO weightings per exam

AO	Application development weighting (Approx. %)	Business Analysis weighting (Approx. %)	Cyber Security weighting (Approx. %)
AO1 Recalls knowledge from across the breadth of the qualification.	20	20	20
AO2 Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.	60	60	60
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	20	20	20
AO	System infrastructure weighting (Approx. %)	Telecoms and cabling weighting (Approx. %)	Web design and social media for e-commerce weighting (Approx. %)
AO1 Recalls knowledge from across the breadth of the qualification.	20	20	20
AO2 Demonstrates understanding of concepts, theories and processes from across the breadth of the qualification.	60	60	60
AO4 Applies knowledge, understanding and skills from across the breadth of the qualification in an integrated and holistic way to achieve specified purposes.	20	20	20

Exam specifications

The way the exam covers the content of the qualification is laid out in the table below:

Assessment type: Examiner marked, written exam usually delivered online *

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

030/530	Duration: 2 hours 40 minutes		
Unit number	Unit title	Number of marks	%
301	Project management	6	7.5
302	Information security	18	22.5
303	Networking fundamentals	18	22.5
305	Software development fundamentals	20	25
NA	Integration across the units	18	22.5
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Application Development Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

035/535	Duration: 2 hours		
Unit	Unit title	Number of marks	%
310	Application development	58	72.5
311 or 312 or 313	Code an application using programming language: object oriented, event driven procedural	4	5
NA	Integration across the units	18	22.5
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Systems Infrastructure Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

036/536	Duration: 2 hours		
Unit	Unit title	Number of marks	%
320	Information systems development	12	15
321	Cloud technologies	12	15
322	Create a computer network	8	10
323	Manage networks	8	10
324	Provide technical support	10	12.5
325	Infrastructure management	12	15
N/A	Integration across the units	18	22
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Web Design and Social Media for E-commerce Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

037/537	Duration: 1 hour 30 minutes		
Unit	Unit title	Number of marks	%
330	Set up e-commerce websites	11	14
331	Social media	10	12.5
332	Digital media	12	15
333	Digital advertising	18	22
334	Set up e-commerce websites	10	12.5
335	Database systems for e-commerce websites	4	5
N/A	Integration across the units	15	19
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Telecoms and Cabling Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

038/538	Duration: 2 hours		
Unit	Unit title	Number of marks	%
342	Designing and planning communication networks	4	5
343	Troubleshooting telecommunication networks	7	9
344	Fibre optic cabling	14	17.5
345	PSTN and data network	10	12.5
346	Telecommunications fundamentals	19	24
347	Wireless technology	8	10
N/A	Integration across the units	18	22
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Business Analysis Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

040/540	Duration: 2 hours		
Unit	Unit title	Number of marks	%
348	System analysis and design	12	15
349	Financial management principles	9	11.5
350	Business continuity planning	12	15
351	Data driven solutions	12	15
352	Change management	9	11.5
353	Database fundamentals	8	10
N/A	Integration across the units	18	22
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

Cyber Security Pathway

Assessment type: Examiner marked, written exam*

Assessment conditions: Invigilated examination conditions

Grading: X/P/M/D

042/542	Duration: 2 hours		
Unit	Unit title	Number of marks	%
336	Threats and vulnerabilities	6	7
337	Information availability	12	15
338	Governance and risk management	14	17
339	Ethical hacking	10	12
340	Data encryption	10	12
341	Access control	12	15
N/A	Integration across the units	18	22
Total		80	100

*These exams are sat under invigilated examination conditions, as defined by the JCQ:

<http://www.jcq.org.uk/exams-office/ice---instructions-for-conducting-examinations>

Entry for exams can be made through the City & Guilds Walled Garden.

6 Moderation and standardisation of assessment

City & Guilds' externally set assignments for technical qualifications are designed to draw from across the qualifications' content, and to contribute a significant proportion towards the learner's final qualification grade. They are subject to a rigorous external quality assurance process known as external moderation. This process is outlined below. For more detailed information, please refer to 'Marking and moderation - Technicals centre guidance' available to download on the City & Guilds website.

It is vital that centres familiarise themselves with this process, and how it impacts on their delivery plan within the academic year.

Supervision and authentication of internally assessed work

The Head of Centre is responsible for ensuring that internally assessed work is conducted in accordance with City & Guilds' requirements.

City & Guilds requires both tutors and candidates to sign declarations of authenticity. If the tutor is unable to sign the authentication statement for a particular candidate, then the candidate's work cannot be accepted for assessment.

Internal standardisation

For internally marked work⁴ the centre is required to conduct internal standardisation to ensure that all work at the centre has been marked to the same standard. It is the Internal Quality Assurer's (IQA's) responsibility to ensure that standardisation has taken place, and that the training includes the use of reference and archive materials such as work from previous years as appropriate.

Provision for reworking evidence after submission for marking by the tutor

It is expected that in many cases a candidate who is struggling with a specific piece of work may themselves choose to restart and rectify the situation during their normal allocated time, and before it gets to the stage of it being handed in for final marking by the tutor.

In exceptional circumstances however, where a candidate has completed the assignment in the required timescales, and has handed it in for marking by the tutor but is judged to have significantly underperformed, may be allowed to rework or supplement their original evidence for remarking prior to submission for moderation. For this to be allowed, the centre must be confident that the candidate will be able to improve their performance without additional feedback from their tutor and within the required timescales ie the candidate has shown they can perform sufficiently better previously in formative assessments.

The reworked and/or supplemented original evidence must be remarked by the tutor in advance of the original moderation deadline and the moderator informed of any candidates who have been allowed to resubmit evidence.

The process must be managed through the IQA. The justification for allowing a resubmission should be recorded and made available on request. The use of this provision will be monitored by City & Guilds.

⁴ For any internally assessed optional unit assignments, the same process must be followed where assessors must standardise their interpretation of the assessment and grading criteria.

Internal appeal

Centres must have an internal process in place for candidates to appeal the marking of internally marked components, ie the synoptic assignment and any optional unit assignments. This must take place before the submission of marks for moderation. The internal process must include candidates being informed of the marks (or grades) the centre has given for internally assessed components, as they will need these to make the decision about whether or not to appeal.

Centres cannot appeal the outcome of moderation for individual candidates, only the moderation process itself. A request for a review of the moderation process should be made to **appeals@cityandguilds.com**.

Moderation

Moderation is the process where external markers are standardised to a national standard in order to review centre marking of internally marked assessments. These markers are referred to as 'moderators'. Moderators will mark a representative sample of candidates' work from every centre. Their marks act as a benchmark to inform City & Guilds whether centre marking is in line with City & Guilds' standard.

Where moderation shows that the centre is applying the marking criteria correctly, centre marks for the whole cohort will be accepted.

Where moderation shows that the centre is either consistently too lenient or consistently too harsh in comparison to the national standard, an appropriate adjustment will be made to the marks of the whole cohort, retaining the centre's rank ordering.

Where centre application of the marking criteria is inconsistent, an appropriate adjustment for the whole cohort may not be possible on the basis of the sample of candidate work. In these instances a complete remark of the candidate work may be necessary. This may be carried out by the centre based on feedback provided by the moderator, or carried out by the moderator directly.

Moderation applies to all internally marked assignments. Following standardisation and marking, the centre submits all marks and candidate work to City & Guilds via the moderation platform. The deadline for submission of evidence will be available on Walled Garden. See the *Marking and moderation - Technicals Centre Guidance* document for full details of the requirements and process.

In most cases candidate work will be submitted directly to the moderator for moderation. This includes written work, photographic and pictorial evidence, or video and audio evidence. For some qualifications there will be a requirement for moderators to visit centres to observe practical assessments being undertaken. This will be for qualifications where the assessment of essential learner skills can only be demonstrated through live observation. The purpose of these visits is to ensure that the centre is assessing the practical skills to the required standards, and to provide the moderators with additional evidence to be used during moderation. These visits will be planned in advance with the centre for all relevant qualifications.

Post-moderation procedures

Once the moderation process has been completed, the confirmed marks for the cohort are provided to the centre along with feedback from the moderator on the standard of marking at the centre, highlighting areas of good practice, and potential areas for improvement. This will inform future marking and internal standardisation activities.

City & Guilds will then carry out awarding, the process by which grade boundaries are set with reference to the candidate evidence available on the platform.

Centres retaining evidence

Centres must retain assessment records for each candidate for a minimum of three years. To help prevent plagiarism or unfair advantage in future versions, candidate work may not be returned to candidates. Samples may however be retained by the centre as examples for future standardisation of marking.

7 Grading

Awarding individual assessments

Individual assessments will be graded, by City & Guilds, as pass/merit/distinction where relevant. The grade boundaries for pass and distinction for each assessment will be set through a process of professional judgement by technical experts. Merit will usually be set at the midpoint between pass and distinction. The grade descriptors for pass and distinction, and other relevant information (eg archived samples of candidate work and statistical evidence) will be used to determine the mark at which candidate performance in the assessment best aligns with the grade descriptor in the context of the qualification's purpose. Boundaries will be set for each version of each assessment to take into account relative difficulty.

Please note that as the merit grade will usually be set at the arithmetical midpoint between pass and distinction, there are no descriptors for the merit grade for the qualification overall.

Grade descriptors

To achieve a pass, a candidate will be able to

- Demonstrate the knowledge and understanding required to work in the occupational area, its principles, practices and legislation.
- Describe some of the main factors impacting on the occupation to show good understanding of how work tasks are shaped by the broader social, environmental and business environment it operates within.
- Use the technical industry specific terminology used in the industry accurately.
- Demonstrate the application of relevant theory and understanding to solve non-routine problems.
- Interpret a brief for complex work related tasks, identifying the key aspects, and showing a secure understanding of the application of concepts to specific work related tasks.
- Carry out planning which shows an ability to identify and analyse the relevant information in the brief and use knowledge and understanding from across the qualification (including complex technical information) to interpret what a fit for purpose outcome would be and develop a plausible plan to achieve it.
- Achieve an outcome which successfully meets the key requirements of the brief.
- Identify and reflect on the most obvious measures of success for the task and evaluate how successful they have been in meeting the intentions of the plan.
- Work safely throughout, independently carrying out tasks and procedures, and having some confidence in attempting the more complex tasks.

To achieve a distinction, a candidate will be able to

- Demonstrate the excellent knowledge and understanding required to work to a high level in the occupational area, its principles, practices and legislation.
- Analyse the impact of different factors on the occupation to show deep understanding of how work tasks are shaped by the broader social, environmental, and business environment it operates within.
- Demonstrate the application of relevant theory and understanding to provide efficient and effective solutions to complex and non-routine problems.
- Analyse the brief in detail, showing confident understanding of concepts and themes from across the qualification content, bringing these together to develop a clear and stretching plan that would credibly achieve an outcome that is highly fit for purpose.
- Achieve an outcome which shows an attention to detail in its planning, development and completion, so that it completely meets or exceeds the expectations of the brief to a high standard.

- Carry out an evaluation in a systematic way, focussing on relevant quality points, identifying areas of development/ improvement as well as assessing the fitness for purpose of the outcome.

Awarding grades and reporting results

The overall qualification grade will be calculated based on aggregation of the candidate's achievement in each of the assessments for the mandatory units, taking into account the assessments' weighting. The qualification will be reported on a seven grade scale: Pass Pass, Pass Merit, Merit Merit, Merit Distinction, Distinction Distinction, Distinction Distinction*, Distinction* Distinction*.

All assessments **must** be achieved at a minimum of pass for the qualification to be awarded. Candidates who fail to reach the minimum standard for grade pass for an assessment(s) will not have a qualification grade awarded and will not receive a qualification certificate.

The contribution of assessments towards the overall qualification grade is as follows:

Assessment method	Grade scale	% contribution
Assignment (039, 041, 042, 046, 047 or 048)	X/P/M/D	30%
Assignment (031)	X/P/M/D	30%
Exam 1 (030/530)	X/P/M/D	20%
Exam 2 (035, 036/530, 037/537, 038/538, 040/540 or 042/542)	X/P/M/D	20%

Both synoptic assignments and exams are awarded (see 'Awarding individual assessments', at the start of Section 7, above), and candidates' grades converted to points. The minimum points available for each assessment grade is listed in the table below. The range of points between the pass, merit and distinction boundaries will be accessible to candidates. For example; a candidate that achieves a middle to high pass in an assessment will receive between 8 and 10 points, a candidate that achieves a low to middle merit in an assessment will receive between 12 and 14 points. The points above the minimum for the grade for each assessment are calculated based on the candidate's score in that assessment.

	Pass	Merit	Distinction
Synoptic Assignment (031): 30%	6	12	18
Synoptic Assignment (038, 039, 040, 041, 043 or 045): 30%	6	12	18
Exam 1 (030/530): 20%	6	12	18
Exam 2 (035/535, 036/536, 037/537, 038/538, 040/540 or 042/542) 20%	6	12	18

The weighted average of candidate's points for each assessment is calculated, and the overall grade of the qualification will then be determined using the following criteria.

Qualification Grade	Minimum points
Distinction*, Distinction*	20.5
Distinction, Distinction*	18.7
Distinction, Distinction	17
Merit, Distinction	14
Merit, Merit	11
Pass, Merit	8.5
Pass, Pass	6

Candidates achieving Distinction*, Distinction * will be the highest achieving of the Distinction candidates.

8 Administration

Approved centres must have effective quality assurance systems to ensure valid and reliable delivery and assessment of qualifications. Quality assurance includes initial centre registration by City & Guilds and the centre's own internal procedures for monitoring quality assurance procedures.

Consistent quality assurance requires City & Guilds and its associated centres to work together closely; our Quality Assurance Model encompasses both internal quality assurance (activities and processes undertaken within centres) and external quality assurance (activities and processes undertaken by City & Guilds).

For this qualification, standards and rigorous quality assurance are maintained by the use of:

- internal quality assurance
- City & Guilds external moderation.

In order to carry out the quality assurance role, Internal Quality Assurers (IQAs) must have and maintain an appropriate level of technical competence and have recent relevant assessment experience. For more information on the requirements, refer to *Section 2: Centre requirements* in this handbook.

To meet the quality assurance criteria for this qualification, the centre must ensure that the following procedures are followed:

- suitable training of staff involved in the assessment of the qualification to ensure they understand the process of marking and standardisation
- completion by the person responsible for internal standardisation of the Centre Declaration Sheet to confirm that internal standardisation has taken place
- the completion by candidates and supervisors/tutors of the record form for each candidate's work.

External quality assurance

City & Guilds will undertake external moderation activities to ensure that the quality assurance criteria for this qualification are being met. Centres must ensure that they co-operate with City & Guilds staff and representatives when undertaking these activities.

City & Guilds requires the Head of Centre to

- facilitate any inspection of the centre which is undertaken on behalf of City & Guilds
- make arrangements to receive, check and keep assessment material secure at all times,
- maintain the security of City & Guilds confidential material from receipt to the time when it is no longer confidential and
- keep completed assignment work and examination scripts secure from the time they are collected from the candidates to their dispatch to City & Guilds.

Enquiries about results

The services available for enquiries about results include a review of marking for exam results and review of moderation for internally marked assessments.

For further details on enquiries and appeals process and for copies of the application forms, please visit the **appeals page** of the City & Guilds website at **www.cityandguilds.com**.

Re-sits and shelf-life of assessment results

Re-sits and shelf-life of assessment results Candidates who have failed an exam or wish to re-take it in an attempt to improve their grade, can do so **twice**. The best result will count towards the final qualification. See guidance on individual assessment types in Section 5.

Factors affecting individual learners

If work is lost, City & Guilds should be notified immediately of the date of the loss, how it occurred, and who was responsible for the loss. Centres should use the JCQ form, JCQ/LCW, to inform City & Guilds Customer Services of the circumstances.

Learners who move from one centre to another during the course may require individual attention. Possible courses of action depend on the stage at which the move takes place. Centres should contact City & Guilds at the earliest possible stage for advice about appropriate arrangements in individual cases.

Malpractice

Please refer to the City & Guilds guidance notes *Managing cases of suspected malpractice in examinations and assessments*. This document sets out the procedures to be followed in identifying and reporting malpractice by candidates and/or centre staff and the actions which City & Guilds may subsequently take. The document includes examples of candidate and centre malpractice and explains the responsibilities of centre staff to report actual or suspected malpractice. Centres can access this document on the City & Guilds website.

Examples of candidate malpractice are detailed below (please note that this is not an exhaustive list):

- falsification of assessment evidence or results documentation
- plagiarism of any nature
- collusion with others
- copying from another candidate (including the use of ICT to aid copying), or allowing work to be copied
- deliberate destruction of another's work
- false declaration of authenticity in relation to assessments
- impersonation.

These actions constitute malpractice, for which a penalty (eg disqualification from the assessment) will be applied.

Where suspected malpractice is identified by a centre after the candidate has signed the declaration of authentication, the Head of Centre must submit full details of the case to City & Guilds at the earliest opportunity. Please refer to the form in the document *Managing cases of suspected malpractice in examinations and assessments*.

Access arrangements and special consideration

Access arrangements are adjustments that allow candidates with disabilities, special educational needs and temporary injuries to access the assessment and demonstrate their skills and knowledge without changing the demands of the assessment. These arrangements must be made before assessment takes place.

It is the responsibility of the centre to ensure at the start of a programme of learning that candidates will be able to access the requirements of the qualification.

Please refer to the *JCQ access arrangements and reasonable adjustments and Access arrangements - when and how applications need to be made to City & Guilds* for more information. Both are available on the City & Guilds website: **<http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments>**

Special consideration

We can give special consideration to candidates who have had a temporary illness, injury or indisposition at the time of the examination. Where we do this, it is given after the examination.

Applications for either access arrangements or special consideration should be submitted to City & Guilds by the Examinations Officer at the centre. For more information please consult the current version of the JCQ document, *A guide to the special consideration process*. This document is available on the City & Guilds website: **<http://www.cityandguilds.com/delivering-our-qualifications/centre-development/centre-document-library/policies-and-procedures/access-arrangements-reasonable-adjustments>**

UAN:	Y/506/5049
Level:	3
GLH:	30

What is this unit about?

This unit is about Project Management techniques that can be used to ensure that a project delivers to scope, budget and time. Learners will explore project management techniques such as GANTT charts, milestones and critical paths. Project Management requires flexibility and it is often the case that a contingency plan is needed.

The project plan itself should be considered as a checklist to be used to monitor a project, it should not be considered as a strict formula, as the project manager needs to be able to change the approach in response to ever changing environments. Any changes to an original plan need to be fully documented in order to create an audit trail and to aid future developments.

The purpose of this unit is for learners to look at key aspects of project management. Learners will gain an understanding of the roles and responsibilities of those involved, especially the Project Manager, and explore some of the documentation that can be used to identify the key criteria that must be satisfied in order to deliver a successful project.

Learners may be introduced to this unit by asking themselves questions such as:

- Why should I use project management?
- What terminology do I need to understand in relation to project management?
- Do project life cycles affect my planning and management?
- What skills do I need to manage a project effectively?
- How do I determine the success of a project?

Learning outcomes

In this unit, learners will be able to:

1. apply the principles of project management
2. apply the stages of project management life cycles
3. present a project review

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Apply the principles of project management

Topics

1.1 The application of the principles of project management including:

- define the **governance**
- define the **purpose** of a project
- outline **viability and financial considerations**
- set and monitor **indicators of progress**
- identify **risks and contingencies**
- agree final project specification

1.2 Define the **roles and responsibilities** within a project

Topic 1.1

Learners must be able to apply the principles of project management relative to the size, complexity and cost of a project including but not limited to:

- Governance:
 - sponsor
 - project commissioning
 - steering committee
 - cadence reviews
- Purpose:
 - justification for a project
 - aim and subordinate objectives (eg Specific, Measurable, Agreed, Realist Time-bound Evaluated, Reviewed (SMARTER))
 - outline a project specification
- Viability and financial considerations:
 - estimating
 - cost control
 - payback period
 - discounted cash flow / net present value
 - Return on Investment (ROI)
 - quality of service
 - business transformation
 - compliance requirements eg change in legislation
- Indicators of progress:
 - utilise technology to create information such as GANTT charts and project reports
 - critical tasks list
 - milestones
 - stage sign offs
- Risks issues and contingency planning:
 - scope creep
 - planned time slippage
 - financial
 - human resources

- critical tasks
- dependencies
- environmental considerations eg weather
- Agree final project specification

In addition to the above learners need to apply the following principles relative to the size, complexity and cost of a project, including but not limited to:

- Project organisation structures:
 - hierarchical
 - flat
 - functional
 - matrix
 - product
 - geographical
- Project documentation:
 - terms of reference
 - review and approval of deliverables
 - business case
 - budget plans
 - required resources
 - project outline
 - project initiation, justification or feasibility
 - project plan
 - identifying the critical path on a basic project network using a given formula
 - calculating the earliest and latest start and finish dates
 - calculating the total float on activities in an Activity on Node (AoN) Network
 - Chart(s) showing project activities (eg Gantt, AoN)
- Criteria for a successful project:
 - objectives eg SMARTER
- Constraints and dependencies:
 - predecessors
 - successors
 - critical tasks
 - time
- tolerances
- previous experience
- human resources

Topic 1.2

Learners should be able to define the roles and responsibilities within a project including but not limited to:

Roles and responsibilities:

- sponsor (executive)
- users
- customers / clients
- suppliers / partners
- project team
 - project manager
 - specialists
 - financial staff
 - resource manager
 - estimators
 - design staff
 - team manager (leader)
 - project support office

Learning outcome:

2. Apply the stages of project management life cycles

Topics

2.1 Document the key stages within project life cycles:

- viability
- plan
- develop and implement
- review

2.2 Use life cycles models

Topics 2.1, 2.2

In order for learners to be able to meet project management needs they will need to be able to apply their understanding of various life cycle models that will include a number of stages. Learners will also need to be aware that project life cycles exist in a number of different models eg Spiral, Waterfall, Agile etc.

Learners will need to be aware that there are as many different staging models for projects as there are approaches to project management. There is preferred or recommended staging model other than that which works for a given situation – unless the organisation concerned stipulates specific stages.

Therefore learners will need to appreciate that the actual model to use will depend on the specific nature of the projects.

Learning outcome:

3. Present a project review

Topics

3.1 Review the outcome of a specified project

3.2 Use technology to communicate the review of a project

Topics 3.1, 3.2

Learners will need to be able to review a project taking into account the application of the principles and stages identified in learning outcomes 1 and 2. The review should include but is not limited to evidence of :

- a summary of the purpose of the project and if the objectives were met (and if not, why)
- that the main roles and responsibilities within a project were identified
- how the estimations were derived
- how the project plan was implemented
- lessons learnt
- recommendations for future projects/ developments

Learners should be able to use technology to communicate the review as specified above. This should include a direct presentation to peer groups. The communication and presentation may include but is not limited to:

Communication:

- emails
- collaborative technologies (eg virtual meetings/dashboards)

- intranet
- posting eg collaborative website
- notices eg flipcharts, poster

Presentation:

- verbal
 - video conferencing
 - presentation SOF

Guidance for delivery

This unit can be used alongside virtually all of the other units. It could be used as the foundation for a learner's project and would help guide learners through the process of completing their other work.

A learner project could be set and linked to this unit to allow learners to outline, plan, manage, review and communicate in areas that are of interest to them. This could be a project to implement a new communication system to be used in a large business environment and should take into account budget, system specification of hardware, software, network requirements, installation and commissioning. The project should be relevant to the learner and reflect the units that they are undertaking to ensure relevancy.

In order for learners to understand project life cycles they are encourage to:

- research three different examples of a project or system life cycle
- select the correct system development life cycle for a given situation
- draw and describe an example of a system life cycle eg waterfall

Suggested learning resources

Project Management Healy P

Published by: Butterworth-Heinemann, 1997
ISBN: 0-7506-8943-9

The Handbook of PROJECT-BASED MANAGEMENT Turner J R

Published by: McGraw-Hill, 1999
ISBN: 0-07-709161-2

The PROJECT MANAGER Newton R

Published by: Pearson Education, 2005
ISBN: 978-0-273-70173-6

Practical Project Management - Tips, Tactics and Tools Levine, H A

Published By: Wiley, 2002
ISBN: 0-47-120303-3

PROJECT MANAGEMENT BODY OF KNOWLEDGE (PMBOK® GUIDE)

Published by: Project Management Institute, 2013
ISBN: 978-1-935589-67-9

Website

Association of Project Management <http://www.apm.org.uk/WhatIsPM>

UAN:	L/506/5050
Level:	3
GLH:	60

What is this unit about?

The aim of this unit is to give an introduction to the principles concerned with the security of Information Technology systems and data. Learners should explore a range of techniques used to enhance security of systems and data. The unit will also explore network infrastructure security, and how security measures can be both physical and logical.

Learners will also explore new and emerging technologies used for cryptography and will have the opportunity to research cryptographic techniques that are applied in organisations.

Learners may be introduced to this unit by asking themselves questions such as:

- Why should I be concerned with security?
- How can I secure a network?
- Do I know what security threats are faced by organisations?
- What is cryptography?

Learning outcomes

In this unit, learners will be able to:

1. Apply security concepts
2. Determine infrastructure security
3. Identify types of cryptography

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Apply security concepts

Topics

1.1 Types of **access control methods**

1.2 **Vulnerabilities and threats**

1.3 Protect technology systems

Learners will need to understand why it is important to implement security measures in order to protect IT systems and data considering the following:

- confidentiality
- integrity
- availability
- the inevitable trade off between security and utility

Topic 1.1: Learners should be able to understand the characteristics of access control methods and be able to differentiate between them to include but not limited to:

Access control methods:

- MAC (Mandatory Access Control)
- DAC (Discretionary Access Control)
- RBAC (Role Based Access Control)
- ABAC (Attribute Based Access Control)

Topic 1.2: Learners should be able to understand the appropriate actions necessary to mitigate (or control) vulnerabilities. Risks and threats can include but are not limited to:

Risks and threats:

- DOS / DDOS (Denial of Service / Distributed Denial of Service)
- back door
- spoofing
- man in the middle
- replay
- TCP/IP Hijacking
- weak keys
- mathematical
- social engineering
- birthday
- password guessing, brute force, dictionary, software exploitation
- malware

Topic 1.3: Learners need to apply controls (or countermeasures) to protect against different types of malicious code and be able to demonstrate an appropriate course of action to mitigate vulnerability and risk, to include but not limited to:

- Viruses
- Trojan Horses

- Logic bombs
- Worms
- Watering Holes

Learning outcome:

2. Determine infrastructure security

Topics

- 2.1 The mitigation of risks associated with technology systems
- 2.2 Security vulnerabilities associated with **storage media**
- 2.3 Security vulnerabilities associated with **networking infrastructure**
- 2.4 Types of **intrusion detection methods**
- 2.5 **Security baselines**

Topic 2.1

Learners need to understand the vulnerabilities of servers, workstations and mobile devices and their operating systems to include but not limited to:

- workstations
- servers
- mobile devices
- wireless
- RAS (Remote Access Server)
- VPN (Virtual Private Network)
- IDS (Intrusion Detection System)
- network monitoring / diagnostic

Topic 2.2

Learners need to understand the security vulnerabilities associated with different types of storage media to include but not limited to:

Storage media:

- removable media
- external storage eg Cloud
- data servers
- local media eg hard disk

Topic 2.3

Learners should understand the security risks, vulnerabilities associated with different networking infrastructures (physical and logical) to include but not limited to:

Networking infrastructures:

- coaxial cable
- unshielded twisted pair / shielded twisted pair (UTP / STP)
- fibre optic cable
- firewalls
- hubs, switches and routers
- security zones
- VLANs (Virtual Local Area Network)
- NAT (Network Address Translation)
- VPN
- tunnelling

Topic 2.4

Learners should be able to differentiate between different types of intrusion detection methods to include but not limited to:

Intrusion detection methods:

- network based
- host based
- honey pots
- incident response

Learners need to understand the concepts behind each type, along with the implementation and configuration of each type of intrusion detection system.

Topic 2.5

Learners should understand the concepts behind the types of security baselines to include but not limited to:

Security baselines:

- OS / NOS (Operating System / Network Operating System) hardening
- network hardening
- application hardening

Learners need to understand what a security baseline is, and understand the implementation and configuration of each type of baseline.

In addition to security baselines, learners will need to understand the trust implications that can apply when accessing online services. This can include identity management through single-sign on authentication and authorisation to access specific resources. Learners will be able to recognise the difference between service provider identity management and the development of providing an online identify from own enterprise identity store (IdP).

Learning outcome:

3. Identify types of cryptography

Topics

- 3.1 Types of **cryptographic algorithms**
- 3.2 Cryptography addresses
- 3.3 Public key/Private key infrastructure
- 3.4 The concepts of key management and certificate lifecycles

Topic 3.1

Learners should understand different types of cryptographic algorithms to include but not limited to:

Cryptographic algorithms:

- Hashing
- Symmetric
- Asymmetric
- RSA
- Public key
- Private key

Topic 3.2

Learners should understand how cryptography is employed to address different Information Security needs including but not limited to:

- confidentiality
- integrity
- authentication/non-repudiation
- access control

Topics 3.3, 3.4

Learners need to understand Public key/Private key infrastructure and the concepts of key management and certificate lifecycles to include but not limited to:

- certificates and granting authorities
- revocation
- trust models
- centralised V's decentralised
- storage
- escrow
- expiration
- suspension
- recovery
- renewal
- destruction
- key usage eg public, private

Guidance for delivery

In order to complete this unit the learner should have access to scenarios where systems have been infected or attacked maliciously.

Learners should have an opportunity where possible to counter attacks and intrusions using a range of technologies and software.

Learners must also be encouraged to research high profile attacks that have been covered in the press, especially their causes and impact.

Suggested learning resources

IT Security: <http://www.itsecurity.com/>

Computer Weekly: <http://www.computerweekly.com/resources/IT-security>

Search Security: <http://searchsecurity.techtarget.com/>

Bletchley Park Trust (Education Resources): <http://www.bletchleypark.org.uk/edu/resources.rhtm>

The National Museum of Computing (Education Resources):
<http://www.tnmoc.org/learn/educational-visits>

Professional Bodies, Trade Associations and Sector Skills Council

Information Security Specialist Group (ISSG) of BCS The Chartered Institute for IT: <http://www.bcs-issg.org.uk>

The Institute of Information Security Professionals: <https://www.iisp.org/imis15/>

The Worshipful Company of Information Technologists: <http://www.wcit.org.uk>

e-skills UK: <https://www.e-skills.com/professional-development/cyber-security/>

The Cyber Security Challenge UK: <https://cybersecuritychallenge.org.uk/existingsponsors.php>

UAN:	R/506/5051
Level:	3
GLH:	60

What is this unit about?

Since the advent of the Internet, networking is probably the single most pervasive technology that influences our professional and private lives from using our mobile phones to Internet banking.

The purpose of this unit is to provide learners with an understanding and practical experience of the principles involved in computer networking through interconnecting static network devices such as desktop computers, mobile network devices, and home appliances, using multiple methods.

Learners may be introduced to this unit by asking themselves questions such as:

- How do I create a network?
- What hardware and software do I need to create a network?
- How do I connect my phone to a network?
- What is the 'Internet of Things'?

Learning outcomes

In this unit, learners will be able to:

1. determine physical and logical network topologies and components
2. recognise the Open System Interconnection (OSI) model of networking
3. recognise the Transmission Control Protocol/Internet Protocol (TCP/IP) model of networking
4. configure networks

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Determine physical and logical network topologies and components

Topics

- 1.1 The difference between **physical** and **logical** network topologies **Vulnerabilities and threats**
- 1.2 Hardware and software **technologies** used in networking

Topic 1.1

Learners should be able to differentiate between the physical and logical network topologies; while understanding the standards that apply to different networks.

Physical:

- Point to Point eg Plain Old Telephone Service (POTS)
- Ring
- Bus
- Star
- Mesh (fully connected)
- Mesh (Partially connected)
- Cellular
- LANs
- WANs

Logical:

- Clock based
- Token passing
- Broadcast (eg Ethernet and Wireless)

Standards:

- IEEE 802.xx
- Wireless
- Bluetooth
- 3G / 4G (LTE) / 5G ('beyond 2020')

Topic 1.2

Learners should understand the different hardware and software components that may be used to implement a network, including but not limited to:

Technologies:

- network hardware
 - workstation
 - server
 - Network Interface Card (NIC)
 - repeater
 - hub (active / passive / intelligent)
 - bridge
 - switch
 - router
 - gateway

- network software and applications
 - network operating system
 - firewall
 - proxy server
 - web server
 - anti-virus / anti-malware
 - text based messaging systems
 - video conferencing
 - VOIP
- interconnection technologies
 - cable types and connectors
 - Cat 5 and RJ11 / RJ45 connectors
 - Cat 5e
 - Cat 6
 - Coaxial and F / BNC / RCA / RG6 / RG59 connectors
 - Fibre Optic and ST / SC / FC / LC connectors
 - radio technologies
 - Wireless
 - Bluetooth
 - 3G / 4G (LTE) / 5G ('beyond 2020')

Learning outcome:

2. Recognise the Open Systems Interconnection (OSI) model of networking

Topics

2.1 The **7 Layers** of the OSI model and the **relationship** between each layer

2.2 The network **functionality** within each layer

Topic 2.1

Learners should be able to identify the 7 Layers of the OSI model and the relationship between each of the layers.

7 layers of the OSI model:

- Application
- Presentation
- Session
- Transport
- Network
- Data Link
- Physical

Relationship (including but not limited to):

- hardware
- software
- encapsulation
- protocols

Topic 2.2

Learners should be able to determine which network function(s) takes place at each layer, including but not limited to:

Functionality:

- network processes to applications

- data representation
- interhost communication
- end-to-end connectivity
- address and 'best path'
- access to media
- binary transmission

Learning outcome:

3. Recognise the Transmission Control Protocol/Internet Protocol (TCP/IP) model of networking

Topics

- 3.1 The **layers** of the TCP/IP model and the **relationship** between each layer Cryptography addresses
- 3.2 The network **functionality** within each layer of the TCP/IP model
- 3.3 The **relationship(s)** between the OSI 7 Layer model and the TCP/IP model

Topic 3.1

Learners should be able to identify the layers of the TCP/IP model and understand the relationship between each layer.

Layers of the TCP/IP model:

- Application
- Transport
- Network/Internet
- Network Interface

Relationship (including but not limited to):

- hardware
- software
- encapsulation
- protocols

Topic 3.2

Learners should be able to identify which network function(s) takes place at each layer of the TCP/IP Model, including but not limited to:

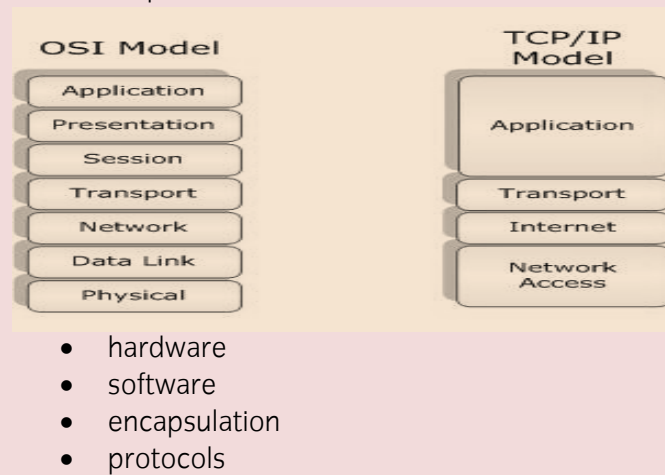
Functionality:

- application programs using the network
- management of end-to-end message transmission, error detection and error correction
- handling of datagrams: routing and congestion
- management of cost effective and reliable data delivery, access to physical networks
- physical media

Topic 3.3

Learners should be able to identify the relationship(s) between the TCP/IP model and the OSI models, including but not limited to:

Relationship:



Learning outcome:

4. Configure networks

Topics

4.1 Connect multiple **network components**

4.2 Carry out the configuration of network **connection and security**

Topic 4.1

Learners should be able to connect multiple network components (a minimum of 3) to construct a functioning network, which may include but should not be limited to:

Network components:

- server(s)
- workstation(s)
- laptop(s)
- tablet device(s)
- mobile phone(s)
- printer
- hub
- switch
- router
- gateway
- ethernet
- USB
- wireless
- fibre optic
- network access point

Topic 4.2

Learners should be able to configure networks in order to provide connectivity and security for devices and users, which may include but should not be limited to:

Connectivity:

- ethernet
- USB

- wireless
- fibre optic
- IP v4
- IP v6

Security and file sharing:

- usernames
- passwords
- network access
- network share

Guidance for delivery

Wherever possible this unit should be delivered within a workshop environment providing learners with practical exercises or case studies. Learners should be encouraged to explore and use a wide range of hardware and software, this should also include researching and utilising new and emerging technologies.

Whichever method (s) are used, learners should experience a variety of technologies.

When creating the network learners should incorporate a **minimum of 4 nodes** plus at least one interconnection device. Learners may also add peripherals to the network if required.

Suggested learning resources

IT Security: <http://www.itsecurity.com/>

Computer Weekly: <http://www.computerweekly.com/resources/IT-security>

Search Security: <http://searchsecurity.techtarget.com/>

Bletchley Park Trust (Education Resources): <http://www.bletchleypark.org.uk/edu/resources.rhtm>

The National Museum of Computing (Education Resources):
<http://www.tnmoc.org/learn/educational-visits>

Professional Bodies, Trade Associations and Sector Skills Council

Information Security Specialist Group (ISSG) of BCS The Chartered Institute for IT: <http://www.bcs-issg.org.uk>

The Institute of Information Security Professionals: <https://www.iisp.org/imis15/>

The Worshipful Company of Information Technologists: <http://www.wcit.org.uk>

e-skills UK: <https://www.e-skills.com/professional-development/cyber-security/>

The Cyber Security Challenge UK: <https://cybersecuritychallenge.org.uk/existingsponsors.php>

UAN:	Y/506/5052
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to get an understanding of the various ways individuals and businesses can communicate online, the advantages and disadvantages of each and how to communicate safely.

The unit covers how individuals communicate using a range of digital tools whilst ensuring their own personal safety and promoting their own personal brand. As part of this unit learners will explore the use of a variety of social networks to communicate with others.

Learners will also analyse how businesses are using a range of digital communication tools to communicate with their audience.

The unit will include discussion and use of the following digital communication technology:

- emails
- collaboration tools
- social networks
- blogs
- a range of creative digital tools (including imaging, video and infographics)

Learners may be introduced to this unit by asking themselves questions such as:

- How can I use digital communication to promote myself?
- How does business use digital communication?
- What range of digital communication tools are used by businesses?
- How do I use digital communication tools?

Learning outcomes

In this unit, learners will be able to:

1. use email to communicate with others
2. use collaboration tools to complete tasks
3. use social networks and blogs to communicate
4. evaluate how business brands communicate using social networks and blogs
5. create digital content
6. recognise ethical, legal and online implications when using digital communications

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Use email to communicate with others

Topics

- 1.1 Set-up email application on devices
- 1.2 Compose and send e-mail messages following local guidelines
- 1.3 Manage incoming emails

Learners must be able to use email to communicate with others.

Topic 1.1

Learners need to be able to:

- set up email on a variety of devices
- understand the difference between POP / SMTP / IMAP
- understand the differences when using email
 - on the internet
 - through an email client
 - on a mobile device
- create and maintain an address book across devices
- compose and use an email signature across devices

Topic 1.2

Learners need to be able to:

- compose, format, send and forward e-mail messages to multiple recipients safely
- attach files to email messages
- understand the difference between cc and bcc and when they should be used
- understand potential restrictions when sending email messages, eg too many recipients, large attachments
- understand and use email encryption

Topic 1.3

Learners need to understand when and how to respond to email messages and they should be able to :

- respond to email messages
- use folders to organise email messages.

Learning outcome:

2. Use collaboration tools to complete tasks

Topics

- 2.1 Stay safe and secure when using collaborative technologies
- 2.2 Prepare collaborative technology for use
- 2.3 Manage tasks using collaborative technology

Topic 2.1

Learners should be able to develop:

- guidelines for good practice when working with collaborative technology
- an identity and information that promotes trust.

Learners should know how to mitigate risks when using collaborative technologies eg disclosure of sensitive information.

Topic 2.2

Learners should explore a range of collaborative tools including but not limited to wikis, social bookmarking, and google documents.

Learners should understand the features, benefits and limitations for different collaborative IT tools. How work is archived, the potential access and compatibility issues should also be explored.

Learners should be able to select, connect and configure a collaborative tool for use.

Topic 2.3

Learners should use a collaborative tool for a purpose. They should be able to:

- manage access levels and permissions for different purposes
- facilitate others' responsible contributions to engage with the tool

Learners should understand why it is important to manage the moderation of others comments and how to moderate. They need to be aware of what problems can occur with collaborative technologies and understand how to respond to problems.

Learning outcome:

3. Use social networks and blogs to communicate

Topics

- 3.1 The importance of defining a personal brand before using digital communications
- 3.2 Define a personal brand
- 3.3 Evaluate how a personal brand is displayed on public and private digital communications
- 3.4 The social networks that can be used and the differences between them for personal and business use
- 3.5 Manage profiles on social networks to represent personal brand
- 3.6 Set security settings on social networks for personal and business use
- 3.7 Engage with others on social networks
- 3.8 The difference between a blog and a web page
- 3.9 Create a blog with posts

Learners must be aware of their own personal brand – what they stand for and how they want to represent themselves to others. They need to be aware that employers and others will search for them across the internet and what is found should represent their personal brand. They also need to understand that knowing their personal brand can help them to respond to digital communications appropriately.

Topic 3.1

Learners should understand:

- the importance of individuals being represented consistently online and offline
- that personal brand awareness will enable them to moderate what communicate on public digital communications.

Topic 3.2

Learners should consider each aspect of their own personal brand.

Aspect of personal brand:

- values
- skills
- goals
- visual impact
- interests
- personality

Topic 3.3

Learners should be able to:

- analyse how digital communication reflects a personal brand
- identify differences between public and private digital communications
- suggest changes that may be made to an individual's digital communication

As part of the teaching learners are expected to generate evidence of the processes listed in topic 3.3.

Topic 3.4

Learners should understand the differences between the main social networks for personal and business use.

Topic 3.5

Learners should be able to:

- create and update their profile on a range of social networks
- use imagery and profile content to represent their individual personal brand

Topic 3.6

Learners should understand how security settings differ across social network platforms and why different security settings might be used for personal and business use.

Learners should be able to set security settings for a range of social networks for a purpose.

Topic 3.7

Learners should be able to engage with others on social networks by

- connecting with others across a range of social networks
- using a range of social networks to engage with others
- understanding how to use language, tone and voice to represent their personal brand.

Topic 3.8

Learners should understand the differences between blogs and websites and know why to choose one over the other for personal and business use.

Learning outcome:

4. Evaluate how business brands communicate using social networks and blogs

Topics

- 4.1 Why businesses use social networks and blogs to communicate
- 4.2 Analyse how businesses project brands on social networks
- 4.3 Analyse how business brands engage on social networks and blogs

Learners should be able to use a range of social networks.

Topic 4.1

Learners should understand why businesses use social networking and blogging as a way of communicating with their audience.

Topic 4.2

Learners should investigate how business brands use a range of social networks to project their brand in terms of consistent images, themes and messages.

Learning outcome:

5. Create digital content

Topics

- 5.1 Why businesses plan and use **digital content**
- 5.2 Types and characteristics of digital content
- 5.3 Tools to create and display digital content
- 5.4 Produce content to share on personal social networks

Learners should have an introduction to the type, range and characteristics of digital content including but not limited to:

Digital content:

- images
- videos
- infographics
- podcasts
- social bookmarking

Topic 5.3

For each type of digital content, learners should understand the range of tools available to create and display content. Note: this is an introduction, not an in depth exploration of the tools.

Learning outcome:

6. Recognise ethical, legal and online implications when using digital communications

Topics

- 6.1 Law compliance when using digital communication
- 6.2 Recommended behaviour when using digital communication
- 6.3 The use of business policies relating to digital communication
- 6.4 Ethical issues with relation to digital communication

This learning outcome covers why individuals and businesses need to be aware of the ethical and legal impact of what they share online. Learners also need to consider what contextually acceptable / unacceptable online behaviour is.

Topic 6.1

Learners should understand the impact of laws when individuals and businesses use digital communications. Laws to be considered including but not limited to:

- Data Protection Act 1998
- Cookie Law
- Libel
- Harassment
- Consumer Protection from Unfair Trading Regulations 2008
- Privacy and Electronic Communications (ED Directive) Regulations 2003
- Copyright Law 1988

Topic 6.2

Learners should understand implications of positive and negative behaviours when using digital technology including but not limited to:

- proper 'netiquette' communication skills
- effective solutions for cyber-bullying
- choosing the time and place to use digital tools
- recognise differences and etiquette within diverse digital communities

Topic 6.3

Learners should understand the policies that businesses have in place relating to digital communication. These will include but not limited to:

- social media policy
- acceptable computer use

Topic 6.4

Learners need to consider the ethical factors when using digital communication. Including, but not limited to:

- age appropriate marketing
- inclusivity
- corporate social responsibility
- equal access to digital communication
- free speech vs privacy
- speed of communication vs accuracy and quality
- file sharing / pirating vs legal downloads of software, music and video.

Guidance for delivery

Learners may need support from the tutor and their peers to define their personal brand therefore they might need to support each other during the activities. Some of the activities will require group work but each learner will need to be given the opportunity to be the leader of the group.

During this module, learners should create or maintain personal profiles on a number of social networks and select security settings of their choice on each network. Learners should understand the consequences of their choice of security settings. Therefore centres will need to ensure learners have appropriate access to a range of social network platforms.

Learners should be encouraged to bring their own views and experience to the unit. There is often no 'right' answer, however learners will need to be able to give clear and rationalised arguments to back up their activity.

Learners should use available resources to support study which may include the use of libraries, websites, accessing research data, learning centres, articles, television programmes and other professionals.

Opportunities for professional development include formal opportunities such as English, IT and informal opportunities such as reading journals/articles/books, watching documentaries /programmes, use of internet.

Suggested learning resources

Google Docs:	https://docs.google.com
Zoho Wiki:	https://wiki.zoho.com/
Delicious:	http://delicious.com
Diigo:	http://www.diigo.com
Using Social Media for Personal Gain:	http://bookboon.com/en/using-social-media-for-personal-gain-ebook
Blog Basics:	http://blogbasics.com/what-is-a-blog/
Digital Law:	http://www.digitallawuk.com

UAN:	D/506/5053
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand how programs are developed, the different purposes of programming languages, and the components that exist within them.

Learners will be able to identify the most appropriate programming language to use for given projects, the impact that data type declarations have on memory and existing technologies that can be used for e-commerce purposes.

This unit is only intended to give learners the background knowledge necessary to progress to using a programming language for a specific purpose.

Learners may be introduced to this unit by asking themselves questions such as:

- Where do I start in order to create an application?
- Are all programming languages the same?
- What is the purpose of software testing?
- Do I need to keep any records?
- Will this unit help me to create a website?

Learning outcomes

In this unit, learners will be able to:

1. determine the design of programming languages
2. recognise common programming language data structures
3. determine application software for business purposes
4. create documented code.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Determine the design of programming languages

Topics

1.1 The differences between programming languages

1.2 The **systems life cycles**

1.3 The **testing** of software

1.4 The **storage** of information

Topic 1.1

In order to utilise the most appropriate programming language, learners need to understand how programming languages have developed and the different techniques they use, including but not limited to:

- understand how programming systems have developed
 - Low level languages
 - High level languages
 - Assembly code
- language techniques
 - Sequential programming – top down
 - Structured programming – eg procedural languages)
 - Object oriented
 - Event driven

Topic 1.2

In order to understand how software applications are developed and maintained, learners should explore different life systems life cycles models. Within systems life cycles, learners should understand the importance of effective planning prior to coding and testing prior to implementation. The life cycle models can include but are not limited to:

Systems life cycle models:

- Standard Life Cycle
 - simplistic design
 - each of the four stages can have their own independent life cycle
- Waterfall
 - completion of each phase prior to moving onto the next phase of the cycle
- Prototyping
 - uses an early approximation of a final system
- Spiral
 - combines the features of the prototyping model and the waterfall model
- Agile
 - supports the assessment of project direction throughout the development lifecycle

Learners should be able to understand that whichever systems life cycle model is employed, in order to support development and future maintenance, documentation needs to be created which includes but is not limited to:

Documentation:

- Requirements document
 - overview of project aims
 - design specification
 - project management
- System functionality and data flows
 - Data Flow Diagrams
 - JSP Charts
 - Pseudo code
 - Rapid application development (RAD)
- Test Plans
 - known inputs
 - expected outputs
- Test logs
 - actual outputs to know inputs
 - run-time errors
- Review
 - including any amendments to the original design

Topic 1.3

Learners need to explore different testing techniques prior to any roll-out. The technique selected for a given project should ensure that any testing is both rigorous and fully documented. This can include but is not limited to:

Testing Techniques:

- Black box
- White box
- Volume
- Functionality
 - Usage
 - Target environment
 - Component
- Boundary

Types of errors:

- Syntax
- Logical
- Runtime

Documentation:

- Test Plan
- Test Log

Topic 1.4

Learners need to explore how data is actually stored. Learners must be aware that compilers convert the textual code into binary digits and that the Central Processing Unit (CPU) works through instruction sets. Storage includes but is not limited to:

Storage:

- Memory
 - RAM
 - for immediate use
 - volatility
 - Permanent storage

- hard disk
- optical
- ROM
- Number formats
 - decimal (Base 10)
 - binary
 - hexadecimal
 - compiler conversion
- CPU
 - Instruction Set Architecture (ISA)

Learning outcome:

2. Recognise common programming language data structures

Topics

- 2.1 Data structures
- 2.2 Programming constructs
- 2.3 Object oriented programming

Topic 2.1

Learners need to understand that all programming languages share some common design features. In coding programs, learners will need to be aware of naming conventions and the use of reserved words, especially those which have specific purposes or are used as CPU instructions. They include but are not limited to:

Features:

- Data types (eg char, float etc.)
- Arrays
- Stacks
- Queues
- Naming conventions
 - Use of key words
 - Consistency
- Declaring variables
 - Impact of variables on memory allocation
 - Local
 - Global
 - Static
- Functions
 - Pre-defined
 - Coded
- Compiler directives (eg #include)
- Comments explaining code operation.

Topic 2.2

Learners need to explore how algorithms are used to solve simple or complex problems. They should understand that algorithms can use decisions, iterations or selections to control pathways. They include but are not limited to:

Algorithms:

- solutions to a problem
- mathematic calculations

- can comprise of either simple or complex code

Decisions:

- Conditional checks
- Conditional statements if, if...else
- Switch()

Iterations:

- For()
- While()
- Do...while()
- If()

Topic 2.3

Learners will be able to explore the basic constructs of object oriented programs in relation to how data objects can be manipulated to reflect real world objects.

Constructs:

- fundamentals of classes
- encapsulation
- inheritance
- polymorphism.

Learning outcome:

3. Determine application software for business purposes

Topics

- 3.1 Integrated software **applications**
- 3.2 Web applications

Topic 3.1

Learners need to understand that software applications are categorised by their intended use. Where applications are integrated learners must understand the need for integration. Learners should understand the difference between interfacing and integration. The types of applications include but are not limited to:

Applications:

- stand-alone
- integrated software suites
- networked
- Internet
- mobile devices

Topic 3.2

Learners should explore the constructs of web applications and how websites are hosted. In order to successfully build and deploy an e-commerce website, learners must have knowledge of server and client side services, including how databases are linked to web pages.

Website construction:

- Constructs
 - Html tags/elements
 - State v stateless
 - HTML5 (hyper text mark-up language) includes:
 - CSS (how the elements will look) cascaded style sheets
 - Scripting languages
 - Interpretation by web browsers
 - Status in session
 - Style sheets
- Hosting websites
 - Server-side
 - Client – side
- Web services
- Databases
 - Linking to websites
 - Security

Learning outcome:

4. Create documented code

Topics

- 4.1 Develop software
- 4.2 Review development

Topics 4.1, 4.2

Learners should be able to use the knowledge gained in learning outcomes 1- 3 in order to develop code through design, code, test and review one or more algorithms for specific purposes, using any programming language. The demonstration of knowledge can include but is not limited to:

Design:

- software requirements document

- design specification
- project timelines

Code:

- simple inputs and outputs
- sorting
- searching
- calculations
- selection
- iteration
- object orientation
- event actions

Test:

- test plan justifying the type of technique used
- test log showing actual outputs from known inputs

Review:

- feedback on project
- recommendations for improvements

Guidance for delivery

The content of this unit is intended to give the learner an overview of program design, coding and testing.

The coding tasks could be directed towards creating a number of simple programs or one larger program, as long as they are capable of generating both input and output. Ideally, programs should explore the constructs of either event driven programs or those that encapsulate the development of classes.

The content of this unit should cover the fundamental knowledge needed to further develop programming skills in the Application Development unit. The Application Development unit could be delivered in such a way that it supports the chosen language for the programming project. This should reduce some of the time learners will need to understand and develop within the programming language software.

Suggested learning resources

Books

C# in easy steps

Anderson T, 2004

In Easy Steps Limited

ISBN-10: 1-84078-150-5

JavaScript in easy steps – 5th Edition

McGrath M, 2013

In Easy Steps Limited

ISBN-13: 978-1840785708

C++ Programming in easy steps

McGrath M, 2013

In Easy Steps Limited

ISBN-13: 978-184 0784329

Learning Python, 5th Edition
Lutz M, 2014
O'Reilly Media Inc.
ISBN-13: 978-1-449-35573-9

C/C++ Programmer's Reference
Schildt H, 1997
Osborne, McGraw-Hill
ISBN-10: 0-07-882367-6

The Java Tutorials: <http://docs.oracle.com/javase/tutorial/java/>

The Java SE Tutorial Downloads: <http://www.oracle.com/technetwork/java/javase/java-tutorial-downloads-2005894.html>

UAN:	K/506/5055
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to acquire and demonstrate a range of skills involved in research. The collection and analysis of data can encompass both digital and non-digital research.

Learners will be given the opportunity of exploring a range of techniques used for the purpose of collecting data, analysing its contents for a given purpose and presenting the resulting information.

This unit is intended to explore the concepts of collecting and analysing data in order that it can support other units. In particular, this unit will support any unit that requires a feasibility study to be conducted or research to justify a given design.

Learners may be introduced to this unit by asking themselves questions such as:

- What is the difference between data and information?
- Where do I start to gather data?
- What sources of data can I use?
- Why do I need to justify sources of data?
- Is there a format for publishing the results of data analysis?
- How does integrity affect the results of data analysis?
- How can I ensure the integrity of all my data?

Learning outcomes

In this unit, learners will be able to:

1. recognise the concepts of data analysis
2. determine the techniques used to collect data for analysis
3. determine how to present the results from data analysis
4. perform collection and analysis of data.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Recognise the concepts of data analysis

Topics

- 1.1 Assess the need for research
- 1.2 Types of research and data sources
- 1.3 Explore methods of recording data

Topic 1.1

Learners will need to understand that the correct implementation of data analysis supports both the statistical or logical interpretation of data that can be obtained from a variety of sources. In order for learners to be able to select the most appropriate collection and analysis technique, they must first be able to identify the intended purpose of any research.

Depending on the purpose, data research and analysis can either support or negate a need for change. In assessing the need for research, learners should recognise that the most common reasons for data analysis include but are not limited to:

- general research (eg education, planning)
- data collection (eg polls, emerging trends)
- modelling real life situations
- forecasting and prediction

Learners will also need to understand that the strategies employed for data collection and analysis should be open and represent the current context or intended goal of any research. Effective data analysis should not be biased from the outset by any pre-conceived conclusions.

Topic 1.2

Having identified the purpose of the research, learners will need to understand the category that the research falls into and modify any approach accordingly in order to collect sufficient and appropriate data. The research categories for data collection and analysis include but are not limited to:

Qualitative research (eg non-numerical):

- interviews
- observations (unobtrusive)
- documentation
- field studies/notes
- biographies
- audio/video files

Quantitative research (eg numerical):

- statistics
- existing numerical data
- metrology
- exploration (eg land, space)
- surveys
- repeated experiments

Learners will need to understand that data can be discrete or continuous.

Topic 1.3

Learners will need to explore different methods of gathering data from a range of sources and to support different types of research. They will need to be aware that all conclusions reached need to be justified and evidenced through the analysis. Primary, secondary sources and tertiary of data used for analytical purposes can be recorded in various formats.

Primary sources (can include but are not limited to):

- direct evidence
- first hand knowledge
- personal correspondence
- census records
- official logs
- personal accounts
- recordings (eg documentaries, audio or video)
- photographs
- documentation (eg newspapers, books)

Secondary sources (can include but are not limited to):

- interpretation
- previously analysed or researched work
- unsubstantiated evidence
- historical accounts
- dictionaries
- websites
- personal reviews

Tertiary sources can include but are not limited to a mixture of both primary and secondary sources.

Learners will also need to understand that research can be qualitative or quantitative to include but not limited to:

Qualitative research:

- video recordings
- tape recordings
- note taking that can be transcribed at a later date (eg minutes)
- word process documents
- database files or index cards capable of being sorted
- interviews - that can often generate meaningful and detailed data such as current trends, understandings or concepts
- avoiding biased questioning or questionnaires

Quantitative research:

- spreadsheet data
- graphical representations
- data recorders
- polls
- data mining
- verified historical data

Learning outcome:

2. Determine the techniques used to collect data for analysis

Topics

- 2.1 Use a methodical approach to data collection
- 2.2 Verifying data reliability and integrity
- 2.3 Ethical behavior in the collection of data

Topic 2.1

Learners should understand that a methodical approach towards the collection and analysis of data involves the application of various research tools that can include but are not limited to:

Summary:

Data collection can involve the collation of large amounts of data. It may be possible to partially analyse data prior to storage but in any event where there are numerous interviews, observation notes, field notes or numerical data, consideration should be given to creating a summary of the data concerned. Summarised data can be readily reviewed when it is being analysed at the conclusion of a project or research ensuring that any meanings are interpreted correctly.

Documented data can be sorted under common issues, ages of participants or themes, while numerical data can be summarised as averages, graphs or frequencies.

Standardisation:

When summarising data it is best to use a consistent format for recording any research (eg style, keywords, referencing etc). Data that has been standardised correctly is more readily accessible and can better support any conclusions as there is less likelihood of data being overlooked.

Topic 2.2

Learners need to be aware that any data gathered for the purpose of producing information must be from reliable sources and unbiased. Confirming the integrity and reliability of data can include but is not limited to:

- verifying sources of data
- preventing unbiased inferences
- preventing the repetition of source data
- using the correct data collection method
- analysing data fairly and accurately
- identifying differences between groups or subgroups (eg age ranges)
- creating an audit trail of all data and sources.

Topic 2.3

Learners need to be aware that in order not to compromise any outcomes, the collection of data must be gathered in an ethical manner, including but not limited to:

- preventing exclusion
- selective groups
- pre-judging outcomes
- altering or changing data (eg massaging)
- unbiased approaches to data collection
- conformity to legislation
- plagiarism.

Learning outcome:

3. Determine how to present the results from data analysis

Topics

3.1 Reporting the findings of analysis

3.2 Formatting reports

3.3 The importance of a bibliography

Topic 3.1

Learners must be given the opportunity to explore reporting the outcomes from analysis for both qualitative and quantitative research. Reports must draw conclusions based on effective analysis including but not limited to:

- not basing conclusions on assumptions or bias
- verifying the sources of all data
- including where applicable any groups or sub-groups
- using accepted norms of analysis
- clearly defining the objectives of the research
- defining the measurements used to justify any conclusions
- not misinterpreting any findings during research
- applying honesty and integrity when reporting

The reports themselves could be for:

- reports
- conference submissions
- presentations
- thesis
- management information
- decision making
- analytical surveys

Reports could support information such as:

- tables
- spreadsheets
- graphs

Topic 3.2

Learners should learn how to generate reports for both qualitative and quantitative research that fully reflect the findings of analysis, being presented in a clear and informative way. The reports formatting could include but are not limited to:

- consistent numbering
- consistent styling
- related diagrams or graphs with understandable axis
- be descriptive to aid understanding
- be written in an academic style (eg not in the first person)
- reflecting the number of sources of data used
- data tables
- images in the text or as appendices

- highlight any data not able to be included to avoid misinterpretation
- statistical data
- non-statistical data

Topic 3.3

Learners need to recognise the requirement to attribute any other persons work, statements or research. This is usually achieved by the inclusion of a bibliography (eg Harvard) that lists any quotations, books, magazines or Internet sources used in a research project. Failure to do so could breach copyright or other ethical or moral guidelines.

Learning outcome:

4. Perform collection and analysis of data

Topics

- 4.1 Investigate data requirements for a given purpose
- 4.2 Collect verified data for analysis
- 4.3 Report on analysis outcomes

Topics 4.1 – 4.3

Learners should be able transfer the knowledge gained from learning outcomes 1-3 for a practical scenario. Learners should explore a range of criteria for differing purposes including qualitative and quantitative research.

Having undertaken collection of data, learners should use a suitable technique/approach to analyse data in order to make judgements and report their findings using a clear, unbiased and consistent style. Learners should be encouraged to demonstrate the analytical basis for their findings, the validity of their sources and the reasoning behind any conclusion reached.

Guidance for delivery

The content of this unit is intended to give the learner an opportunity to develop the skills necessary to effectively research any given subject.

In performing research for any of the other units (eg a feasibility study) learners will naturally put into practice the concepts and techniques for the collection and analysis of data.

This unit would be best delivered alongside Project Management where client or user requirements can be researched and documented.

Suggested learning resources

Books

Data Collection and Analysis
 Roger Sapsford, Victor Jupp, 2006
 Sage
 ISBN-13: 978-0761943631

Responsible Conduct of Research

Shamoo, A.E., Resnik, B.R. (2003)
Oxford University Press.
ISBN 13: 9780195368246

Qualitative research and evaluation methods (3rd ed.).
Patton, M. Q. (2002).
Sage.
ISBN 13: 978-0761919711

Designing and conducting mixed methods research.
Creswell, J. W., & Clark, V. L. P. (2007).
Sage.
ISBN-13: 978-1412975179

Websites

http://nnlm.gov/evaluation/workshops/measuring_your_impact/DataCollectionHandout.pdf

<http://www.preservearticles.com/201104125345/methods-of-collecting-primary-data-in-statistics.html>

UAN:	M/506/5056
Level:	3
GLH:	30

What is this unit about?

The purpose of this unit is for learners to explore the various tools typically available to promote business enterprise through the Internet. These tools include but are not limited to social media, e-commerce, blogs, internet etc. It is about how these can be used along with the main components of enterprise for specific purposes.

Learners may be introduced to this unit by asking themselves questions such as:

- What is enterprise technology?
- How is enterprise technology regulated?
- What are the main components of enterprise technology?
- How is enterprise technology changing the way business is conducted?

Areas for exploration will include the shift from physical outlets towards online ordering and supplying (e-commerce).

Learning outcomes

In this unit, learners will be able to:

1. identify tools and components that can be used for enterprise technology
2. determine how online financial transactions can be carried out and the associated regulations

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Identify tools and components that can be used for enterprise technology

Topics

- 1.1 Online tools that can be used for enterprise technology
- 1.2 Enterprise technology **components** and how they can be used

Topic 1.1

Learners should understand that enterprise technology is the process of gathering information and personal data that enables different tools to be used to target marketing of products related to the individual. This enables businesses to increase turnover based upon the information gathered and reduced business overheads eg reduced presence in the high street (lower rents), less stock required, informed planning and improved logistics.

Learners must have an understanding of how online and mobile analytical tools can contribute towards the following, including but not limited to:

Tools:

- Social networks
 - Targeted advertising
 - Approved content and recommendation eg 'like', '+1'
- Blogs
- Forums
- E-Commerce sites
- Smartphones
- Apps
 - In Apps Purchases
- Information management systems
- Customer Relation Management (CRM) systems
- Search engines
 - Browser history
 - Cookies
 - Aggregation tools that pull data from multiple sources to create buyer/user profiles

Topic 1.2

Learners must have an understanding of how the following enterprise technology components are used, including but not limited to:

Components:

- CRM systems
 - recording all contacts with customers
 - storing customer's details
 - retrieving customer's information
 - targeted e-mails
- database driven websites
- social media and search engines
 - sponsored links

- pay per click
- pop-ups
- data mining
 - loyalty cards use
 - spending history
 - targeted promotion
 - business development
 - informed planning
 - logistics
 - audit trail
- mobile apps
- bluetooth messaging
- integration of all the above using cloud platforms
- the importance of identity online and identity relationship management

Learning outcome:

2. Determine how online financial transactions can be carried out and the associated regulations

Topics

- 2.1 **Direct payment methods** accepted for enterprise technologies
- 2.2 **Indirect payment methods** accepted for enterprise technologies
- 2.3 **Regulations** relating to payments

Topics 2.1, 2.2

Learners must have an understanding how online financial transactions are conducted. Learners must have an understanding of the following methods of payment including but not limited to:

Direct methods of payment:

- credit card payment
- debit card payments
- credit accounts
 - shopping basket

Indirect methods of Payment:

- Escrow (governed by Financial Services Authority - FSA)
- 3rd party services
 - payment on delivery

Topic 2.3

Learners must be aware of the following regulations and how they apply to purchase of goods and/or services online in order to demonstrate compliance, including but not limited to:

Regulations:

- Sales of Goods Act 1979
- Distance Selling Regulations 2000
- Consumer Credit Act 1974
- Unfair Terms in Consumer Contract Regulations 1999
- E-Commerce Regulations 2002
 - Information that must be supplied
 - Electronic Signature Regulations 2002
- Data protection Act 1998

Guidance for delivery

This unit can be delivered alongside many of the other units. It could be used as the foundation for a learner's project and would help provide the underpinning knowledge required for the learner to complete their other work.

A typical project could include the creation of a website, the promotion of the website through different mediums and the ability for payments to be taken online.

Suggested learning resources

Data Protection: A Practical Guide to UK and EU Law Carey P

Published By: Oxford University Press, 2009

ISBN-10 0199563543

Selling online - an overview of the rules: <http://www.out-law.com/page-424>

Consumers Rights: <http://www.which.co.uk/consumer-rights/regulation>

UAN:	A/506/5058
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to demonstrate the knowledge and skills learned in either Introduction to Programming or Software Development Fundamentals.

Learners will be given the opportunity of designing a software application and its accompanying documentation in preparation for one of the coding units. It would be to the learner's advantage if they based their designs around the programming language that they intend to use.

This unit does lend itself to being a part of a larger project that can encompass one or more other units (eg Project Management) in order to give the learner an insight into programming requirements within the software development industry.

Learners may be introduced to this unit by asking themselves questions such as:

- Where should I start to gather the required information?
- Does my plan meet with the customer's requirements?
- What software testing methodology shall I use?
- How should I produce my documentation?
- What systems development life cycle should I follow to support future development?
- How will my documentation support future maintenance of an application?

Learning outcomes

In this unit, learners will be able to:

1. create program specifications
2. create design specifications
3. use testing methodologies
4. determine how documentation supports software development

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Create program specifications

Topics

- 1.1 **Analytical tools** to identify user needs
- 1.2 Life cycle methodology
- 1.3 Plan to develop a software application

Topic 1.1

In order to create software applications, the learners will be able to demonstrate that they understand the client or end user **requirements**. Learners should use a range of **analytical tools** in order to document the feasibility. The requirements and analytical tools can include but are not limited to:

Requirements:

- intended purpose
- targeted platform
- system constraints
 - hardware
 - software
 - in-house
 - web/cloud based
- project constraints
 - budget
 - time
 - specialist skills
 - quality
- designs to be included (eg logos, images)
- style (eg event driven, procedural)
- end user (eg skill level, training implications)

Analytical tools:

- Interview
- survey
- direct questioning (eg recorded, documented)
- market research
 - current products
 - future developments
- Availability of off the shelf/vendor products

Topic 1.2

In order to demonstrate how software applications will be developed and maintained, learners will need to select and use an appropriate **systems life cycle model**. The life cycle models can include but are not limited to:

Systems life cycle models:

- Waterfall
 - completion of each phase prior to moving onto the next phase of the cycle.
- RAD (Rapid Application Development)
 - Uses an early approximation of a final system
- Agile

Learners will be able to understand that in order to support development and future maintenance **documentation** needs to be created. The documentation needs to be clear as it may be read by others with no prior knowledge of the original requirements.

Topic 1.3: Learners will use the information gathered in Topics 1.1 and 1.2 to create outline design specification documentation. The documentation can include but is not limited to:

Documentation:

- Requirements document
 - Overview of project aims
 - Design specification
 - Project management

Learning outcome:

2. Create design specifications

Topics

- 2.1 Data structures
- 2.2 Programming constructs
- 2.3 Program data flow

Topic 2.1

Having created design specifications, learners will identify the components that will make up the final program. At this stage learners will understand the need to design the program on paper in order to identify the main **components**, (including any naming conventions), **decisions**, **iterations**, **algorithms** or **constructs** to be used including but not limited to:

Components:

- data types (eg char, float etc.)
- arrays
- stacks
- queues
- naming conventions
 - use of keywords
 - consistency
- variables
 - local
 - global
 - static
- functions
 - pre-defined library functions
 - coded
- compiler directives (eg #include)
- code commentary
 - well formatted code
 - indentation

- consistency

Decisions:

- conditional checks
- conditional statements if, if... else
- Switch()

Iterations:

- For()
- While()
- Do...while()
- If()

Algorithms:

- pre-defined to solve a problem (eg pathways, calculations)
- data passing

Constructs:

- fundamentals of classes
- encapsulation
- inheritance
- polymorphism

Topic 2.3

Learners will learn to demonstrate how the intended program will operate using graphical representation. This could be by means of a data flow chart and can include but is not limited to:

Data flow:

- data flow diagrams
- system flow
- data flow between objects
- parameter passing
- interfaces

Pseudocode:

- structure
- algorithms
- dry run

Learning outcome:

3. Use testing methodologies

Topics

3.1 Testing methodology

3.2 Testing documentation

Topics 3.1, 3.2

Learners will understand why applications are tested and that the testing regimes selected for a given project should ensure that any testing is rigorous. Accompanying **documentation** must support both development and future maintenance. When creating specifications for software

applications, learners will explore and understand the need to select the most appropriate **testing methodology**. This can include but is not limited to:

Testing methodology:

- Phased testing process
 - ALPHA
 - BETA
 - Final Master
 - User acceptance
- Black box
- white box
- stress (eg volume)
- functionality
 - Usage
 - Target environment
- data Boundaries

Testing documentation:

- justification of testing strategy
- test Plan
 - boundary testing
 - stress testing (volume)
 - expected outcomes from known inputs
- test Log
 - actual outputs from known inputs
 - run-time errors
 - modifications tracking

Learners will be expected to be introduced to debug tools within the integrated development environment.

Learning outcome:

4. Determine how documentation supports software development

Topics

4.1 **Review** of software

4.2 Software **documentation**

Topics 4.1, 4.2

Learners will learn how to recognise the importance of fully documenting the design, testing and roll-out of any programming application. In documenting the processes learners should gain an understanding of how the documentation supports on-going maintenance and future development of the application. The **review** and software **documentation** can include but is not limited to:

Review:

- feedback
 - client
 - end user
- test results
- recommendations for improvements

Documentation:

- software requirements document
- design specification
- project timelines
- logical code design (eg flow charts)
- actual code file
- code commentary
- testing
 - testing technique justification
 - test plan
 - Expected outputs from known inputs
 - test Log
 - actual outputs from known inputs
 - run-time errors
 - modifications tracking
- details of next review phase (eg systems life cycle)

Guidance for delivery

The content of this unit is intended to give the learner an opportunity to use the knowledge and skills gained in other units to plan for creation of a software application.

The coding tasks will naturally occur in the programming units, Object oriented programming, Event driven programming, Procedural programming.

Prior to commencing this project it would be advisable for tutors to discuss with the learners the practicalities of a given project or where necessary offer some guidance and support in identifying the type of software application project that could be developed.

The content of this unit is based on the knowledge from the Software Development Fundamentals unit.

Suggested learning resources

Books

C# in easy steps
Anderson T, 2004
In Easy Steps Limited

ISBN-10: 1-84078-150-5

Visual Basic .NET For Complete Beginners

Carney K, 2010

Home and learn

ISBN-13: 978-0956365361

JavaScript in easy steps – 5th Edition

McGrath M, 2013

In Easy Steps Limited

ISBN-13: 978-1840785708

C++ Programming in easy steps

McGrath M, 2013

In Easy Steps Limited

ISBN-13: 978-184 0784329

Visual Basic/Net for Dummies

Wang W, 2002

Hungry Media Inc.

ISBN 10: 0-7645-0867-9

Learning Python, 5th Edition

Lutz M, 2014

O'Reilly Media Inc.

ISBN-13: 978-1-449-35573-9

C/C++ Programmer's Reference

Schildt H, 1997

Osborne, McGraw-Hill

ISBN-10: 0-07-882367-6

Project Management

Healy P, 1997

Butterworth-Heinemann

ISBN: 0-7506-8943-9

The Handbook of Project-based Management

Turner JR, 1999

McGraw-Hill

ISBN: 0-07-709161-2

Practical Project Management - Tips, Tactics and Tools
Levine, H A, 2002
Wiley
ISBN: 0-47-120303-3

Learning Visual Basic .NET
Liberty J, 2002
O'Reilly Media Inc
ISBN-10: 0596003862

Unit 311

Code an application using an object oriented programming language

UAN:	F/506/5059
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to demonstrate their programming skills by implementing a design specification.

The mandatory unit 'Application Development Principles' sets out the design specification where this unit is intended to be used. Where this unit is used as an optional unit, in order to demonstrate alternative programming skills, the specification from the 'Application Development Principles' unit can be used or an alternative design specification agreed with the centre.

This unit is about the practical application of skills as opposed to acquiring knowledge or planning and the development of application software using an object oriented programming (OOP) language.

Learners may be introduced to this unit by asking themselves questions such as:

- What types of programmes are created using OOP?
- Have I got enough information to start coding my application?
- Is an OOP language the best option?
- Have I checked that my design will meet the customer's requirements?
- Do I need to document any changes to the original plan?
- Why is indenting code so important?
- Is it really necessary to add comments to my code?

Learning outcomes

In this unit, learners will be able to:

1. create a software application based on a design specification
2. test the final program
3. produce documentation to support the program

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Create a software application based on a design specification

Topics

- 1.1 Select **components** based on the design specification
- 1.2 Code the application
- 1.3 Compliance and functionality

Topic 1.1

Learners will refer to a pre-defined design specification in order to identify the components necessary to code the application.

Topic 1.2

Having identified the components necessary to complete the application, the learner will learn to use an **object oriented programming language** in order to create the code.

It is expected that the design specification may include various generic **components** including but not limited to:

Components:

- data types (eg char, float, struct etc.)
- arrays
- containers
 - list
 - stacks
 - queues
- naming conventions
 - use of keywords
 - consistency
- variables
 - local
 - global
 - static
- functions
 - pre-defined library functions
 - coded
 - parameters
- classes members
- compiler directives (eg #include)
- iteration
 - For
 - Loop
 - Do...while()
- selection
 - If (),
 - switch()

- If...else
- Switch()
- code commentary
 - Well formatted code
 - Indentation
 - consistency
 - sufficient notes to aid future maintenance and/or development
 - good practice

Topic 1.3

Learners will be aware that when coding an application it must be checked for compliance with specification and functionality. This can include but is not limited to:

- conforming to the design specification
- functionality of the application
 - application operation
 - user interface
- passing of data values
- working correctly in the intended operating environment
- making and recording any changes from the original design

Learning outcome:

2. Test the final program

Topics

- 2.1 Use test plans
- 2.2 Use test results in a test log
- 2.3 Deal with any errors that may occur and recommend changes

Topics 2.1, 2.2, 2.3

Learners will be expected to use the test plan developed when designing the application and record the results.

- All tests should be conducted in the intended operating environment.
- Use debug techniques as appropriate.
- Data inputs must follow the test plan in order to check the actual output against the expected output.
- All results from the test plan must be recorded in the test log including any unexpected errors that may occur.
- Test should include any queries or printouts that are required.
- Where errors occur they should be fully documented, along with any alterations to the code necessary to resolve them.

Learning outcome:

3. Produce documentation to support the program

Topics

- 3.1 Create **technical documentation**
- 3.2 Create **user documentation**

3.3 Review the application

Topics 3.1, 3.2: On completion of the testing strategy, learners will create **technical documentation** and where necessary user manuals/documentation. They can include but are not limited to:

Technical documentation:

- project justification
 - analysis and research
 - project team
- design specification
- code file
- testing strategy
 - test plan
 - test log
 - error log

User documentation:

- screen shots of application in operation
- operations
- input validation rules
- trouble shooting guide

Topic 3.3: On completion of testing, learners will complete a **review** document that evaluates their application development against the design specification.

Learners must know how to be reflective on the development process and justify any choices they have made.

Review application:

- recommendations for improvements
- statement that the application conforms to the design.

Guidance for delivery

This unit is intended to give learners the opportunity to use the planning and testing documentation created in the unit 'Application Development Principles' to physically code an application. Ideally it should be delivered as part of an on-going project that will stimulate interest and reflect software development activities.

Where this is delivered as an 'optional' unit, learners could be given the option of using the design specification from 'Application Development Principles' or a design specification for a different application.

When used as an optional unit, the programming language should be different from that used in the mandatory unit in order to allow learners to demonstrate additional programming skills.

Whether the design specification from 'Application Development Principles' or an alternative is used, the centre must ensure that candidates have all of the necessary documentation prior to starting any coding

The actual programming software to be deployed should already have been identified or agreed in the unit 'Application Development Principles' and all related designs based around that software.

This unit supports the knowledge gained from units 'Software Development Fundamentals' and 'Application Development Principles'.

Suggested learning resources

Books

C# in easy steps
Anderson T, 2004
In Easy Steps Limited
ISBN-10: 1-84078-150-5

JavaScript in easy steps – 5th Edition
McGrath M, 2013
In Easy Steps Limited
ISBN-13: 978-1840785708

C++ Programming in easy steps
McGrath M, 2013
In Easy Steps Limited
ISBN-13: 978-184 0784329

Learning Python, 5th Edition
Lutz M, 2014
O'Reilly Media Inc.
ISBN-13: 978-1-449-35573-9

C/C++ Programmer's Reference
Schildt H, 1997
Osborne, McGraw-Hill
ISBN-10: 0-07-882367-6

Unit 312

Code an application using event driven programming language

UAN:	T/506/5060
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to demonstrate their programming skills by implementing a design specification.

The mandatory unit 'Application Development Principles' sets out the design specification where this unit is intended to be used. Where this unit is used as an optional unit, in order to demonstrate alternative programming skills, the specification from the 'Application Development Principles' unit can be used or an alternative design specification agreed with the centre.

This unit is about the practical application of skills as opposed to acquiring knowledge or planning and the development of application software using event driven programming language.

Learners may be introduced to this unit by asking themselves questions such as:

- Have I got enough information to start coding my application?
- Is an event driven programming language the best option?
- Have I checked that my design will meet the customer's requirements?
- Do I need to document any changes to the original plan?
- Why is indenting code so important?
- Is it really necessary to add comments to my code?

Learning outcomes

In this unit, learners will be able to:

1. create a software application based on a design specification
2. test the final program
3. produce documentation to support the program

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Create a software application based on a design specification

Topics

- 1.1 Select **components** based on the design specification
- 1.2 Code the application
- 1.3 Compliance and functionality

Topic 1.1

Learners will refer to a pre-defined design specification in order to identify the components necessary to code the application.

Topic 1.2

Having identified the components necessary to complete the application, the learner will learn to use an **event driven programming language** in order to create the code.

It is expected that the design specification may include various generic **components** including but not limited to:

Components:

- modules
 - code
 - form
 - control
- event procedures
- methods (eg unload)
- objects
 - properties
 - private
- form components
 - labels
 - text boxes
 - check boxes
 - list boxes
 - combo boxes
 - scroll bars
 - timers
 - picture box
- events
 - click
 - roll-over
- data types (eg string, byte, integer, object, variant etc.)
- arrays
- algorithms
- naming conventions
 - use of keywords

- consistency
- variables
 - local
 - global
 - declaring (eg dim, option explicit)
- code commentary
 - well formatted code
 - indentation
 - consistency
 - sufficient notes to aid future maintenance and/or development
 - good practice
- Iteration
 - For
 - Loop
 - Do... while()
- Selection
 - If
 - If...then...else
 - Select...Case

Topic 1.3

Learners need to be aware that when coding an application it must be checked for compliance with specification and functionality. This can include but is not limited to:

- conforming to the design specification.
- functionality of the application
 - application operation
 - user interface
- passing of data values.
- working correctly in the intended operating environment.
- making and recording any changes from the original design.

Learning outcome:

2. Test the final program

Topics

- 2.1 Use test plans
- 2.2 Use test results in a test log
- 2.3 Deal with any errors that may occur and recommend changes

Topics 2.1, 2.2, 2.3

Learners will be expected to use the test plan developed when designing the application and record the results.

- all tests should be conducted in the intended operating environment
- use debug techniques as appropriate
- data inputs must follow the test plan in order to check the actual output against the expected output.
- all results from the test plan must be recorded in the test log including any unexpected errors that may occur.
- test should include any queries or printouts that are required.

- where errors occur they should be fully documented, along with any alterations to the code necessary to resolve them.

Learning outcome:

3. Produce documentation to support the program

Topics

3.1 Create **technical documentation**

3.2 Create **user documentation**

3.3 **Review** the **application**

Topics 3.1, 3.2

On completion of the testing strategy, learners will create **technical documentation** and where necessary user manuals/documentation. They can include but are not limited to:

Technical documentation:

- project justification
 - analysis and research
 - project team
- design specification
- code file
- testing strategy
 - test plan
 - test log
 - error log

User manuals:

- Screen shots of application in operation
- Operations
- Input validation rules
- Trouble shooting guide

Topic 3.3

On completion of testing, learners will be expected to complete a **review** document that evaluates their application development against the design specification.

Learners must know how to be reflective on the development process and justify any choices they have made.

Review application:

- recommendations for improvements
- statement that the application conforms to the design

Guidance for delivery

This unit is intended to give learners the opportunity to use the planning and testing documentation created in the unit 'Application Development Principles' to physically code an application. Ideally it should be delivered as part of an on-going project that will stimulate interest and reflect software development activities.

Where this is delivered as an 'optional' unit, learners could be given the option of using the design specification from 'Application Development Principles' or a design specification for a different application.

When used as an optional unit, the programming language should be different from that used in the mandatory unit in order to allow learners to demonstrate additional programming skills.

Whether the design specification from 'Application Development Principles' or an alternative is used, the centre must ensure that candidates have all of the necessary documentation prior to starting any coding

The actual programming software to be deployed should already have been identified or agreed in the unit 'Application Development Principles' and all related designs based around that software.

This unit supports the knowledge gained from units 'Software Development Fundamentals' and 'Application Development'.

Suggested learning resources

Books

C# in easy steps
Anderson T, 2004
In Easy Steps Limited
ISBN-10: 1-84078-150-5

Learning Visual Basic .NET
Liberty J, 2002
O'Reilly Media Inc
ISBN-10: 0596003862

Visual Basic/Net for Dummies
Wang W, 2002
Hungry Media Inc.
ISBN 10: 0-7645-0867-9

Unit 313

Code an application using procedural programming language

UAN:	A/506/5061
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to demonstrate their programming skills by implementing a design specification.

The mandatory unit 'Application Development Principles' sets out the design specification where this unit is intended to be used. Where this unit is used as an optional unit, in order to demonstrate alternative programming skills, the specification from the 'Application Development Principles' unit can be used or an alternative design specification agreed with the centre.

This unit is about the practical application of skills as opposed to acquiring knowledge or planning and the development of application software using event driven programming language.

Learners may be introduced to this unit by asking themselves questions such as:

- Have I got enough information to start coding my application?
- Is a procedural programming language the best option?
- Have I checked that my design will meet the customer's requirements?
- Do I need to document any changes to the original plan?
- Why is indenting code so important?
- Is it really necessary to add comments to my code?

Learning outcomes

In this unit, learners will be able to:

1. create a software application based on a design specification
2. test the final program
3. produce documentation to support the program

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Create a software application based on a design specification

Topics

- 1.1 Select **components** based on the design specification
- 1.2 Code the application
- 1.3 Compliance and functionality

Topic 1.1

Learners will refer to a pre-defined design specification in order to identify the components necessary to code the application.

Topic 1.2

Having identified the components necessary to complete the application, the learner will learn to use a **procedural programming language** in order to create the code.

It is expected that the design specification may include various generic **components** including but not limited to:

Components:

- data types (eg char, float, struct etc.)
- arrays
- naming conventions
 - use of keywords
 - consistency
- variables
 - local
 - global
 - static
- functions
 - pre-defined library functions (eg <iostream>
 - library (eg strcpy(), getc())
 - coded algorithms
- procedures
 - routines
 - sub routines
- compiler directives (eg #include)
- iteration
 - For
 - Loop
 - Do...while()
- Selection
 - If (),
 - switch()
 - If...else
 - Switch()

- code commentary
 - well formatted code
 - indentation
 - consistency
 - Sufficient notes to aid future maintenance and/or development
 - Good practice

Topic 1.3

Learners need to be aware that when coding an application it must be checked for compliance with specification and functionality. This can include but is not limited to:

- conforming to the design specification
- functionality of the application
 - application operation
 - user interface
- passing of data values
- working correctly in the intended operating environment
- making and recording any changes from the original design

Learning outcome:

2. Test the final program

Topics

- 2.1 Use test plans
- 2.2 Use test results in a test log
- 2.3 Deal with any errors that may occur and recommend changes

Topics 2.1, 2.2, 2.3

Learners will be expected to use the test plan developed when designing the application and record the results.

- all tests should be conducted in the intended operating environment
- use debug techniques as appropriate
- data inputs must follow the test plan in order to check the actual output against the expected output.
- all results from the test plan must be recorded in the test log including any unexpected errors that may occur.
- test should include any queries or printouts that are required.
- where errors occur they should be fully documented, along with any alterations to the code necessary to resolve them.

Learning outcome:

3. Produce documentation to support the program

Topics

- 3.1 Create **technical documentation**
- 3.2 Create **user documentation**
- 3.3 **Review** the **application**

Topics 3.1, 3.2

On completion of the testing strategy, learners will create **technical documentation** and where necessary user manuals/documentation. They can include but are not limited to:

Technical documentation:

- project justification
 - analysis and research
 - project team
- design specification
- code file
- testing strategy
 - test plan
 - test log
 - error log

User documents:

- screen shots of application in operation
- operations
- input validation rules
- trouble shooting guide

Topic 3.3

Learners will be expected to complete a **review** document that evaluates their application development against the scenario.

Learners must know how to be reflective on the development process and justify any choices they have made.

Review application:

- recommendations for improvements
- statement that the application conforms to the design

Guidance for delivery

This unit is intended to give learners the opportunity to use the planning and testing documentation created in the unit 'Application Development Principles' to physically code an application. Ideally it should be delivered as part of an on-going project that will stimulate interest and reflect software development activities.

Where this is delivered as an 'optional' unit, learners could be given the option of using the design specification from 'Application Development Principles' or a design specification for a different application.

When used as an optional unit, the programming language should be different from that used in the mandatory unit in order to allow learners to demonstrate additional programming skills.

Whether the design specification from 'Application Development Principles' or an alternative is used, the centre must ensure that candidates have all of the necessary documentation prior to starting any coding

The actual programming software to be deployed should already have been identified or agreed in the unit 'Application Development Principles' and all related designs based around that software.

This unit supports the knowledge gained from units 'Software Development Fundamentals' and 'Application Development Principles'.

Suggested learning resources

Books

Procedural Programming Through C
Mishra R
Vision Publications
BOOK ID: 893

C/C++ Programmer's Reference
Schildt H, 1997
Osborne, McGraw-Hill
ISBN-10: 0-07-882367-6

C Programming for the Absolute Beginner
Vine M, 2007
Cengage Learning, Inc
ISBN: 9781598634808

C Programming Language, Second Edition
Kernighan B & Richie D,
Prentice-Hall Inc.
ISBN-13: 007-6092003106

Websites

<http://my.safaribooksonline.com/book/programming>

UAN:	F/506/5062
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to develop an understanding of the concepts that are fundamental to the gaming industry and the games that it produces. They will explore how technology has developed and the gaming industry has moved to its present state. They will consider how games have impacted on society, the economy and culture.

Learners will explore types of games and the technologies they use. They will learn how to use the key terminologies to produce documentation that will form the basis of a proposal that could be presented to stakeholders based on their own original concept.

Learners may be introduced to this unit by asking themselves questions such as:

- What impact has the gaming industry had on me?
- How have games evolved to where they are now?
- How are games different to one and other?
- What is involved in designing a game?

Learning outcomes

In this unit, learners will be able to:

1. identify computer games industry
2. determine computer games architecture and components
3. evaluate games
4. develop computer games specification.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Identify the computer games industry

Topics

- 1.1 Stages of evolution of the computer game industry
- 1.2 Types of games
- 1.3 Roles and activities required to develop modern computer games
- 1.4 **Impact** of game industry

Topics 1.1, 1.2

Learners will explore the growth of the industry from simple 2D graphics through to current gaming environments. The learners will explore the differences between types of games, genres, formats and platforms.

Topic 1.3

Learners will be able to identify the roles and skills set required in the development of games when they are developed from initial concept, to development and final launch into the market place

Topic 1.4

the **impact** on:

- society
 - moral
 - ethical
 - legal
- culture
- economy
- education
 - gamification

Learning outcome:

2. Determine computer games architecture and components

Topics

- 2.1 Hardware components
- 2.2 Software components
- 2.3 **Game elements**

Topics 2.1, 2.2

Learners will learn the hardware and software components of a video game system (eg historic, current and future)

Topic 2.3

Learners will learn the important of games elements, including but not limited to:

- video
- audio
- story boards
- characterisation
- narrative
- objects
- terrains

Learning outcome:

3. Evaluate games

Topics

- 3.1 Evaluation of computer games
- 3.2 Recommendations for future development

Topic 3.1

Learners will learn to document structured evaluations of computer games against topics listed in outcome 2.

Topic 3.2

in documenting evaluations of computer games learners will develop the skills necessary to make justified recommendations for future developments

Learning outcome:

4. Developing computer game specifications

Topics

- 4.1 Games terminology
- 4.2 Components required
- 4.3 Pre-production proposal document

Topics 4.1, 4.2

When developing computer games specifications, learner will need to know the generic games terminologies including but not limited to:

- concept
 - original idea
- narrative
 - characterisation
 - storyline
- target market
 - age
 - gender

- platform
- output medium
- input medium
- storyboard

Topic 4.3

Using the information in topics 4.1 and 4.2 learners will learn how to create **pre-production documents** as a design brief.

Guidance for delivery

This unit aims to provide learners with an understanding of the development of computer games and the industry. Tutors involved in delivery should have a good understanding of the computer games industry. Learners should have the opportunity to experience different types of platforms and games within the classroom. in-class game play should be structured and different genres and platforms should be made available for experiential learning. This practical approach should be used alongside classroom discussions and guest speakers which enable learners to understand the development techniques involved in the production of modern computer games.

Learners also need to explore the effects of games on society. Learners will need to discuss and understand how computer games are perceived by some and their positive and negative affects on society. Discussions should play a key role in the delivery as well as independent research.

Learners will go on to learn how to create design specifications for computer games. In order for this units potential to be fully realised it would be wise for it to be delivered alongside a programming unit such as Object-oriented Programming. This would then allow learners the opportunity to see a completed game through from initial concept to working application.

Suggested learning resources

Books

Adams E and Rollings A – Game Design and Development (Fundamentals of Game Design) (Prentice Hall, 2006)

ISBN 978-0131687479

Crawford C – Chris Crawford on Game Design (F T Prentice Hall, 2003) ISBN 978-0131460997

Fullerton – Game Design Workshop: A Playcentric Approach to Creating Innovative Games (Morgan Kaufmann, 2008) ISBN 978-0240809748

Koster R – A Theory of Fun for Game Design (Paraglyph Press, 2005) ISBN 978-1932111972

Laramee F D (editor) – Game Design Perspectives (Charles River Media, 2002) ISBN 978-1584500902

Meigs T – Ultimate Game Design: Building Game Worlds (Osborne McGraw-Hill, 2003)

ISBN 978-0072228991

UAN:	J/506/5063
Level:	3
GLH:	60

What is this unit about?

In this unit learners will gain an understanding of the concepts behind 3D modelling and learn how to apply these to develop 3D models for use in various applications such as games, films and TV.

3D modelling is the art of creating characters and objects. They are created using 3D computer application software. In this unit learners will use a 3D modelling software application to produce 3D models. 3D modelling concepts are complex. In this unit learners will learn how 3D modelling is used within the interactive media industry. Learners will gain an understanding of the theory behind 3D modelling and then apply this to design and develop their own models following design briefs. Learners will gain an appreciation of the theories involved and understand the technical terms used in the industry.

Learners may be introduced to this unit by asking themselves questions about 3D computer modelling such as:

- Where are 3D computer models used?
- What software is used to create 3D computer models
- What techniques are used in creating 3D Computer models?
- What is rendering and when would I use it?

Learning outcomes

In this unit, learners will be able to:

1. understand 3D modelling theory
2. design 3D models
3. create 3D models
4. use lighting and rendering
5. develop industry practice skills

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. understand 3D modelling theory

Topics

- 1.1 Uses of 3D models
- 1.2 Geometric theory in 3D modelling
- 1.3 Textures and shaders in 3D modelling
- 1.4 Mesh construction in 3D modelling
- 1.5 3D modelling constraints

Topic 1.1

Learners will investigate and learn the different **uses** of 3D computer modelling in the creative media sector: Learners will research the history of 3D modelling and how it has developed in different industry settings:

- computer games
- films and tv
- product design
- architecture
- education

Topic 1.2

Learners will learn and understand how geometric theory is used in order to create and develop 3D models:

- vertices
- lines
- spine modelling
- edges
- polygons
- cartesian coordinates system

Topic 1.3

Learners will learn the theory of textures and shaders used in 3D modelling:

- Pixel shaders
- Vertex shaders

Topic 1.4

Learners will learn the theory of common mesh construction techniques used in 3D modelling. They will learn and understand how 3D models are created by modifying primitive shapes for Pre-Viz.

- Common primitives
 - Cubes
 - Pyramids
 - Cylinders
- Box modelling

- Extrusion modelling

Topic 1.5

Learners will understand the impact and constraints that file size, polygon count and rendering time have on 3D models.

Learning outcome:

2. Design 3D models

Topics

- 2.1 Use a range of design tools
- 2.2 Create specifications for 3D model projects
- 2.3 Legal and ethical considerations

Topic 2.1

Learners will learn to use a variety of industry standard design tools that enable them to design 3D models for a variety of applications. These could include computer games, films, TV.

- idea generation techniques
- sketches
- concept drawings
- architectural drawings
 - 2D
 - 3D

Topic 2.2

Learners will learn the skills to enable them to develop modelling specifications based on client needs and understand the techniques used in developing specifications. Learners will need to understand the importance of pitching specifications to clients.

- Market research
 - target audience
- Constraints
 - image resolution
 - file size
 - file type
 - output medium
 - polygon count
 - render time

Topic 2.3

Learners will learn and understand the legal and ethical considerations that take place in the design and development of 3D models and how these can impact on final designs.

- legislation
- culture
- social acceptance

Learning outcome:

3. Create 3D models

Topics

- 3.1 Geometric modelling
- 3.2 Mesh building
- 3.3 Virtual camera concepts
- 3.4 Modelling methods
- 3.5 Texturing techniques

Topics 3.1, 3.2

Learners will now learn how to apply the theory taught in Learning outcome 1 to create 3D models in an appropriate software environment eg Maya, Blender, 3Ds-Max. Learners will learn the skills to create a range of 3D models such as characters, objects and basic environments.

Topic 3.3

Learners will learn the skills required to create 3D models

- Layers
- Modify
 - Move
 - Rotate
 - Stretch
 - Deform
- Extend
 - Bevel
 - Extrude
 - Lathe
- Combine
 - Boolean
- Duplicate
 - Mirror
 - Array
 - clone
- organic modelling
- weight maps
- polygonal modelling
- nurbs modelling
- curves
- vertices
- coordinates
- surfaces

Topic 3.4

Learners will learn how virtual camera concepts can be applied to in 3D computer modelling

- lens length
- field of vision(fov)
- focus and aperture
- camera
 - parameters
 - view
 - type

Topic 3.5

Learners will learn the methods of adding details to objects using textures.

- creating textures
- applying to objects
- materials
 - mapping
 - editor
 - modifiers
 - types

Learning outcome:

4. Use lighting and rendering

Topics

4.1 Lighting effects and techniques

4.2 Rendering techniques

Topic 4.1

Once learners know how to apply the concepts of 3D modelling they will learn the importance lighting plays in enhancing 3D models. The techniques covered should include:

- types
 - ambient
 - distant
 - spot
 - photometric
 - volumetric
- controls and effects
 - projector
 - attenuation
 - glow
- colour
- shadows
- atmosphere
- fog

Topic 4.2

Rendering is the final stage in the creation of 3D models. Learners will learn what rendering is, the different types of rendering used for different applications and the importance rendering has on the final products. They will also learn how to render their own models following industry standard techniques and be able to adjust settings appropriately.

Learners will also explore different rendering engines and learn the difference between sketch and final rendered models.

Learning outcome:

5. Develop industry practice skills

Topics

5.1 Industry practice

- 5.2 Present products
- 5.3 Reviewing products

The skills and theory covered in this Learning outcome should be delivered alongside the practical outcomes of the unit. It is essential that learners are able to apply these core skills across the various disciplines of the unit.

Topic 5.1, 5.2, 5.3

Whilst learning the theory and practical skills required in 3D computer modelling learners also need to develop strong industry practice skills. Learners need to understand the importance of:

- workflow
- time management
- team work

Learners also need to learn how to present professionally to a client. This should be done once the design stage is complete and then again when the final product is complete. It is vital that learners are able to review final products and their effectiveness. A product review should contain:

- comparison to brief
 - fit for purpose
 - meet client needs
 - budget
 - timescale
- technical qualities and competence
- aesthetic qualities
- production skills.

Guidance for delivery

A variety of teaching methods and activities should be used during the delivery of this unit. These could include lectures, group discussions, practical session demonstrations and guest speakers. A large proportion of time should be spent with learners developing practical skills using 3D modelling application software.

Independent study could be used for learners to develop an understanding of the concepts and principles of 3D computer modelling. This is a highly specialised unit and Centres will need tutors with strong 3D modelling skills and preferably some industry experience. Appropriate industry standard software will be required and centres will need high end hardware in order to run this unit appropriately.

Suggested learning resources

http://minyos.its.rmit.edu.au/aim/a_notes/anim_principles.html

http://www.pixar.com/behind_the_scenes

<http://www.free3dtutorials.com/>

<http://www.instructables.com/id/How-To-Draw-8/>

<http://cgcookie.com/>

<http://cgcookie.com/blender/cgc-courses/piero/>

<http://www.dreamworksanimation.com/insidedwa/productionprocess>

UAN:	L/506/5064
Level:	3
GLH:	60

What is this unit about?

In this unit learners will gain an understanding of the concepts behind computer animation and learn how to apply these to develop computer animations for use in various applications such as computer games, films and TV.

Computer animation is the art of creating moving images using computer graphics. They are created using specialist application software. In this unit learners will use a computer animation software application to produce animations. Learners will learn the principles of 2D and 3D animation, explore animation pioneers and principles before learning the techniques to enable them to apply this to design and develop their own animations following design briefs. Learners will gain an appreciation of the theories involved and understand technical terms used in the industry.

Learners may be introduced to this unit by asking themselves questions about computer animation such as:

- How has computer animation been changed over the years?
- What software is used to create computer animations?
- What techniques are used in creating computer animations?
- What is rendering and when would I use it?

Learning outcomes

In this unit, learners will be able to:

1. understand principles of animation
2. design computer animations
3. create computer animation
4. use lighting and rendering to enhance models
5. present to a client

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Understand principles of animation

Topics

- 1.1 Animation history
- 1.2 Industry practice
- 1.3 Animation **techniques**
- 1.4 **Uses** of computer animation

Topic 1.1

Learners will investigate and learn the history of animation and its development within the creative media sector. Learners will gain an understanding of key pioneers of animation and how their work has influenced contemporary animations:

- Eadweard Muybridge
- Edison (kinetoscope)
- Lumière brothers
- Walt Disney
- 12 principles of animation
- Hannah Barbera
- Warner Bros
- Norman McLaren
- Len Lye

Topic 1.2

Whilst learning the theory and practical skills required for computer animation learners also need to develop strong **industry practice** skills. Learners need to understand the importance of:

- workflow
- time management
- team work

Topic 1.3

Learners will learn a range of animation **techniques** and gain an understanding of how these have been developed.

- Traditional 2D animation
 - Flick book (kineograph)
 - Cell animation
 - Rotoscoping
 - Drawn on film
 - Black film
 - photographic stills
- Digital 2D Animation
 - 2D Graphics
 - Bitmap
 - Vector

- 3D animation
 - visual styling
 - blended motion
 - Cinematography
 - facial animation
 - user-controlled animation

Topic 1.4

Learners gain knowledge of the contemporary **uses** of computer animation within the creative media sector and explore how different techniques can be used in different media.

- Films
- TV
- Computer games
- Websites
- Mobile phones

Learning outcome:

2. Design computer animations

Topics

- 2.1 Use a range of design tools to create specifications for computer animations
- 2.2 **Legal and ethical** considerations

Topic 2.1

Learners will learn how to devise computer animations. This will include consideration and development of the following in order to produce a documented design specification

- format
- idea generation techniques
 - visualisation
 - characters
 - storyline
 - soundtrack ideas
- target audience
- designs
 - sketches
 - concept drawings
 - storyboards
 - architectural drawings
 - 2D
 - 3D
 - movement
 - continuity
 - frames per second
 - perspective
- constraints
 - image resolution
 - file size
 - file type
 - output medium

Topic 2.2

Learners will learn and understand the **legal and ethical considerations** that take place in the design and development of computer animations and how these can impact on final designs.

- Copyright
- Computer Misuse Act
- Data Protection Act
- Representation
 - Race
 - Gender
 - Sexuality
 - Religion
- Decency
- Violent imagery

Learning outcome:

3. Create computer animations

Topics

3.1 Animation techniques in practice

3.2 Texturing techniques

Topic 3.1

Learners will learn the practical **animation techniques** required to produce computer animations utilising the theoretical principles covered in learning outcome 1. Learners will need to learn how to use industry standard software such as Maya, 3D studio-Max to be able to implement:

- time based animation
- motion animation
- kinematics
 - forward
 - inverse
- animation staging
 - lights
 - cameras
- biped animation
- deformations
- paths
- effects
 - blur
 - glow
- objects
 - hierarchies
 - inheritance
- virtual camera

Topic 3.2

Learners will learn the methods of adding details to objects using textures in computer animation.

- Applying to objects
 - creating
 - loading
- materials

- mapping
- editor
- modifiers
- types

Learning outcome:

4. Use lighting and rendering to enhance models

Topics

4.1 Lighting effects and techniques

4.2 **Rendering techniques**

Topic 4.1: Once learners know how to apply the concepts of computer animation they will learn the importance lighting plays in computer animation. The techniques covered should include:

- types
 - ambient
 - distant
 - spot
 - photometric
 - volumetric
 - raytraced
- controls and effects
 - projector
 - attenuation
- colour
- shadows
- atmosphere

Topic 4.2: Rendering is the final stage in the creation of computer animation. Learners will learn what rendering is, the different **types** of rendering used for different applications and the importance rendering has on the quality of the final products.

- real time rendering
 - interactivity
 - speed
 - methods
- offline rendering
 - predictability
 - photorealism

Learners will also understand the advantages and disadvantages of different **rendering techniques**:

- Scanline (rasterization)
- Raytracing
- Radiosity

Learners will also need to learn how to render in their chosen software package and be able to use rendering controls for the following:

- scene rendering
- output
 - file size
 - file type
 - use eg film, tv, website
- aspect ratio

- safe frame
- file type/size

Learning outcome:

5. Present to a client

Topics

5.1 Products presented to clients

5.2 Products reviewed

Topic 5.1, 5.2: Learners need to learn how to present professionally to a client. This should be done once the design stage is complete and then again when the final product is complete. It is vital that learners are able to review final products and their effectiveness. A product review should contain:

- comparison to brief
 - fit for purpose
 - meet client needs
 - budget
 - timescale
- technical qualities and competence
- aesthetic qualities
- production skills
- recommendations for future development.

Guidance for delivery

A variety of teaching methods and activities should be used during the delivery of this unit. These could include lectures, group discussions, practical sessions, demonstrations and guest speakers. A large proportion of time should be spent with learners developing practical skills using computer animation application software.

Independent study could be used for learners to develop an understanding of the concepts and principles of computer animation. This is a highly specialised unit and Centres will need tutors with strong computer animation skills and preferably some industry experience. Appropriate industry standard software will be required and centres will need high end hardware in order to run this unit appropriately.

As well as teaching theoretical knowledge and practical skills this unit also develops learner's industry standard skills. To ensure this is done effectively it is recommended that the content in Learning outcome 5 is delivered throughout the unit and not as a stand alone outcome.

It is recommended that this unit is delivered after 3D Computer Modelling.

Suggested learning resources

<http://research.dreamworks.com/>

<http://graphics.pixar.com/library/>

<http://animationresources.org/>

<http://k-3d.en.softonic.com/>

<http://www.animationarena.com/>

<http://www.creativecrash.com/maya/>

<http://www.3dteachers.com/search/label/News>

UAN:	R/506/5065
Level:	3
GLH:	60

What is this unit about?

The aim of this unit is to develop knowledge and the ability to create assets (elements) that can be used in both multimedia and interactive media whether that is for DVDs, websites, applications or games, banner ads, animated interface elements, linear and interactive animations.

Examples of the uses of interactive media authoring include:

- web developers who use it to add interactivity, sound and motion to their web pages.
- animators use it to create animation for output to videotape or streaming web movies.
- games designers use it for interactive sequences.
- software developers use it to create working models of applications, allowing demonstration and fine-tuning of the look and feel of products that are still in development.
- software publishers use it to create product tutorials.
- businesses use it to create presentations, training materials and interactive catalogues that help buyers choose colours and patterns.

In this unit learners will become familiar with some of the tools and techniques of the digital graphics software used to produce images for interactive media. These techniques form the basis of the development of graphics for adverts, magazine pages, websites, DVD interfaces, animations, in short for all print and screen design.

This unit is therefore fundamental to the development of digital design skills.

Learners may be introduced to this unit by asking themselves questions such as:

- How do I determine client's needs?
- What should I consider when I plan the design of my finished product?
- What legislation and guidelines do I need to be aware of?
- What are the constraints that I will need to work to, when producing the interactive media product?
- How do I check that the final product meets the business need?

On completion of this unit learners should be able to use creative interactive media software to meet business needs. Practical skills should be demonstrated in the software used, enabling learners to develop skills.

Learning outcomes

In this unit, learners will be able to:

1. design interactive media products to meet business needs
2. create interactive media products
3. evaluate interactive media products.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Interactive media authoring integrates a wide variety of elements including sound, video, animation, text, quizzes and interactivity to produce a complete package which can be distributed in a variety of formats eg Evolve, Quizcity

Interactive media products are produced using authoring tools which allow the most common asset types to be imported and controlled. Some tools use a page and book approach to build and link screens within a product, whilst others use a timeline or score and a stage. The authoring tools will include some form of programming or scripting to produce the complex interactivity required for games and quizzes.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Design interactive media products to meet business needs

Topics

1.1 Business requirements

1.2 Product designed to meet business needs

Topic 1.1

Learners will explore factors that define business **requirements** for a multimedia product. At this level research and business analysis requirements should be comprehensive including but not limited to:

Business requirements:

- Methods
 - design specifications
 - business analysis
 - research
 - questionnaire – qualitative and quantitative
 - interview – structured, semi structured, unstructured
- Product
 - DVD
 - website
- application limitations
 - platform: eg web, mobile, operating systems
- purpose: educational, commerce
- content
 - sound clips, animation, pictures, video clips, interactive elements eg buttons, links, pop ups
- business objective
 - promotion and advertising eg web pages, digital posters, virtual tours
 - education and training eg simulations, e-learning packages
 - entertainment and leisure eg computer games, virtual reality
 - commerce
- audience
 - profiles eg age, demographics, gender, culture, ethnicity, class, business, interests, IT literacy

Topic 1.2

Learners will be able to create full **design** specifications for creative interactive products based on defined business needs, elements that should be considered include but are not limited to:

Design:

- products
 - interactive eg information points, digital stories, virtual tours; limited interactivity eg digital posters, adverts, quizzes, movies
- layout
 - features eg content, navigation, mix of digital components, interactivity
 - input methods eg keyboard, mouse, voice recognition, touch screen, stylus, digital video or still camera, microphone; number of pages; features; audience
- content:
 - types eg text, images, graphics, video, sound, animation; interactive features eg transitions, menus, submenus, buttons, links, pop-ups, video clips, sound clips; legal requirements
 - acknowledgment of sources; avoiding plagiarism; permissions; copyright law eg on music downloads, use of images
- design documentation:
 - presentation methods eg detailed storyboards, scripts, flow charts, annotations, visuals, timelines; layout eg size, frames, orientation, consistency.

Learning outcome:

2. Create interactive media products

Topics

- 2.1 Develop assets for interactive media products
- 2.2 Combine assets for interactive media products
- 2.3 Review functionality and quality of an interactive media product

Topic 2.1

Learners will use **input devices, software, techniques** and **tools** to create, store and retrieve interactive media assets elements. These may include but are not limited to:

input devices:

- smartphones
- tablets
- microphones
- keyboard
- mouse
- stylus
- touch screen
- cameras eg web cam, dslr, video

software:

- audio editing
- video editing
- web authoring software
- web animation software
- presentation graphics
- imaging
- animation
- modelling

- computer generate imagery (cgi)

Techniques and tools:

- Creating, animating, formatting and combining information (Insert, size, position, wrap, order, group; import data, links and references to external data File format for interactive media outcomes: Will vary according to the content, for example jpg for Internet photo display, png for Internet drawing display, svg for graphic designs)
- Basic: drawing, eg pencil, line, pen, brush, shapes; free transform, eg rotate, skew, distort, scale, envelope, ruler and guidelines; editing, eg lasso, eraser, undo, copy, paste, duplicate, insert, delete, aligning, grouping, ungrouping
- Objects: symbols, eg instances, duplicating symbols, swapping symbols, editing, grouping
- Colour: eg colour properties, eyedropper, creating custom colours, colour swatches, stroke and fill
- Text : text, eg editing, moving, rotating, reshaping, scrolling, creating text blocks, converting text to shapes
- Manipulating objects: manipulating vector shapes; single layer vector shape interaction; transforming and grouping vector shapes
- Animation: frame label; frame rate; timeline (playhead, layers, frames, frame rate, keyframes, onion skinning, markers); frame manipulation, eg copying, deleting, reversal; testing movies; frame by frame animation; tweening (shape, motion)
- Assets: importing, eg raster images, vector images, sound files, video files, movie clips; resizing; bitmap to vector conversion; asset libraries
- Advanced: scenes; guide layers; masking, eg mask layers, animated masks; timeline effects, eg blur, drop shadow, expand, explode, transform, transition; nesting movie clips
- Interactivity: scripting; behaviours; actions; triggers; buttons; rollovers; playback control; preloaders
- Saving and exporting for the web: saving a movie; publishing a movie; optimising; file formats; reasons for formats
- Animation: optical illusion of motion (persistence of vision); claymation; stop motion; computer generation(frame rate, frames, key frames, onion skinning, tweening)
- Digital animation: vector animation; raster (bitmap) animation; compression (file size, download speeds);
- Create, store and retrieve: Files (eg create, name, open, save, save as, print, close, find, share); version control; import/export; file size; folders (eg create, name).

Learners will be able to obtain, gather, store and retrieve creative media files effectively, in line with local guidelines and conventions. Learners should be given opportunities to develop their understanding of the range of file types that can be combined to create multimedia products. Eg text, images, video, audio

Learners will understand how copyright and other constraints affect use of own and others' information and the effect of copyright law (eg on music downloads or use of other people's images), acknowledgment of sources, avoiding plagiarism.

Learners will know the range of asset types that may be created , sourced or utilised to include:

- buttons
- menus
- action button
- rollovers
- hot spots
- images
 - stock
 - library resources

- freehand drawing
- video clips
- time lapse
- sounds clips
- animations
- 2D models
- 3D models
- banner ads
- pop ups
- CGI
 - green screen

Topic 2.2

Learners will explore differing techniques to combine a range of source elements to create interactive media products. When combining source elements, learners will be able to comply with time management techniques as set out in learning outcome 1. **Techniques** used may include but are not limited to:

Techniques:

- workspace
 - panels, eg stage, timeline, menu bar, toolbar, library, colour palettes, properties, preferences, help
- editing
 - text, vectors, images, objects, grouping
- interactivity
 - scripting, hot spots, actions, triggers, buttons, rollovers
- use assets
 - objects (cast, sprites), scripts, edit properties, image files, video files, audio files eg bmp, png, jpeg,gif; avi, mp4, wmv; aiff, wav, midi, asf, flacc, mp3
- animation
 - transitions and effects, timeline, animation editing
- interactivity
 - buttons, hotspots, hyperlinks, programming and scripting, behaviours, actions and properties, eg mouse and keyboard events, video and sound controls
- publishing
 - eg self-running presentation (projector), product medium, eg cd, dvd rom, web, application

Topic 2.3

Learners will be able to review a creative interactive media product for:

- functionality
 - usability
 - accessibility
 - performance – giving due consideration for different platforms and browsers where the product may be used on.
- quality issues
 - sound eg noise, volume
 - images eg levels, contrast unwanted content
 - text eg clarity, spelling, grammar, structure
 - interactive elements eg interactivity, links, aesthetics, transitions
 - load speed

Learning outcome:

3. Evaluate interactive media products

Topics

- 3.1 Analyse an interactive media solution against specific business requirements and design specification
- 3.2 Review user feedback

Topic 3.1

Learners will be able to fully review, evaluate and document against planned business needs and design specification based on the requirements and design determined in Learning outcome 1. The review should include the following but is not limited to:

- use the specified business needs as the basis for evaluation of effectiveness
- obtain client and/or audience feedback on the product's effectiveness
- evaluate the completed product in terms of its effectiveness and impact on the audience
- list potential opportunities for improvement, and recommend improvements when required

Topic 3.2

Learners will be able to use a range of methods to gather feedback on multimedia product, these include but are not limited to:

Methods:

- questionnaire – qualitative and quantitative
- interview – structured, semi structured, unstructured
- focus groups
 - test users: alpha, beta, user testing, representatives of the target audience
- observation, outcomes eg identify errors
- users suggestions for further enhancements
- users comments on product

Learners will also be aware of research bias and techniques that can be used to limit its impact.

Guidance for delivery

Depending on the interactive media products to be developed, learners may access one or more of the following:

- computer hardware which is capable of running the chosen software and adequate for video editing
- the Internet
- a digital camera, scanner or mobile phone with camera capabilities
- software to allow the editing, cropping and manipulation of images
- a digital video camera, a digital camera capable of capturing video clips with sound, or a mobile phone capable of capturing high resolution video clips with sound
- video editing software
- sound editing software
- industry standard multimedia animation software
- modelling software
- software to allow the creation of animations
- a range of resources to demonstrate current multimedia authoring products.

Suggested learning resources

Books

Principles of Interactive Multimedia
Elsom – Cook M, 2001
McGraw – Hill
ISBN-13 9780077096106

Multimedia Making It Work Eighth Edition
Vaughan T, 2011
McGraw – Hill
ISBN-13: 978-0071748469

Digital Multimedia (3rd Edition)
Chapman N & Chapman J, 2009
John Wiley and Sons
ISBN-13: 978-0470512166

Multimedia Learning (2nd Edition)
Mayer R E, 2009
Cambridge University Press
ISBN-13: 978-0521735353

Adobe PhotoShop Elements 8 for Photographers
Andrews P, 2009
Focal Press
ISBN-13: 978-0240521893

Digital Multimedia
Chapman, Dr N and Chapman J, 2009
John Wiley & Sons
ISBN-13: 978-0470512166

New Media Design
Austin T and Doust R, 2007
Laurence King Publishing
ISBN 978-1856694315

Multimedia Projects in Education: Designing, Producing and Assessing
Barron A E and Ivers K, 2005
Libraries Unlimited Inc
ISBN 978-1591582496

Journals and magazines

- Layers Magazine, Kelby Media Group, Bi Monthly
- Net, Part of the Future Group,
- Digital Arts
- Barron A E and Ivers K – Interactive Media Projects in Education: Designing, Producing and Assessing (Libraries Unlimited Inc, 2005)
- Chapman N and Chapman J – Digital Interactive Media (John Wiley & Sons Ltd, 2004)
- Vaughan T – Interactive Media: Making it Work (McGraw-Hill Education, 2003)

Websites

www.digitalworkshop.com – multimedia authoring tools for business

<http://www.mackiev.com> – authoring tools for project-based learning

www.macromedia.com – the Adobe website

<http://elearningindustry.com/list-of-authoring-tools-part-1>

UAN:	Y/506/5066
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to enable learners to describe how applications are classified by their purpose and use. They will describe issues associated with navigation and data handling common to current application types.

They must be able to describe the development requirements for different application platforms and be able to define the programming language options when using the application development software.

They will design a mobile application to fulfil a scenario set and will identify all the data and structural application requirements in a formal planning process to enable efficient development in an individual or team development environment. The design created will be developed into a working mobile application, tested and then evaluated in terms of the success of the development processes against the original specification laid out in the scenario. All processes will be documented and the learner will produce specimen end-user help documentation for selected features of the application.

Following the development and testing process they will recommend how the developed application might be enhanced or extended in future development phases.

Learners may be introduced to this unit by asking themselves questions such as:

- What are the common features of mobile applications?
- How can I design a mobile application?
- Are there patterns I have to stick to in my application?
- How could I build a mobile application?
- How would I know if my application works properly?

Learning outcomes

In this unit, learners will be able to:

1. explain characteristics of mobile applications
2. design mobile applications
3. develop mobile applications
4. test mobile applications
5. review mobile application developments.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Explain the characteristics of mobile applications

Topics

- 1.1 **Purpose** of mobile applications
- 1.2 Typical **uses** for mobile applications
- 1.3 **Features** of mobile applications
- 1.4 Programming options for application development

Topic 1.1

Learners will know how different applications are classified by their **purpose**. Examples of purpose might be but not limited to:

- information provision
- navigation
- entertainment and lifestyle
- gaming
- communication

Topic 1.2

Learners will learn how to describe **uses** for applications across a range of types of devices. Such uses would include but not be limited to:

- communication
- media play
- provide entertainment
- gaming
- data transfer

Topic 1.3

Learners will know about the different **features** of mobile applications. They must learn about:

- application launching
- application navigation
- authentication strategies and technologies to access data (eg OAuth)
- data and resource access using shared identity services and APIs (eg Google, OpenID, Facebook)
- screening transfer

Topic 1.4

Learners will learn about different options for developing applications for different application platforms. They must understand about:

- development software required
- programming languages used
- methods of application publication

Learning outcome:

2. Design mobile applications

Topics

- 2.1 Software Development Life-Cycle (SDLC)
- 2.2 User requirements

- 2.3 Application layout
- 2.4 Application navigation
- 2.5 Data flow
- 2.6 Graphical application design

Topic 2.1

Learners must learn to identify the stages of the SDLC and how they link to the phases of developing a mobile application. The phases in the cycle might include:

- requirements gathering and identification
- design specification
- identification of limitations and constraints
- code development
- application testing
- review and maintenance

Topic 2.2

Learners must know how to use information gathering techniques to discover and record the needs of the application from the perspective of the targeted user. The methods might include:

- interview by phone
- meeting
- online collaboration
- written communication

Target 2.3

Learners must learn techniques that allow them to design screens that allow planning of the methods for entry and display of data. Techniques might include:

- sketching by hand
- electronic design software
- design meeting with clients
- flow chart creation
- data flow diagrams
- use-case diagrams

Target 2.4

Learners will need to identify strategies that will allow them to design the navigation routes for the user as they move to connected parts of the application. The strategies might be recorded as:

- diagrams
- text descriptions
- presentation
- video walk-through

Topic 2.5

Learners will learn methods that allow them to plan for the transfer of data between application elements as the data is processed. Learners must learn that the algorithms created for transfer of data should allow for validation of user-entered data prior to processing. The learner should understand data management and might discuss:

- form status and visibility
- data scope using variables (local, public, static)
- data scope using classes (local, public, static)
- application 'tombstoning'
- application unload and terminate

Topic 2.6

Learners must be taught how to use drawing techniques to design the layout of the targeted application so that a consistent theme and style is easily applied to related interfaces in the application. Learners should understand that the output might be shared with:

- client
- developers in their team
- development partners
- documentation designers

Learning outcome:

3. Develop mobile applications

Topics

- 3.1 Content preparation
- 3.2 Application creation
- 3.3 Test data planning
- 3.4 Application documentation

Topic 3.1

Learners must learn how to identify resources they have permission to use in their application or they must learn how to create original graphics for use. They must know how to create a record of the sources of assets to verify the rights to use. The learner should be aware of limitations relating to:

- Licensing
 - Creative commons
 - Copyright protected
 - Reservation of selected rights
- Stock image sources
 - Costs
 - Rights
- Search engine techniques
- Attribution

Topic 3.1

Learners must learn how to identify resources they have permission to use in their application or they must learn how to create original graphics for use. They must know how to create a record of the sources of assets to verify the rights to use. The learner should be aware of limitations relating to:

- ownership of media
- types of licensing
- rights to modify original artwork or media
- software techniques used to create media
- cost implications of using media

Topic 3.2

Learners will be taught how to create a working mobile application using a development environment. The learners must be taught how the use of efficient, modular code and appropriate data types improve performance of an application and optimise the use of device and external storage systems. The learner must be taught how the modular approach to design and implementation will improve maintainability of code for error identification and extensibility. The centre must ensure that the learner has access to:

- hardware
- software development tools
- documentation tools

Topic 3.3

Learners must know how to plan for testing an application using appropriate data items that allow for verification of the application's output in a variety of circumstances. The testing must cover:

- functionality – does the application do what was specified?
- fit for purpose in terms of usability – does it do it well?
- would it attract the intended user?
- does all navigation perform correctly?

Topic 3.4

Learners must be taught techniques that allow the progressive creation of application documentation supporting the development team and the target end user. The learner would demonstrate an understanding of the value of:

- prototypes for a Rapid Application Development programme.
- progressive development of features

Learning outcome:

4. Test mobile applications

Topics

4.1 Data testing

4.2 Functionality testing

Topic 4.1

Learners must be taught how to test the application using the tests designed in Topic 3.3: and how to use strategies for recording the outcomes of the tests and the details of any modifications that might be implemented as a result of these tests. The learner should demonstrate knowledge of test phases such as:

- Alpha
- Beta
- User-acceptance

Topic 4.2

Learners must be taught how to record the testing of the application's functionality efficiently to support the evaluation against the scenario and any modifications that might be implemented as a result of these tests. The learner should use a formal structure and a business-like style to record test outcomes. The testing should include some numeric information and the learner must demonstrate an understanding of how the numbers could be interpreted.

They must know that the application must be tested against as many device options as is practicable. Learners must learn the value of the functionality testing in the creation of support and marketing material. The centre must make sure that learners have opportunities to test on:

Physical devices

or

Emulators

Learning outcome:

5. Review mobile application development

Topics

5.1 Application evaluation against scenario

5.2 Improvement planning

Topic 5.1

Learners will learn how to use a formal evaluation process that allows the created application against the scenario set. The learner must be taught how to record and present the evaluation in a business-like manner. The evaluation should consider:

- functionality
- usability
- attractiveness
- potential in the intended market place
- identified weaknesses or faults.

Topic 5.2

The learner will be taught how to review the application so that planning for future improvements in efficiency, functionality and appearance might be effectively planned. The learner should show that they can plan for:

- feature improvement
- feature expansion
- fault elimination
- usability improvement or extension

Guidance for delivery

This unit allows learners to learn about the development of mobile applications.

It is recognised that the technologies for development of applications, the environments in which they run and the devices they target are a rapidly changing set of systems and opportunities. There is likely to be an increasing number of ways for the development of applications using wizard-driven development systems but it is essential that centres give all learners the chance to consider the development and testing of applications at a level that promotes deep understanding.

The first learning outcome allows learners to contextualise current developments and to consider a range of generic concepts that apply regardless of specific platforms or devices. The outcome will allow learners to rationalise their intended designs and finished applications in the current market place at the time of the unit delivery.

It is essential that learners complete a rigorous design process in Learning Outcome 2 to develop strong understanding of industrial and commercial practice. It may be helpful to use a case study of a well-known device and 'reverse-engineer' the product through the design cycle so that all aspects are covered usefully.

The application development phase in Learning Outcome 3 will allow centres to use available staff skills and technologies to work with processes that lead to the development of the application. It is recognised that there may be several possible approaches in use at the time of the delivery of the unit but processes must allow the topics of the learning outcome to be covered in depth. The use of development teams, and a variety of roles in the teams, may allow some of the knowledge points to be contextualised as industrially relevant processes. It is acceptable for software to be run on IDE

emulators, rather than physical devices, if this is necessary as long as comprehensive and verifiable evidence is gathered.

In Learning Outcome 4, learners must know about the value of tests which provide the rigour needed to identify faults, devise corrective strategies and complete processes of record-keeping that support a robust testing regime. The tests used to verify effective functionality must be monitored and recorded efficiently and completely. The outcomes of the testing regime should allow a knowledgeable outsider to follow the whole test process without the need for further information.

The evaluation in Learning Outcome 5 of the application and the processes used to design and create it must allow the learner to make personal, qualitative judgements covering aspects beyond functionality and learners must make clear judgements about what they consider to be good and bad. It is recommended that learners be given a common framework for the evaluation process and the form of the output across the whole cohort to help learners formalise the process. There is no stipulated framework but the output should follow commonly used commercial regimes and formats.

Suggested learning resources

Annuzzi Jr., J et al. 2013. *Introduction to Android Development*. [PDF eBook]. London: Addison Wesley.

Camden, R. & Matthews, A. 2013. *jQuery Mobile Web Development Essentials* (2nd Edition). [PDF eBook]. Birmingham: Packt Publishing.

Dickett, J. 2011. *HTML & CSS*. Indianapolis: Wiley.

McWhirter, J & Gowell, S. 2012. *Professional Mobile Application Development*. [PDF eBook]. Indianapolis: Wiley.

Nathan, A. 2012. *Windows 8 Apps with XAML and C#*. Indianapolis: Sams Publishing

Olson, S et al. 2012. *Professional Cross Platform Mobile Development in C#*. [PDF eBook]. Indianapolis: Wiley.

Vaughan, D. 2013. *Windows Phone 8 Unleashed*. Indianapolis: Sams Publishing.

Watson, K. et al. 2013. *Beginning Visual C# Programming*. Indianapolis: Wrox Publishing.

UAN:	D/506/5067
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to acquire knowledge and demonstrate the skills involved in the creation of effective interfaces to improve the user experience (UX) when interacting with an application. The science of HCI has developed significantly alongside technological developments in hardware and learners should know that the designs implemented have a significant impact on the potential success of the application in the marketplace. The effectiveness of the UX will allow users to be efficient and will improve functionality.

Learners will understand that the approach to design must be structured and if guidelines are followed the likelihood of success is increased. Learners will consider some laws governing how users interact with a broad range of device types and interface styles.

Much of the unit develops knowledge that will be useful in development cycles beyond the scope of the unit and these transferrable skills will be valuable in many commercial situations.

Learners may be introduced to this unit by asking themselves questions such as:

- How do I make sure users like an application?
- What does the term 'user-friendly' mean?
- Why do some layouts work better than others?
- Can I follow rules that will help me create good interfaces?
- How can I make sure an interface is accessible?

Learning outcomes

In this unit, learners will be able to:

1. identify the concepts of human computer interaction
2. identify design processes
3. recognise techniques to improve accessibility
4. interface evaluation and documentation.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Identify the concepts of human computer interaction

Topics

- 1.1 Users and cognition
- 1.2 Interface and interactions
- 1.3 Affective aspects of the UX

Topic 1.1

Learners will need to understand that an individual's characteristics and needs can impact on the effectiveness of an interface.

Learners will consider the user as a component of the system and will learn about the role of cognition in areas such as:

- information processing (eg culturally based reading formats, distributed cognition, metaphors)
- memory (short and long-term memory, skills-acquisition and learning, load, chunking)
- perception (eg colour, pattern, grouping, proximity, sound and visual triggers)
- sensory aspects:
 - vision (sight)
 - audition (hearing)
 - tactition (touch)
 - smell and taste

Topic 1.2

Learners will learn about different interface types and consider how users may interact with them using different hardware and software options.

The learner should consider interfaces including:

- command line driven (eg linux, dos)
- menu driven (eg atm/ bank cash machine)
- natural user interfaces (eg speech recognition)
- wimp and gui (windowed operating systems)
- virtual, augmented and mixed reality
- biometric (eg fingerprint and iris recognition, voice activation)
- hardware (eg pen, stylus, touch-screen, control dial, proximity awareness, keyboard)

The learners will learn different software design paradigms that are used to create software and system interaction including:

- toolbar menu interaction
- icon interaction
- tile interaction
- mark-up language and scripting driven interaction

The learner must know about interaction using built-in and peripheral hardware devices (eg Touch, Mouse, Voice controlled) to interact with systems. The consideration should include interaction with a range of device types using both installed and embedded operating systems (eg Hardware dials on washing machine, microwave).

Topic 1.3

Learners will need to explore why different interfaces may appeal more to certain users and how they might contribute to success of the application (or not). The aspects might include:

- Emotions and the user experience
- affective computing (recognising and mimicking emotion)
- expressive interfaces
- frustrating interfaces
- persuasive technologies
- anthropomorphism and zoomorphism
- friendly interfaces using agents (eg characters, sprites)

Learning outcome:

2. Identify design processes

Topics

- 2.1 Needs analysis and modelling
- 2.2 Prototyping methods
- 2.3 Predictive interface analysis
- 2.4 Descriptive analysis, testing and evaluation
- 2.5 Documentation and support

Topic 2.1

Learners need to know about a range of techniques used to establish what an intended interface should achieve. They must know about the establishment of needs through methods including:

- client interview
- observation
- research
- existing system analysis
- competitor product analysis

Such needs analysis must include:

- project justification (eg off-the-shelf alternatives)
- data requirement analysis
- project constraints
- software constraints (eg platform, device, data transfer protocols)
- performance (eg improvement over existing systems)
- cultural requirements (eg language, acceptable imagery)
- security (eg authentication, data-hiding)
- environmental requirements (eg hazardous or challenging environments)
- legal requirements
- Implementation and user training

The learner must be able to create logical models which might include:

- conceptual entity modelling
- mood board
- wireframes
- scenario design
- interaction storyboard
- user and usage models

- barrier summaries

The learner must produce models that are consistent in quality and prepared to a standard suitable for presentation to a commercial client.

Topic 2.2

Learners need to be aware of different methods of producing prototypes for an application and how they might be used effectively. They will learn about different development environment options for creating working prototypes establishing proof of functionality (eg Java SDK, Visual studio, iOS SDK, HTML & CSS). They must know about system requirements needed to use a selected development environment.

Topic 2.3

Learners will need to learn about ways that an interface might be analysed in the design stages to predict success.

They must learn about heuristics guiding design practices (eg Jakob Nielsen's Usability Heuristics, Apple Design Guidelines, Microsoft Design Principles).

The learner must know about scientific models used to predict the functionality and effectiveness of an interface prior to implementation. (eg Fitts' Law, GOMS, Keystroke-Level Model, Choice reaction time Hick-Hyman Law.)

Topic 2.4

Learners will learn about frameworks (eg DECIDE, APEC) that might be used to formally evaluate an interface. They must learn about strategies used to measure functionality and effectiveness of an interface through formal testing. Such evaluations include but are not limited to:

- Walkthrough and review
- Controlled and natural environment user tests
- Descriptive models including:
 - Key-Action Model
 - Buxton's Three State Model
 - Bimanual Control Model
 - Guiard's Model

Topic 2.5

Learners will learn what needs to be produced to support the user of an interface. The learner must learn about support systems that enable availability of support offered offline and online (eg Printed documentation, electronically delivered documentation, interactive directed help, forums, website, telephone).

Learning outcome:

3. Recognise techniques to improve accessibility

Topics

- 3.1 Software aspects of accessibility
- 3.2 Hardware aspects of accessibility

Topic 3.1: Learners will learn about issues of accessibility concerned with software.

They must consider how software enabling aspects of interface design might allow accessibility to users challenged by difficulties and disabilities (eg Accelerator keystrokes, screen magnifiers, virtual keyboards). Learners must learn about strategies to use design to mitigate difficulties caused by perceptive problems (eg Hearing loss, colour blindness, short-sightedness).

Topic 3.2: Learners will learn about issues of accessibility concerned with hardware through the consideration of problems associated with input devices (eg Mouse, keyboard) and the mitigation of these issues through use of enabling or alternative devices (eg Microphone, trackball, eye-tracking, pneumatic control systems).

Learning outcome:

4. Interface evaluation and documentation

Topics

4.1 Evaluation of an interface

4.2 Documenting an interface

Topic 4.1

Learners will be able to transfer the knowledge gained from learning outcomes 1, 2 and 3 for practical scenarios. Learners should create a range of interface designs and techniques in preparation for evaluation.

Topic 4.2

Learners will then be able to select a suitable format for documenting the evaluation, demonstrating their knowledge of the designs and techniques that were considered above. Consideration should be given to varying the type of documentation/reporting in order to reflect the range of interfaces considered in Topic 4.1

Guidance for delivery

The principles considered in this unit may be used to inform design, creation and analysis of interfaces used in other units. The learner should be given opportunities to develop the skills necessary to consider elements of successful interface design, produce prototypes and measure their potential or actual success.

Much of the content of the unit is knowledge based and the learner must be encouraged to research current and legacy trends in design. Where consideration is given to empirical measurement using established laws the learner must be able to describe the laws generally, scenarios where they might apply and describe their usefulness. They are not required to give details of how the laws were derived.

The consideration of affective and emotional aspects will rely on subjective judgement and the experience of the learner. The tutor must be able to provide examples of items listed and to indicate sources where additional information might be found.

The research for this unit should encourage the use of books, Internet sources and multimedia resources (where available). Learners must be encouraged to discuss findings and to form opinions that they can justify and defend.

Exercises set to reinforce the knowledge may benefit from collaborative techniques and peer review. Role-play may allow the development of skills required to engage with client-based communication skills.

Suggested learning resources

Books

Carroll, John M., 2003 HCI Models, Theories and Frameworks, Towards a Multidisciplinary Approach. Morgan Kaufmann Publishers: San Francisco.

Dix, Alan et al. 2003 Human Computer Interaction, 3rd Edition. Pearson Education Limited: Harlow.

Duckett, Jon. 2011 HTML & CSS, Design and Build Websites. John Wiley & Sons Inc.: Indianapolis, IN.

Hartson, Rex and Pyla, Pardha S. 2012. The UX Book, Process and Guidelines for Ensuring a Quality User Experience. Elsevier: Waltham, MA.

MacKenzie, I. Scott. 2013 Human Computer Interaction, An Empirical Research Perspective. Elsevier: Waltham, MA.

Rogers, Yvonne et al. 2012 Interaction Design, Beyond Human-Computer Interaction. John Wiley and Sons Limited: Chichester.

UAN:	H/506/5068
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to develop an understanding of the concept involved in information systems development to meet a given scenario.

To enable learners to undertake this unit they will have to consider the external influences that could impact on the design of information systems. The methodologies that can be used to analyse these requirements must also be considered along with how they impact on the design of systems.

Once learners have explored the research and design elements they will learn how to develop prototype Information Systems to ensure that their design is feasible.

Learners may be introduced to this unit by asking themselves questions such as:

- What methodologies are available to help me with systems development?
- What is the scope of the project?
- What factors do I need to consider when designing an information system?

Learning outcomes

In this unit, learners will be able to:

1. determine a methodology to use during system developments
2. use analysis to define the scope
3. design information systems
4. prototype systems.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Determine a methodology to use during system developments

Topics

- 1.1 **Methodologies** available for designing systems
- 1.2 Select a methodology
- 1.3 Stages of the system life cycle

Learners will need to explore the methodologies that can be used as part of the design.

Topic 1.1

Learners must understand the methodologies that are available to allow the analysis and design of systems. These should include but are not be limited to:

Methodologies:

- SSADM
- Waterfall development approach
- Rapid application development (RAD)
- Spiral
- Agile
- Soft Systems Methodology (SSM)

Topic 1.2

Learners must select a methodology to use during the analysis and design of Information Systems. Learners should be able to justify why they have selected a particular methodology. This should include but is not be limited to:

- scope
- feasibility
- time frame
- resources

Topic 1.3

Depending on the methodology selected, learners must understand the stages of the system life cycle. This should include is but not be limited to:

- feasibility
- analysis
- design
- prototyping
- testing
- implementation
- monitoring
- management/ maintenance

Learning outcome:

2. Use analysis to define the scope

Topics

- 2.1 Gather information required defining the scope
- 2.2 Scope the development of an information system

Learners must be able to scope the development of a system. This will involve investigating the factors that may impact on the scope and producing a document that defines the scope.

Topics 2.1, 2.2

Learners should understand the factors to be taken into account when defining the scope. Scoping involves gathering information required to start the chosen methodology, and professionally documenting the system required by the stakeholders. This should include but is not be limited to:

- business requirements
- the function(s) of the system
- user requirements
- regulatory / compliance requirements
- integration with existing systems
- the services to be provided by the system
- time frames involved
- team members
- resource constraints
- access to available resources

Learning outcome:

3. Design Information Systems

Topics

- 3.1 Analyse a system
- 3.2 Document the findings of the analysis
- 3.3 Document the design

Topics 3.1, 3.2

Learners should be able to analyse and professionally document the relevant information in an existing system or data to support the design of a new system. Learners should use the scope already documented. This should include but is not be limited to:

- the purpose of the system
- capability of proposed or existing hardware and software
- compatibility of proposed or existing hardware and software
- potential for growth / redundancy
- training implications
- maintenance requirements
- software licensing
- support requirements
- hardware and software requirements

Learners must use the previous selected methodology when performing an analysis.

Topic 3.3

Learners should, following the methodology chosen, be able to design the required system according to the analysis previously completed to include but not limited to:

- design diagrams
 - physical
 - logical
 - dataflow
 - entity life
 - entity relationship
- system test plan

Learning outcome:

4. Prototype systems

Topics

- 4.1 Implement designs
- 4.2 Configure the software
- 4.3 Test the system
- 4.4 Document findings

Learners should be able to develop a limited prototype of the system infrastructure to allow testing of the hardware and software elements of the system infrastructure. This consists of interconnecting each type of hardware device that is required to implement the infrastructure and configuring the relevant software.

Learners should have an understanding of the basic concepts involved in testing a system infrastructure. This could involve performing routine tasks such as accessing servers to retrieve data or the more technical aspects such as using echo requests to test the configuration of a router.

Topic 4.1

Learners should be able to interconnect the required hardware to allow a proof of concept study to be undertaken. This should include but is not be limited to:

- media identified in the analysis and design stage
- devices identified in the analysis and design stage

Topic 4.2

Learners should be able to configure the software required to implement the system infrastructure. This should include but is not be limited to:

- configuring shared drives
- configuring IP addresses
- configure firewalls to block access

It is suggested that learners should be given a scenario that contains the information regarding the required system infrastructure. They should analyse the information provided and document recommendations upon which the design of the system infrastructure should be based.

Topic 4.3

Learners should be able to carry out tasks that would routinely be undertaken to ensure that the infrastructure functions as expected. Learners need to understand that any issues that occur should be rectified and the tests undertaken again to ensure that the infrastructure is functioning as expected. These should include but is not be limited to:

- test connectivity using Ping
- transfer files between systems
- analysing the data flow

Topic 4.4

Learners should be able to record the results of the tests undertaken on the infrastructure. It is expected that learners should be able to explain where issues have occurred, a description of the issue and the actions required to correct the issues, which should also be recorded.

Guidance for delivery

Learners should be exposed to the theoretical and practical aspects of analysing and designing information systems, including the various methodologies that can be adopted (and adapted). Learners should be encouraged to use at least two different methodologies, select an appropriate methodology and justify their selection.

Once they have justified their design they should be able to implement a limited prototype to allow the testing of the components of the infrastructure. They should use commonly available tools to analyse the data flow through the infrastructure and document their findings.

Learners should be given a scenario that contains the information regarding the required system infrastructure. They should analyse the information provided and document recommendations upon which the design of the system infrastructure should be based.

Once the documentation has been produced the learners need to agree the scope with the person commissioning the project.

Learner should be able to design an information system to meet the requirements identified in the scenario. Once the design has been completed it should be presented to the person commissioning the project for approval.

Suggested learning resources

Websites

http://cis.msjs.edu/courses/core_courses/csis202/lessons/10/ch10.pdf

<http://ceur-ws.org/Vol-72/097%20Thorpe%20Systems.pdf>

http://opensdlc.org/mediawiki/index.php?title=Main_Page

UAN:	K/506/5069
Level:	3
GLH:	60

What is this unit about?

Within this unit, learners will be able to explore the potential of utilising cloud technologies for both private and business purposes.

Cloud technologies can be considered as being an extension of the Internet, opening up a range of social and corporate IT services, some of which can result in considerable cost savings and increased flexibility.

Learners will be introduced to a variety of methods by which businesses can continue to use existing network infrastructures and rent services, solutions and software from service providers. Other options can include a business creating its own custom cloud or using a service provider's framework from which they can conduct business.

Learners may therefore be able to suggest new and innovative ways that these technologies could be employed in the future.

Learners may be introduced to this unit by asking themselves questions such as:

- What is the cloud?
- Who controls the cloud?
- Are cloud technologies just for business users?
- Are cloud technologies free to use?
- What equipment do I need for their use?
- What security measures do I need to employ?

Learning outcomes

In this unit, learners will be able to:

1. Recognise cloud technology concepts
2. determine how cloud technologies may be used for a given purpose
3. justify the use of cloud technologies.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit in order to ensure that all the learning outcomes can be achieved.

Learners need to have some knowledge as to how networks are deployed in a business context, which is also covered in the Networking Fundamentals unit.

This knowledge could be developed through the mandatory unit Information Systems Development.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Recognise cloud technology concepts

Topics

1.1 The principles of **cloud technologies**

1.2 **Social aspects** of cloud technologies

Topics 1.1, 1.2

Learners should explore cloud technologies that could be considered as the next development of the Internet. Learners should understand that cloud computing is about accessing data and programmes over the Internet, typically through a third party computing utility provider, instead of local network servers.

Learners should recognise that the term 'cloud' refers to remote storage, freeing up local resources including maintenance and security. Cloud Technologies use and benefits include but are not limited to:

- personal data storage and retrieval (eg documents, images, databases)
- accessing shared files (eg group storage, data archives)
- software as a service (eg software applications)
- accessing entertainment (eg television, films, games)
- interactivity (eg games)
- information gathering (eg search engines)
- virtual meetings / virtual training
- accessibility
 - access on the move
 - home working
 - 24/7

Learners should understand that clouds can be public, private, hybrid or virtual. Cloud computing also has social aspects that should be readily identifiable. They include but are not limited to:

Social aspects:

- personal web-based mail accounts
- data storage (eg images, videos, music)

Learning outcome:

2. Determine how cloud technologies may be used

Topics

2.1 **Cloud services** for professional use

2.2 Cloud services for personal use

Topics 2.1, 2.2

Learners will need to be aware that there is a difference between how home users access cloud services and how businesses and organisations access cloud services. Business can choose a range of options including but not limited to:

Cloud services:

- Software-as-a-Service (SaaS)
 - uses existing network infrastructure
 - server connects to the Internet
 - company subscribes to an application it regularly accesses over the Internet
- Platform-as-a-Service (PaaS)
 - business can create its own custom applications
 - off the shelf templates available for quick deployment
 - can be used by all in the company
- Infrastructure-as-a-Service (IaaS)
 - large internet providers or search engine companies provide a backbone that is effectively rented out to other companies (eg films, books etc.)
- Solution-as-a-Service (SoaaS)
 - software solutions provide an end-to-end capability such as online payments, event management, payroll processing supported by staffing, service level agreements, etc

Learners should be aware of the components required to make up a basic network topology within a business context. An emphasis should be placed on how the network communicates through external connectivity to the Internet and the importance of transmission speeds when adopting cloud technologies.

As cloud technology is effectively using the Internet for a specific purpose, learners will need to be aware that for home use, they require no further equipment other than that already in place to access their Internet service provider. The Internet will then, as with email, direct them to the correct location or resources to be deployed.

Learning outcome:

3. Justify the use of cloud technologies

Topics

3.1 The adoption of cloud technologies for a given business scenario

3.2 The validation of **metrics**

Topic 3.1

Learners should be aware that Cloud technologies may not be the answer for all computer uses and wherever it is employed within a business context, it must be justified.

Learners should explore a business case in order to produce a justification that may take the form of a formal document that rationalises the implementation. The justification document will vary depending on the scenario but could include elements from the list below, including but not limited to:

Document:

- rationale for adopting cloud technologies
 - virtual network
 - home working
 - mobile access
 - accessibility
 - cloud strengths
 - risks
 - change of finance model
 - increased costs but greater flexibility
- potential cost savings
 - availability of the latest applications
 - no need to regularly update software applications
 - licence fees reduced
 - fewer company IT technicians
 - reduced physical assets (eg servers)
- cloud service providers
 - need to provide a predictable and guaranteed level of service
 - level of service and performance can have cost factors
 - security for client data
 - responsible for all external IT assets and management
- software requirements
 - interface
 - linking software to access web-based services
- the intended purpose
 - data storage and retrieval
 - using online software (eg Office suites)
 - enabling of existing enterprise software
- security measures
 - firewalls
 - passwords
 - administration arrangements, usually controlled locally
- comparison of access speeds
 - local hard disk
 - network
 - remote connections
- benefits
 - user side
 - decreased workload for existing hardware
 - decreased reliance on software
- risks
 - service side
 - loss or corruption of client data
 - theft of client data
 - confidentiality
- flexibility
 - software configuration
 - administration (eg access rights)
- recommendations

Topic 3.2

Within any feasibility or justification documentation, learners need to be aware that any deployment of cloud technologies needs to be measurable against standard metrics. The types of

metrics that could be employed would require baselines from which any benefits or success can be measured against and can include but are not limited to:

Metrics:

- predicted costs savings compared to any actual cost savings
- improvements to productivity justifies cost
- upload/download speeds
- increased business
- decreased administration
- improved allocation of resources across development/maintenance.
- reduced wage costs (eg technicians)
- security of data storage
- client feedback
- user feedback

Guidance for delivery

Learners should be encouraged to explore the practical feasibility of cloud technologies available for all users.

Guidance should be given regarding metrics that can be employed in order to determine the success or cost effectiveness of employing cloud technologies for a business purpose.

The skills learned from this unit could best be evidenced by learners undertaking a small project to explore a range of possibilities for cloud technology deployment and completing a project analysis, recommendation and testing document.

Suggested learning resources

Books

Above the Clouds - Managing Risk in the World of Cloud Computing

McDonald, K T, 2010

Published by: IT Governance Publishing

ISBN13: 9781849280327

The Basics of Cloud Computing

Rountree & Castrillo

Published by: Styngress

ISBN 13: 9780124059320

Cloud Computing: Concepts, Technology & Architecture

Eri, Puttini & Mahmood, 2013

Published by: Prentice Hall

ISBN 13: 9780133387520

Cloud and Virtual Data Storage Networking

Schulz, G, 2013

Published by: CRC Press

ISBN 13: 978-1439851739

Unit 322

Create a computer network

UAN:	H/506/5071
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to have the opportunity to build, configure and test a functioning computer network encompassing a wide variety of networking devices. Learners should have the opportunity to use and configure more complex technologies such as managed switches and routing devices (for both physical and wireless communication) in their network.

Learners will explore how to implement a range of different user account types with appropriate permissions. Learners will also understand the importance of documenting the complete installation, configuration and testing of their working network.

Learners may be introduced to this unit by asking themselves questions such as:

- What services are required on a network?
- What are network topologies?
- How can I configure a distributed user account?
- How can I connect a mobile device to a network?

Learning outcomes

In this unit, learners will be able to:

1. connect network components
2. configure network technologies
3. test network configurations.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit in order to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Connect network components

Topics

- 1.1 Set up the connection of network infrastructure
- 1.2 Set up the connection of network media
- 1.3 Configure network software including services and protocols

Topics 1.1, 1.2, 1.3

Learners should be able to select and connect appropriate hardware, media and software components in order to build a functioning computer network, including but not limited to:

Hardware:

- cabling
- routers
- switches
- hubs
- mobile devices
- server
- workstation(s)
- gateway
- data storage
 - RAID
 - Network Attached Storage
 - Storage Area Network

Media:

- media types
- media connections
- media access technologies

Software:

- operating systems (network, workstation, mobile etc.)
- protocols eg TCP/IP
- software firewall
- antivirus
- additional software services eg HTTP, NFS, DNS, etc.

Services and protocols:

- IP Addressing
- IP v4
- IP v6
- subnetting
- private Networks
- DNS
- domain names

- URL (uniform Resource Locators)
- Authoritative Name Servers
- DHCP
 - scope
 - reserved addresses
- Wireless
 - SSID (security Set Identifier)
 - security type
 - WEP (Wired Equivalent Privacy)
 - 802.1x
 - WPA (Wi-Fi Protected Access)
 - ❖ TKIP (Temporal Key Integrity Protocol)
 - ❖ WIDS (Wireless Intrusion Detection System)
 - ❖ EAP (Extensible Authentication Protocol)
 - WPA2
 - channel
- QOS (Quality of Service)
- remote access

Learning outcome:

2. Configure network technologies

Topics

- 2.1 Network configuration
- 2.2 User accounts configuration

Topic 2.1: Having built the physical network, learners need to be able to configure a network including but not limited to:

- hardware
- software
- services and protocols

Topic 2.2: Learners should be able to configure a range of network controlled user accounts, to include but not limited to:

- administrator
- back up operator
- users
- guest

Learning outcome:

3. Test network configurations

Topics

- 3.1 Configuration of technologies tested
- 3.2 Document the network testing and configuration

Topic 3.1: As part of this outcome learners should be in the situation where the device in the network must be able to successfully send and receive a file to/from every other device. Learners

should be able to identify the tests to perform, conduct them, record the results and make any changes required to achieve a successful outcome.

Topic 3.2: Learners should be able to document the complete network installation, including all testing and configuration to include but not limited to:

- installation
 - topology
 - network devices
 - asset list
 - software
- configuration
 - IP addressing
 - subnetting
 - name resolution
 - storage locations
 - network services eg user accounts
- testing
 - test plan
 - test logs
 - connectivity
 - throughput
 - access.

Guidance for delivery

Wherever possible this unit should be delivered within a lab or workshop environment allowing the learners the hands-on experience of the appropriate and relevant hardware and software. Learners should be encouraged to explore and use a wide a range of network hardware and software.

Centres should to introduce configuration errors in to the network, in order for learners to understand the likely consequences and remedies. Learners must be able to access and configure devices eg routers and switches.

Whichever method or methods are used, learners should experience a variety of network devices including mobile and wireless technology.

Suggested learning resources

IT Security: <http://www.itsecurity.com/>

Computer Weekly: <http://www.computerweekly.com/resources/IT-security>

Search Security: <http://searchsecurity.techtarget.com/>

Bletchley Park Trust (Education Resources): <http://www.bletchleypark.org.uk/edu/resources.rhtm>

The National Museum of Computing (Education Resources):
<http://www.tnmoc.org/learn/educational-visits>

Professional Bodies, Trade Associations and Sector Skills Council

Information Security Specialist Group (ISSG) of BCS The Chartered Institute for IT: <http://www.bcs-issg.org.uk>

The Institute of Information Security Professionals: <https://www.iisp.org/imis15/>

The Worshipful Company of Information Technologists: <http://www.wcit.org.uk>

e-skills UK: <https://www.e-skills.com/professional-development/cyber-security/>

The Cyber Security Challenge UK: <https://cybersecuritychallenge.org.uk/existingsponsors.php>

Unit 323

Manage networks

UAN:	K/506/5072
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to enable learners to develop an understanding of managing computer networks and how network monitoring tools can be usefully deployed to assist in network management.

Learners should experience a range of network types including physical and virtual networks. Learners will also gain a deeper understanding of network security against a range of network types.

Learners may be introduced to this unit by asking themselves questions such as:

- Why is it important for networks to be monitored?
- How would I monitor a network?
- What sort of network activities need to be monitored?
- How are networks managed?
- Can changes be made to working networks without loss of service?

Learning outcomes

In this unit, learners will be able to:

1. recognise network performance and management
2. determine network security threats
3. manage computer networks

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit in order to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Recognise network performance and management

Topics

1.1 The impact of **network design factors**

1.2 **Network performance** fundamentals

1.3 Network **management** fundamentals

Topic 1.1: Learners should understand that effective network management begins with the design of the network. Learners need to understand the factors in network design that directly affect the process of network management, including but not limited to:

Network design factors:

- scalability
- traffic patterns
- performance
- data traffic and formats
- heisenberg uncertainty principle
- standards compatibility
- resilience/availability

Topic 1.2: Learners should understand that network performance can be monitored, tracked and reported in different ways to assist in network management, including but not limited to:

Network performance:

- reliability
- availability
- latency
- throughput

Topic 1.3: Learners should understand that management aspects (business, technology, service) can be monitored, tracked and reported in different ways to assist in network management, including but not limited to:

Management:

- business management
 - reducing operational costs
 - enhancing flexibility
 - maintaining business continuity
 - timely service provision
- technology management:
 - efficiently distributing data throughout the network
 - minimise overheads

- resource deployment
 - management systems
- resource maintenance
- service management:
 - enable rapid service deployment
 - ITIL strategies
 - meeting day-to-day customer needs eg passwords, printing
 - network and data security
 - resource monitoring
 - configuration management
- network management (it consists of):
 - operations
 - administration
 - maintenance
 - provisioning
 - FCAPS
 - Fault
 - Configuration
 - Accounting
 - Performance
 - Security

Learning outcome:

2. Determine network security threats

Topics

2.1 The necessity of network security

2.2 Types of **threats** to be protected against

Topic 2.1

Learners should understand that network security is essential to ensure the integrity of network services and data. There are multiple principles and safeguards that can be employed to include but not limited to:

Principles:

- risk analysis
- protecting the managed objects
- authentication procedures
- maintenance of access control routines
- management of keys for encipherment (eg to convert a message into cipher)
- maintenance of authorisation facilities
- maintenance of security logs
- protecting the NMS
- external influences (eg cloud based environments)

Countermeasures:

- enable firewall
- cryptography
 - public key
 - private key
- message integrity
 - digital signatures
- secure email
- secure DNS
- secure transport (SSL)
- secure network (IPsec, secure routing, VPN)
- secure link (802.11)

Topic 2.2

Learners should understand the types of threats that can be encountered on a network, to include but not limited to:

Threats:

- Malware
- Spyware
- Virus
- Trojan Horse (payload)
- Worm
- Trap Door
- Logic bomb
- Zombie
- Botnet
- DoS Attack
- Unauthorised access

Learning outcome:

3. Manage computer networks

Topics

3.1 Network **management tools**

3.2 **Remote** management

3.3 Monitor and manage a computer network

Topic 3.1

Learners should be able to use a variety of network management tools to monitor and manage a network. To include but not limited to:

Management tools:

- proprietary

- free (often advert based)
- monitoring tools
- open source
- SNMP (Simple Network Management Protocol)
- management 'Agents'
- 'Sniffers'

Topic 3.2

Learners should be able to demonstrate that they can manage networks including remote management, to include but not limited to:

Network management:

- group policies
- account types
- passwords
- updates
- backups
- virus definition update
- remote access
- troubleshooting
- Cloud technologies
- network infrastructure
 - media
 - switches
 - bridges
 - routers

Remote management:

- VPN
- SNMP / Traps
- Virtualisation
- Management Agents

Topic 3.3

In order to successfully manage a network learners should be able to monitor a network, to include but not limited to:

Network monitoring:

- correct use of tools
- monitoring engine
- intrusion detection
- network tomography
- route analytics
- internet server
- network traffic
- wireless

Guidance for delivery

Wherever possible this unit should be delivered with 'real-world' network activity, alongside practical exercises and case studies. If 'real-world network activity' is not available then running simulations within either virtual networks or specialist (simulation) software should be utilised.

Learners should be able to experience most of the 'issues' faced by network managers or technicians in a small organisation, to allow the teaching content to be contextually understood.

For practical purposes, it may be advisable for Learning Outcomes 2 and 3, to be undertaken by learners over a period of time; in order that the monitoring and management activities are achievable as discrete tasks, within the available environment.

Suggested learning resources

IT Security: <http://www.itsecurity.com/>

Computer Weekly: <http://www.computerweekly.com/resources/IT-security>

Search Security: <http://searchsecurity.techtarget.com/>

Bletchley Park Trust (Education Resources): <http://www.bletchleypark.org.uk/edu/resources.rhtm>

The National Museum of Computing (Education Resources):
<http://www.tnmoc.org/learn/educational-visits>

Professional Bodies, Trade Associations and Sector Skills Council

Information Security Specialist Group (ISSG) of BCS The Chartered Institute for IT: <http://www.bcs-issg.org.uk>

The Institute of Information Security Professionals: <https://www.iisp.org/imis15/>

The Worshipful Company of Information Technologists: <http://www.wcit.org.uk>

e-skills UK: <https://www.e-skills.com/professional-development/cyber-security/>

The Cyber Security Challenge UK: <https://cybersecuritychallenge.org.uk/existingsponsors.php>

Unit 324

Provide technical support

UAN:	M/506/5073
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to enable learners to develop the skills required to support both business and private users with differing levels of expertise. The unit will also enable learners to source and communicate detailed technical information when dealing with technical faults. Throughout this unit learners will need to understand the importance of questioning techniques and effective communication.

Learners may be introduced to this unit by asking themselves questions such as:

- What are the steps involved in troubleshooting?
- Do I have the skills to repair a system?
- What diagnostic tools are available to help with troubleshooting?
- How can I test that an issue has been resolved?
- Do I need to document troubleshooting?
- How should technical support be offered to me?

Learning outcomes

In this unit, learners will be able to:

1. identify techniques for providing technical support
2. perform technical diagnosis
3. report on testing outcomes
4. communicate effectively to provide technical support.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit in order to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Identify techniques for providing technical support

Topics

- 1.1 Requirements for technical support
- 1.2 Support **tools**
- 1.3 Information gathering

Topic 1.1

Learners will need to be aware of the requirement and purpose of maintaining technical support for personal use or within a business and how they can be employed for this purpose. They can include but are not limited to:

Purpose:

- to maintain functionality
- to keep a business running
- to access technical advice
- systems development

Method:

- Service Level Agreements (SLA)
- breakdown insurance
- vendor support
- in-house technician
- remote support services (eg outsourcing)

Considerations:

- data integrity
- minimising the disruption to service

Processes:

- first, second and third line support
- ticketing systems (eg fault tracking)
- escalating faults
- response times

Topic 1.2

Learners should be able understand differing tools used in technical support to include but not limited to:

Tools:

- software diagnostic
- monitoring tools
- remote diagnostic

- VNC (Virtual Network Computing)
- control panel
- network monitoring
- cable testers
- tone tester
- multimeter
- feedback

Topic 1.3

Learners should be able to demonstrate an understanding of the differing techniques available when gathering information to support fault diagnosis to include but not limited to:

- identify the problem:
 - asking questions of the user
 - identifying any changes made
 - reviewing fault logs or helpdesk software reports
 - observation
 - feedback
- establish a theory of probable causes:
 - trend analysis
 - what if scenarios
 - flow charts
 - component failure
- prepare an action plan for a business environment:
 - planning downtime
 - informing users
 - backing up existing environment
 - testing backups
- implement the plan
- test functionality after the plan has been implemented
 - test plans
- document faults, actions and outcomes
 - test logs
 - fault logs

Learning outcome:

2. Perform technical diagnosis

Topics

- 2.1 Justify tests or actions taken during diagnosis
- 2.2 Select **tools** to diagnose faults
- 2.3 **Validate information** for correct fault diagnosis

Using the information gathered from Topic 1.1, 1.2, learner should be able to implement any planning in order to carry out the steps involved in diagnosing and correcting faults.

Topic 2.1: Learners should be able to justify any tests or actions performed during diagnosis process. These should include but not be limited to:

- substitution
- replication
- performance testing
- function testing
- environmental changes (eg temperature, location etc)

Topic 2.2: Learners should be able to understand hardware and software tools that can be used as part of the troubleshooting process. These should include but not be limited to:

Tools:

- Software
 - third party utilities
 - Command Line Interface (CLI)
 - Ping
 - Trace route etc.
 - recovery disks including live operating systems
 - built in system utilities
 - reboot (eg home PCs and workstations only)
 - remote access
- Firmware
 - Basic Input Output System (BIOS) output
 - Unified Extensible Firmware Interface (UEFI) output
 - Power On Self Test (POST) Cards
- Hardware
 - LED / LCD panels and other status indicators
 - multimeters
 - cable testers
 - loop back devices

Topic 2.3: Learners should be able to gather various types of technical support information and understand why it is important to validate such information, to include but not limited to:

Information types:

- manuals
- higher level support / developers
- knowledge bases
- job aids
- fault records
- internet sources
- specialists

Validation methods:

- observation
- cross referencing
- problem replication
- log file analysis
- reliability of information source

- previous experience

Learning outcome:

3. Report on testing outcomes

Topics

- 3.1 Test system functions
- 3.2 Record remedial actions

Learners should understand that the troubleshooting process does not end at the initial remedial actions as there could still remain underlying factors that could adversely affect the system. In order to check that the remedial actions taken were successful, learners should be able to test the system in line with a test plan and fully document the actions taken to support future maintenance.

Topic 3.1

Learners should be able to demonstrate functionality of the system following the completion of the actions required to rectify faults. This should include but is not limited to:

- functionality of new or existing hardware
- functionality of new or existing software
- functionality of connectivity
- system performance (pre and post troubleshooting)
- backup procedures
 - creation
 - testing
 - restoration

Topic 3.2

Learners must record the remedial actions and functionality tests undertaken. Depending on the remedial actions taken, the documentation can include but is not limited to:

Documentation:

- Fault logs
- Help desk logs
- Test logs (based on test plans)
- Hardware installation logs
 - make
 - model
 - serial number/ asset tag
 - location
 - issues identified
 - date
 - time
- Software installation logs
 - operating system installed
 - type of software
 - updates/ patches
 - issues identified
 - error messages
 - date
 - time
 - version

- installed location

Learning outcome:

4. Communicate technical support

Topics

4.1 Methods of communication

4.2 Classification of **users**

4.3 Technical advice and guidance

Topic 4.1

Learners should be able to use different communication methods and understand their purpose's to include but not limited to:

Communication methods:

- direct
- email
- face to face
- telephone
- documentation
- forums

Topic 4.2

Learners need to be able to establish the user's level of technical understanding when communicating information and adapt the communication accordingly, to include but not limited to:

Users:

- novices
- technicians
- experts

Topic 4.3

Learners should demonstrate how to give effective and professional advice and guidance to differing types of users to include but not limited to:

- politeness and timely response
- giving appropriate recommendation's
- identifying opportunities for further learning
- use of appropriate language
- relevance of content
- control of anger and frustration
- remaining calm and collected
- maintain focus
- patience
- communicating response times and managing expectations

Guidance for delivery

In order to successfully achieve this unit, learners should experience first-hand IT technical support, this could be through visiting IT departments within the setting or by simulating a realistic IT support environment.

Learners should also experience the needs of users and giving of support through either a realistic environment or through the use of role play. The learner should be exposed to a wide a range of faults and customers.

Further to this learners must understand the importance of effective communication and the importance of understanding the types of customers they may encounter.

Suggested learning resources

IT Security: <http://www.itsecurity.com/>

Computer Weekly: <http://www.computerweekly.com/resources/IT-security>

Search Security: <http://searchsecurity.techtarget.com/>

Bletchley Park Trust (Education Resources): <http://www.bletchleypark.org.uk/edu/resources.rhtm>

The National Museum of Computing (Education Resources):
<http://www.tnmoc.org/learn/educational-visits>

Professional Bodies, Trade Associations and Sector Skills Council

Information Security Specialist Group (ISSG) of BCS The Chartered Institute for IT: <http://www.bcs-issg.org.uk>

The Institute of Information Security Professionals: <https://www.iisp.org/imis15/>

The Worshipful Company of Information Technologists: <http://www.wcit.org.uk>

e-skills UK: <https://www.e-skills.com/professional-development/cyber-security/>

The Cyber Security Challenge UK: <https://cybersecuritychallenge.org.uk/existingsponsors.php>

UAN:	A/506/5075
Level:	3
GLH:	60

What is this unit about?

This unit allow learners to explore the components of the infrastructure of organisations. Learners will appreciate that systems are becoming increasingly complex as new functionality develops, and that effective use of the systems has a significant impact on the ability of a business and individuals in commercial situations. Learners will be able to appreciate that systems will help them expand to accommodate success if they are well designed.

The unit features the management process from several facets so that learners can explore how these components of the infrastructure are brought together to create a functional system. The infrastructure incorporates people, hardware, software and data and these are the parts that will need to be connected for the system to function well.

The unit deals with technologies that continue to improve rapidly and therefore uses generic terms as indicators of the topic; learners will be able to investigate current practices, both hardware and software. Systems can operate as a collection of interconnected components using links to present different views based on who is accessing the system, what they want to see and what they are authorised to work with. Systems are set up to allow access based on rules that are established and managed centrally.

It is important to be able to model systems graphically so that people might understand their nature without needing to understand the underlying technologies completely. The system's components are represented as whole entities and the reader sees how these come together to allow each to interact with others, or not.

Learners may be introduced to this unit by asking themselves questions such as:

- How do organisations design their systems?
- Are systems managed differently inside and outside?
- Who manages the systems?
- How does the data I see on a webpage get created?

Learning outcomes

In this unit, learners will be able to:

1. identify infrastructure management roles and benefits
2. identify public-facing infrastructure
3. determine internal infrastructure
4. manage data
5. create an infrastructure plan.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit in order to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout this unit are not definitive.

Learning outcome:

1. Identify infrastructure management roles and benefits

Topics

- 1.1 Engineering and data **roles**
- 1.2 **Support roles**
- 1.3 Infrastructure management benefits

Topic 1.1

Learners will learn about a range of roles played by employees and consultants providing system designs, and producing working elements of the system when it is implemented for an organisation. The roles should cover how these employees contribute to the infrastructure's success. The roles should include but are not limited to:

Roles:

- system architect
- network manager
- hardware and cabling engineers
- database administrator
- data analyst
- website analyst/designer

Topic 1.2

Learners will learn about employees who provide support to users of the system, both external and internal. They should understand how these people do their jobs and how they might be expected to respond to given scenarios. The roles should include:

Support Roles:

External support:

- Tier 1 support
- Escalated support
- Specialist support
- Contracted support
 - Service Level Agreements (SLA)

Internal support:

- Hardware support technicians
- Software support technicians

Topic 1.3

Learners must explore the core benefits of formal infrastructure management. The aspects should include:

- adherence to standards
- enhanced flow of services and data
- interoperability of systems
- fault prevention, detection and resolution
 - disaster planning
 - recovery planning
- financial planning
- improved productivity
- complexity reduction
- cost reduction
- alignment of business and it strategies
- security optimisation
- automation of processes
- maintaining availability of service.

Learning outcome:

2. Identify public-facing infrastructure

Topics

2.1 Services provided

2.2 Service hosting

2.3 User validation

Topic 2.1

Learners should have an understanding of services and products that might be used by external users of the system. Such services might include but are not limited to:

- websites
- data
- media
- VoIP
- video-conferencing

Topic 2.2

Learners should explore ways to host the data and information used by the external users of the system. Options might include:

- own server provision
- paid-for hosting
- cloud services
- managed services (eg outsourcing, collocated services).

Topic 2.3

Learners should understand a range of ways that might be used to allow users to access services that are not freely available or public. Such authentication services might include:

- conventional credential database
- authentication services (eg OAuth, Open ID)

- linked account APIs (Facebook, Twitter, Google).

Learning outcome:

3. Determine internal infrastructure

Topics

3.1 Core **computing facilities**

3.2 Network management

3.3 Internal authentication

Topic 3.1

Learners should have an understanding of centralised computing facilities used by large organisations. Such systems might include:

Computing facilities:

- mainframe computers
- distributed systems
- dedicated and heterogeneous grids
- edge computing
- autonomic systems
- electricity and water supplies
- cooling and air-conditioning.

Topic 3.2

Learners should consider the structures of networks and how they might be used to connect components using strategies such as an Intranet.

Learners should consider the infrastructures used might implement wired and wireless technologies, including:

- component interfacing
- cabling standards and transfer rates
- cable ducting systems
- virtualisation
- load-balancing
- remote desktop
- client devices
- PC/Mac/Linux based workstations
- thin client
- mobile devices.

Topic 3.3

Learners must explore the authentication of users who work on the company's network and how such strategies allow different users to be limited in access to different system parts. Learners should know about methods to qualify access based on:

- role
- seniority
- task/ workgroup/ project.

Learning outcome:

4. Manage data

Topics

- 4.1 Data server architecture
- 4.2 Data backup strategy
- 4.3 Making data public
- 4.4 Data mining

Topic 4.1: Learners should understand how organisations might provide server facilities to store data used externally and internally. Learners should consider:

- physical hardware (eg u-based rack systems)
- server operating systems
- hosted data systems (cloud, managed data services)
- warehousing.

Topic 4.2: Learners should understand the methods used to back-up data that is required by the organisation. They should consider:

- onsite and offsite backup storage
- cold and hot backup sites
- cloud backup
- backup strategies (eg, full, incremental, archive)
- backup schedules
- restore and recovery methods
- restore validation strategies.

Topic 4.3: Learners should explore data publication systems and their management. These should include:

- file servers
- RAID Systems
- Virtual Learning Environments (VLE)
 - e-learning
 - distance learning
 - tests
 - course files
- Content Management Systems (CMS)
 - workflow
 - publishing
 - collaboration
- Customer Relationship Management (CRM) systems
 - contact with current customers
 - contacting future customers
 - marketing
 - customer support.

Topic 4.4: Learners must understand the strategies used by organisations to interrogate stored data to provide strategic information through data mining. They should explore:

- trend analysis
- Online Transaction Processing (OLTP)

- Online Analytical Processing (OLAP)
- knowledge management systems
- legal and ethical guidelines.

Learning outcome:

5. Create an infrastructure plan

Topics

5.1 Infrastructure planning

5.2 Presenting the plan

Topic 5.1

Learners should be able to use the knowledge gained in learning outcomes 1- 4 to explore how various infrastructure designs can be effectively managed. In order to demonstrate their knowledge of infrastructures, learners need to understand techniques that could be used to represent the infrastructure system holistically using diagrams.

Diagrams could include but are not be limited to:

- structure diagrams
- hierarchy charts
- conceptual modelling of system entities
- pictorial models
- network models
- spider diagrams
- information modelling

Topic 5.2

Having implemented a proposed set of models, learners should review the outcomes in order to evaluate the models against a defined framework. Learners should explore a range of presentation techniques including documentation, presentation or peer panel discussion.

Guidance for delivery

Much of this unit could be based around case studies and scenarios to allow learners to explore the nature of infrastructures implemented across a range of different company types and sizes. Learners should consider how individuals might create an effective infrastructure scaled to meet their needs.

Learners should be given opportunities to speak to employees of organisations where possible to allow them to consider how the infrastructure elements are defined and implemented in real situations.

Suggested learning resources

Books

Benyon-Davies, P. 21013. Business Information Systems. Palgrave Macmillan: San Francisco.

Boddy, D. et al. 2008. Managing Information Systems: Strategy and Structure. Financial Times; London.

Brown, C. et al. 2013. Managing Information Technology. Prentice Hall: Upper Saddle River, NJ.

Curry, A. et al. 2007. Managing Information and Systems. The business perspective. Routledge: Abingdon.

Laan, S. 2013. IT Infrastructure Architecture. Lulu.com (Self published)

Laudon, K. 2009. Management Information Systems: Global Edition. Pearson Education: London.

UAN:	F/506/5076
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand, recognise and apply the fundamentals of e-commerce.

E-commerce has become one of the biggest growth areas in recent years. Almost everybody has engaged with buying and selling over the Internet and this trend continues to grow annually. This includes individuals trading online, through to traditional retailers extending their business provision to include an online presence and thus reaching out to a global market.

The unit begins by exploring a current commercial e-commerce website, beginning with the front-end services and investigating how this links to back-office processes such as data management systems. The technologies involved in running an e-commerce solution are explored including web architecture, hardware and software requirements and communication technology features which ensure the smooth running of the site.

Security is a key aspect of any e-commerce solution and this unit explores the various methods of securing the site, data and online payments as customers purchase goods from the site.

Finally, learners will explore the designing and creation of an e-commerce solution for a small to medium organisation. On completion of this unit learners will have an understanding and appreciation of e-commerce technologies, and how they support the infrastructure of e-commerce activities and trading.

Learners may be introduced to this unit by asking themselves questions such as:

- How do e-commerce sites work?
- How is my security guaranteed?
- How do I design an e-commerce site?
- How do I add e-commerce functionality to an existing site?
- How do I manage payments on an e-commerce site?

This unit links to 'Social Media' therefore they should be delivered together.

Learning outcomes

In this unit, learners will be able to:

1. determine e-commerce website functionality
2. identify e-commerce hardware and software architecture
3. design e-commerce solutions
4. create e-commerce solutions
5. evaluate e-commerce solutions.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

This is an introduction to the theory behind e-commerce websites and creating e-commerce websites.

Learners must have access to facilities which give them the opportunity to fully evidence all of the criteria. If this cannot be guaranteed then this unit should not be attempted.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Determine e-commerce website functionality

Topics

- 1.1 **Functions** of an e-commerce website
- 1.2 **Considerations** for an e-commerce website
- 1.3 **Customer interactions** with an e-commerce website
- 1.4 **Back end maintenance** within an e-commerce website

Learners must be aware of the functionality of e-commerce websites.

Topic 1.1

Learners should understand the purpose of e-commerce websites, the design and functionality, paying particular attention to how e-commerce websites capture user information, how they handle transactions and the type of transactions involved.

Learners need to have an understanding of the functions including:

Functions:

- goods and services offered
- product information
- payment types
 - options
 - security
- how information is captured
- usability
- accessibility

Topic 1.2

Learners will need to look in greater detail at e-commerce websites, exploring the advantages and disadvantages of having an e-commerce site both from a retailer and consumer perspective. Running costs will need to be taken into account as well as the ever changing nature of consumer expectation.

Considerations :

- advantages and disadvantages of e-commerce
- set up and running costs
- merchant accounts
- customer expectation
- scalability

Topic 1.3

Learners will need to gain an understanding of the customer interactions with an e-commerce website and any issues that may arise, knowing how to resolve them.

Customer interactions:

- conduct secure transactions
- how to distribute goods
- customer relations
- stock issues
- pricing
 - discounts
 - offers
- customer profiles
- refunds

Topic 1.4

Learners will need to gain an understanding of the back end maintenance required with an e-commerce website and any issues that may arise, knowing how to resolve them.

Back end maintenance:

- shopping basket
- real time tracking
- payment processing
- stock control
- delivery and despatch

Learning outcome:

2. Identify e-commerce hardware and software architecture

Topics

2.1 **E-commerce website hardware architecture** and **security considerations**

2.2 **E-commerce website software architecture**

2.3 **Legal and ethical considerations**

Topics 2.1, 2.2

Learners need to explore the technologies involved in creating and managing an e-commerce website. This starts with choosing a server and looking at the configurations available and the impact that has on a range of topics from bandwidth to database types that can be used and how this is then linked to Content Management System options.

e-commerce website hardware architecture:

- server configuration options
- bandwidth

Topic 2.1

Links to the security issues (eg options offered by the chosen server) need to be carefully considered .

Security considerations:

- physical security

- firewalls
- quarantine zone
- virus protection
- secure communication SSL
- HTTPS
- secure electronic transactions
- third party authentication systems
- permissions
- authentication permission
- file access permission
- potential threats and mitigations
- hacking
- viruses
- denial of service
- phishing
- social engineering

Learners need to understand the software architecture of e-commerce websites. Here learners will look at the software architecture and explore the different ways to create dynamic content. This will include looking at third party plugins as well as an overview of current scripting languages.

e-commerce website software architecture:

- directory structure
- content management systems
- database systems
- dynamic content
 - plugins
 - common scripting languages (eg PHP, Java Script, XML, Soap, ASP, REST)
 - media

Topic 2.3

Learners need to understand that anyone creating or managing an e-commerce website needs to be aware of both their legal and ethical obligations. In this topic learners will explore the main legal constraints involved and look at the ethical dilemmas facing e-commerce businesses.

Legal and ethical considerations:

- Copyright Law 1988
- Human Rights Act 1998
- Netiquette
- Ethics (as covered in the Digital business communication unit)
- Consumer Protection Act 1987
- Data Protection Act 1998
- Cookie Law
- Consumer Protection from Unfair Trading Regulations 2008
- Privacy and Electronic Communications (EC Directive) Regulations 2003

Learning outcome:

3. Determine e-commerce solutions

Topics

- 3.1 How search engines use keywords
- 3.2 Use keywords to inform web design
- 3.3 E-commerce websites design

Topic 3.1

Before website design begins learners need to understand the importance of search engine optimisation and the essential role it plays in informing website design. Here learners will explore the fundamentals of keyword identification.

Learners will need to understand:

- why keywords are important
- how keywords are used by search engines
 - relevance versus ranking
- keywords analytic tools

Topic 3.2

Learners should know how to apply this theory to define keywords and content for an e-commerce website. Learners should be taught how to:

- define keywords
- relevance of keywords
- use keywords analytic tools
- break keywords into pages

Topic 3.3

Learners need to explore and be able apply a range of website design tools to create a graphical representation of e-commerce websites. It is important learners understand how to follow industry practice and be aware of W3C compliance issues. Learners should understand how to make websites accessible where practical to cover disabilities (visual, auditory, cognitive, mobility). Websites should be able to be viewed across a range of devices.

Design tools and concepts:

- storyboards
- mood boards
- templates
- colour schemes
- themes
- site map/structure
- online store front

Learning outcome:

4. Create e-commerce solutions

Topics

- 4.1 Configure a Content Management System (CMS)
- 4.2 Use back end
- 4.3 Manage the online store

Topic 4.1

Following on from the design stage learners will need to learn how to install and configure a Content Management System. This often involves creating a database on the server and learners will need to understand how to do this.

Installing and configuring CMS:

- creating
- installing a CMS
- linking to a database
- configuring a CMS

Topic 4.2

Learners will learn how to use a CMS back end to perform various key tasks. These should include:

- creating pages
- editing content – both text and media based
- installing and configuring plugins
- adding keywords for SEO

Once the basic content of the website is created learners will need to learn how to install and configure a third party shopping cart plugin.

Topic 4.3

This topic covers some of the key operations and processes involved in managing an online store. These should include:

- managing products
- managing orders / sales
 - fulfilment
 - out of stock issues
 - refunds
 - early orders
 - discounts
- payment options
 - types of payment
 - localisation
 - delivery
 - tax
- analyse sales reports
- streamline stock control

Learning outcome:

5. Evaluate e-commerce solutions

Topics

5.1 **Test** e-commerce websites

5.2 Reflect on e-commerce websites

Topic 5.1

Learners should understand that once a website is created it is important a thorough testing process is undertaken. Here learners will explore the theory and practice behind successful e-commerce website testing. Learners should explore the creation and implementation of a testing plan for the created e-commerce website and be able to record findings.

Test:

- links and navigation
- content
- expected outcomes
- fit for purpose
- shopping cart functionality
- payment functionalities
- accessibility across a range of devices
- against WC3 compliance
- browser compatibility
- security
- intrusion detection

Topic 5.2

Learners need to understand that after testing has been carried out it is important to review both their own performance as well as the e-commerce website performance, to include:

- the choice of server
- the choice of CMS
- keywords chosen
- what could have been done differently
- finished products
 - design
 - functionality
 - usability

Guidance for delivery

For learning outcome 1, learners need to show an understanding of the functions behind an e-commerce website. This would best be delivered by using examples of e-commerce sites as case studies. Learning outcome 2 shifts the focus to the technologies involved in commercial e-commerce websites. The full range of technologies needs to be considered from server options, database systems to server side scripting languages. It is not necessary for learners to be taught any coding, however they need to be aware of the different languages available and how they are used. Case studies should be backed up by delivered sessions and the use of group discussions and guest speakers is encouraged.

Learning outcomes 3, 4 and 5 should be assessed together. Learners should design, create and then test an e-commerce website. Centres are encouraged to use one of the many Content Management Systems and shopping cart plugins that are freely available to achieve this. Particular attention should be paid to search engine keywords and how developers ensure that content is found. This process ensures that search engine optimisation is an integral part of the website development process and not an afterthought. The importance of ensuring websites are W3C compliant should also be covered and there are a number of online resources available to test this.

Learners are not required to produce an e-commerce solution that takes actual payment. A simulated site is sufficient. Finally learners need to devise and carry out a test plan to ensure the website functions as planned.

Suggested learning resources

Books

Benyon-Davies, P. 21013. Business Information Systems. Palgrave Macmillan: San Francisco.

Boddy, D. et al. 2008. Managing Information Systems: Strategy and Structure. Financial Times; London.

Brown, C. et al. 2013. Managing Information Technology. Prentice Hall: Upper Saddle River, NJ.

Curry, A. et al. 2007. Managing Information and Systems. The business perspective. Routledge: Abingdon.

Laan, S. 2013. IT Infrastructure Architecture. Lulu.com (Self published)

Laudon, K. 2009. Management Information Systems: Global Edition. Pearson Education: London.

Unit 331

Social media

UAN:	J/506/5077
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to explore the use of a variety of social media channels on behalf of an e-commerce business.

The unit will comprise of the practical use of social media channels and tools. Analysis of how e-commerce businesses are using social media channels will also be explored including:

- social networks
- blogs
- video
- images

Learners may be introduced to this unit by asking themselves questions such as:

- How do e-commerce businesses use social media?
- How do I use social media channels to drive traffic to an e-commerce site?
- How can an e-commerce business use social media to provide customer service?
- Which social media channels work best for e-commerce businesses?

This unit links to 'Set up e-commerce websites' therefore they should be delivered together.

Learning outcomes

In this unit, learners will be able to:

1. develop a social media strategy for e-commerce businesses
2. create a social media content plan for e-commerce businesses
3. use social networks and blogs on behalf of e-commerce businesses
4. use video and image sharing on behalf of e-commerce businesses
5. measure success of using social media for e-commerce businesses.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Develop a social media strategy for e-commerce businesses

Topics

- 1.1 How social media aligns with the marketing plans of e-commerce businesses
- 1.2 The brand, tone and voice to use on social media for e-commerce businesses
- 1.3 The **audience** for e-commerce businesses
- 1.4 The social media resources available for e-commerce businesses
- 1.5 The **social media channels** for e-commerce businesses
- 1.6 Create a social media policy for e-commerce businesses

Topic 1.1

Learners should understand that social media forms part of the marketing mix for e-commerce businesses and should align with the marketing plan of a business, ultimately linking to business objectives. Learners should explore the reasons e-commerce businesses use social media including but not limited to:

- brand awareness
- customer service
- drive traffic to website
- promote offers / discounts
- product awareness
- get feedback from customers about new products
- recruit staff
- relationship management
- crisis management

Topic 1.2

Learners should understand that a business should represent their brand consistently across chosen social media channels in terms of:

- imagery
- words used
- tone of communication (formal/informal text short cut)
- timeliness of replies
- issue resolution

Topic 1.3

Learners should understand the range of different audiences that businesses can engage with on social media channels including:

Audience:

- customers
- influencers
- brand ambassadors

- suppliers
- business partners
- personal contacts
- regulators, competitors

The understanding of Topic 1.3 is through researching current and potential business audiences.

Topic 1.4

Learners should understand that while social media is essentially free, there are costs involved in terms of time, associated tools and potential staff training.

Topic 1.5

Learners should understand that there are a number of social media channels available, including:

Social media channels

- social networks
- blogs
- video
- images

Learners should understand the importance of using social media channels well rather than spreading available resources too wide using a range of channels. Learners should also understand that additional social media channels that can be added to the mix at a later date. Learners should explore the differences between social media channels in terms of:

- the audience (eg difference between Facebook and LinkedIn audience)
- functionality
- use for e-commerce businesses (some channels are more appropriate than others)

Learners should understand how to identify suitable social media channels for e-commerce businesses.

Topic 1.6

Learners should explore how to create a social media policy for e-commerce businesses :

- how employees use social media for personal use
- how employees use social media on behalf of the business
- legal, ethical and local guidelines
 - crisis management

Learning outcome:

2. Create a social media content plan for e-commerce businesses

Topics

- 2.1 Types of social media content
- 2.2 Analyse content published on social media for e-commerce businesses
- 2.3 Sources for sharing content for e-commerce businesses

2.4 Produce a social media **content plan** for e-commerce businesses

Topic 2.1

Learners should understand the difference between original and shared content and why it is important to generate both types. Learners also need to learn the importance of creating a variety of content that :

- adds value (enhances the readers experience)
- builds relationships
- links to the website
- sales driven content (limited)

Topic 2.2

Learners should be able to analyse content that similar e-commerce businesses post on social media including:

- the different content posted
- the content engagement levels
- which content includes images / links from the business website
- the relationship of content to calendar and news events

Topic 2.3

Learners should learn to use content curation tools to find and share content on social media channels (eg: Pulse, Flipboard, Google Currents)

Topic 2.4

Learners should explore the creation of a social media content plan for e-commerce businesses including:

Content plan:

- added value content to share with the audience of e-commerce businesses
- content which links to products of e-commerce businesses
- content publishing timeframes and social media channel choice
- keywords to associate with each item of content (eg hashtags, tags, keywords)
- what (if any) additional work is required to create the content

Learning outcome:

3. Use social networks and blogs on behalf of e-commerce businesses

Topics

- 3.1 Analyse how other e-commerce businesses use social networks and blogs
- 3.2 Create profiles on social networks to reflect the brand of e-commerce businesses
- 3.3 **Engage** with others on behalf of e-commerce businesses using social networks

Learners should learn how to use a range of social networks.

Topic 3.1

Learners should analyse how e-commerce businesses use social networks and blogs based on the reasons identified in learning outcome 1, topic 1.1. This includes:

- what works well
- what is not working

- how they engage their audience

Topic 3.2

Learners should learn to:

- create and update their profile on a range of social networks
- use imagery and profile content to represent the brand of e-commerce businesses

Topic 3.3

Learners should be able to use a range of social networks to **engage** with others.

Engage:

- connect with others across a range of social networks
- use a range of social networks to engage with others
- use language, tone and voice to represent e-commerce businesses
- write blog posts on e-commerce websites

Learning outcome:

4. Use video and image sharing on behalf of e-commerce businesses

Topics

- 4.1 The **importance** of video and image sharing on behalf of e-commerce businesses
- 4.2 Differences between tools:
 - to create videos
 - to share images
- 4.3 **Create videos** to share for e-commerce businesses
- 4.4 **Share images** for e-commerce businesses

Learners should appreciate the importance of using a range of image and video sharing tools.

Topic 4.1

Importance:

- drive traffic
- gain loyalty
- search engine optimisation
- increase reach
- improve engagement
- showcase brand image

Topic 4.2

Learners should explore the differences between video creation and image sharing tools.

Video creation tools:

- iMovie
- Windows Movie Maker
- Vine
- Instagram

Image sharing tools:

- Instagram
- Pinterest

- Facebook,
- Google+

Topic 4.3

Learners should learn the skills to create videos for e-commerce businesses to share including:

Create videos:

- selecting tools to create videos
- planning (short) videos relevant to an e-commerce business using a storyboard
- creating and editing videos
- uploading videos to appropriate hosting sites
- sharing videos across social networks
- identifying areas for improvement

Topic 4.4

Learners should learn the skills to share images for e-commerce businesses including:

Share images:

- selecting tools to create images
- creating and taking images
- selecting tools to share images
- sharing images using the image sharing tool
- sharing images across social networks
- identifying areas for improvement

Learning outcome:

5. Measure success of using social media for e-commerce businesses

Topics

- 5.1 The importance of measuring the impact of social media on e-commerce businesses
- 5.2 The importance of setting **SMARTER** targets
- 5.3 **Tools** to measure social media impact

Topic 5.1

Learners should understand that it is important to measure the impact of social media so that businesses can :

- identify if social media delivers expected results
- modify social media activities if required
- identify success stories and replicate

Topic 5.2

Learners should appreciate the importance of setting SMARTER targets which are:

SMARTER:

- Specific- and therefore clear
- Measurable - so success can be measured in terms of numbers
- Attainable - so it is possible to do
- Relevant - so it is a target relevant to the social networking channel
- Time based - so the target will be achieved within a set time frame
- Evaluated - so target will be reviewed
- Reevaluate - so the target is reviewed regularly

Topic 5.3

Learners should be aware of a range of tools to measure the impact of social media including:

- analytic tools
- manual count
- human analysis
- automated tools

Guidance for delivery

Ideally this unit will be a practical example of using social media tools to generate traffic to an e-commerce site. Therefore it is essential learners have access to a range of social media channels. In the case where centres are unable to allow this, then this unit should not be delivered.

The practical elements of the unit should be delivered through case studies and learners should be encouraged to share their experiences through group discussions and presentations. Careful planning of the unit will ensure that learners have sufficient time to monitor the effectiveness of their campaigns.

It is recommended that this unit is completed once the 'Set up e-commerce websites' unit is completed.

Opportunities for professional development include formal opportunities such as English, IT and informal opportunities such as reading journals/articles/books, watching documentaries /programmes, use of internet.

Learners will need access to social media channels and will need to be able to set up profiles.

Suggested learning resources

Social Media Made Simple

Blog Basics: <http://blogbasics.com/what-is-a-blog/>

Digital Law : <http://www.digitallawuk.com>

UAN:	L/506/5078
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the importance of using visual methods of engagement. E-commerce businesses use images to showcase products on their website and through the use of social media. Video is also an important medium and should be used as part of a joined-up approach to showcase the products and personality of an e-commerce business.

During this unit, learners will learn how to create images using a variety of tools, optimise images for the web, resize images for use on social media sites and share images through a range of channels.

Learners will learn how to plan, create and edit a variety of types of videos and share them across a range of social media sites. Learners will also need to consider the legal aspects of creating and sharing images and videos.

Learners may be introduced to this unit by asking themselves questions such as:

- What sort of image and video types might an e-commerce business use?
- What tools can I use to create and optimise images?
- Which file format do I use when creating and playing videos?
- How and where do I publish media files?

Learning outcomes

In this unit, learners will be able to:

1. determine the use of images and videos
2. create images for use on the Internet
3. share images on the Internet
4. create videos on the Internet
5. publish videos for sharing on the Internet.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Determine the use of images and videos

Topics

- 1.1 The **benefits** of using image and video
- 1.2 Types of images, formats and sizes
- 1.3 The optimisation of images for the web
- 1.4 Types, formats and conversion of videos
- 1.5 Legal and ethical guidelines

Topic 1.1

Learners should understand the benefits e-commerce businesses can gain by using images and video on their website and sharing these on social media platforms.

Examples of benefits of images:

- 'images speak a thousand words'
- ease of sharing to wider audiences
- illustrate points made in text
- ease of creation
- improving search engine results
- ease of sharing on social media channels

Examples of benefits of videos:

- popularity on the Internet
- showcase products or services in action
- greater impact on potential customers
- ease of sharing to a wide audience
- engaging
- website customer retention – more likely to convert

Topic 1.2

Learners should understand that there are different types of images that can be used. Learners should be able to identify the relative advantages, disadvantages and differences between them.

Learners should understand the difference between Raster and Vector Images. Images may be used as:

- Clipart
- Photographs
- Animated GIFS

- Infographic
- Graphic (eg original digital artwork created in packages like Photoshop)

Learners should understand that there are a number of different file formats and the differences between them:

- JPG (lossy, compression, can use high level of compression to give small files, sharp edges may be blurred, loss of quality may become worse with every save)
- GIF (lossless compression, support transparent backgrounds, pixels can only be 100% transparent or 100% opaque, use for older browsers and animated GIFS)
- PNG (lossless compression, pixels can be partially transparent, drop shadow or other effects)
 - PNG8 – optimised for graphics with simple colours, eg logos, icons, buttons
 - PNG24 – can handle lots of colour and it is good for complex images (eg Photographs). Alternative to jpg with high quality but larger file sizes
 - PNG32 – Highest quality and largest file sizes, used for complex graphics

Topic 1.3

Learners should understand the effect of using large images on websites. Learners should explore image compression techniques and understand the need to do this prior to uploading. Learners should also explore the difference between megapixels and resolution. Learners need to understand the difference between lossy and lossless files.

Learners should understand how to compress an image using a range of tools:

Examples of compression tools:

- Image optimizer
- Blubox
- Photoshop
- MS Picture Manager
- Adobe Fireworks

Learners should understand how to create images that are optimised for search engines:

- the image file name should use the identified keywords
- a meaningful 'alt tag' or 'alternative tag' should be included with the uploaded image. This ensures search engines know what the image is about.

Topic 1.4

Learners should understand different types of videos that can be used in e-commerce businesses and the nature of each.

Examples types of video:

- short instant videos (eg instagram, vine) (can be informal, quickly forgotten; instant, good brand awareness, viral potential)
- full length (up to five minutes) videos (long lasting, good for search engine results, viral potential, brand awareness, helps to make websites 'sticky')

Learners should understand a number of video file formats. Learners need to be aware of the differences between the main file formats and when each should be used.

Learners should understand how to convert between file formats to be able to use video editing software and playback video. Learners should learn that codec software uses code to encode and decode a file and helps editing software to work. A digital video camera and playback software may be supplied with a codec.

Examples of file formats:

- .MP4 – A common digital format. Typically incorporates MPEG-1 or MPEG-2 audio and video compression. Often used for creating video for distribution on the internet
- .Mov – (Apple QuickTime Movie) developed by Apple. Compatible with Mac and Windows platforms. Commonly uses the MPEG-4 codec for compression. Often need to convert to MP4
- .WMV – Created by Windows Media Player. Will need to convert to MP4 or Mov if need to edit in another tool than Windows Movie Maker.
- .FLV – flash videos (less popular recently, may not play on mobile devices)
- .RM – Real Media File. Used by Real Player and can be played using VLC media player.

Topic 1.5

Learners should understand the legal and ethical guidelines relating to images and videos on the Internet.

Legal:

- Copyright
 - who owns the image or video
 - free to re-use
 - creative commons licences
 - commercial purposes
 - attribute
 - share alike
 - reuse
 - personal use vs commercial use
 - sources of free to use images
 - use of watermarks to protect images / videos
 - copyright on sound used on video

Ethical:

- Issues
 - eg taking photos/videos of children
 - consent

Learning outcome:

2. Create images for use on the Internet

Topics

- 2.1 Produce photographs
- 2.2 Edit photographs

- 2.3 Produce infographics
- 2.4 Produce animated graphics
- 2.5 Develop original digital artwork

Topic 2.1

Learners should learn how to take photographs using digital cameras and mobile devices using basic techniques.

Examples of techniques for mobile devices:

- position of device in relation to the body
- awareness of the delay between pressing the button and closing the shutter
- lens cleanliness
- distance between subject and device
- device quality settings
- use of mobile apps such as:
 - Magic Shutter
 - Lapse It
 - Camera+
 - Fast Burst

Examples of techniques for digital cameras:

- the rule of thirds
- lighting levels
- white balance levels
- camera flash options

Topic 2.2

Learners should explore the editing of photographs using a range of tools. Learners should be able to use photo editing applications for mobile devices and digital cameras.

Learners should learn how to transfer photographs from mobile devices and digital cameras to a computer for editing. They should also learn how to add watermarks in order to protect ownership rights.

Examples of mobile Apps:

- Be Funky
- Adobe Lightroom
- Filterstorm
- Photoshop Express
- Camera+
- Pixlr-O-Matic

Examples of editing tools:

- GIMP
- Inkscape
- Photoscape
- Photoshop

- Reszeit (simple editing tool)

Example of editing:

- cropping
- re-sizing
- alignment
- filter
- rotation
- lighting
- composition

Topic 2.3

Learners should be able to collate data and represent it visually and textually. Learners should understand how to storyboard infographics including:

- design
- layout
- colours
- shape
- fonts
- structure

Learners should understand to create infographics for e-commerce businesses using a range of tools (eg MS PowerPoint, Piktochart, Easel.ly, Visual.ly, infogram) and how to evaluate infographics (eg meeting user requirements, browser compatibility, load time, colour effectiveness, accessibility).

Topic 2.4

Learners should explore how to create animated graphics using a range of tools (eg makeagif, picasion, gifninja, gickr, Adobe Fireworks, Adobe Photoshop).

Topic 2.5

Learners should learn how to create original digital artwork using a range of tools (eg inkscape, Adobe Fireworks, GIMP, MS Expression Design).

Learning outcome:

3. Share images on the Internet

Topics

- 3.1 **Tools** for sharing images
- 3.2 Share images

Topic 3.1

Learners need to understand the differences between image sharing tools and the functions of each.

Examples of tools:

- social bookmarking sites (eg Pinterest, Scoop-it)
- image capturing tools (eg Instagram)

- image sharing tools (eg Flickr, 500px)
- social networking sites (eg Facebook Pages, Tumblr)
- websites

Topic 3.2

Learners should learn how to use the tools listed in Topic 3.1 to share images.

Learning outcome:

4. Create videos on the Internet

Topics

- 4.1 Storyboard videos
- 4.2 Capture videos
- 4.3 Edit videos

Topic 4.1

Learners should learn how to plan videos using storyboard formats. Learners need to understand that storyboards may include:

- type of video
 - short informal video (eg vine or instagram)
 - full length video (up to five minutes)
- aims of video
- audience
- title screens
- script
- equipment and editing software to use
- sound capture methods
- background music
- still images
- lighting and background
- overview of scenes
- additional resources required (actors, voice overs, props etc)

Topic 4.2

Learners should learn how to capture a range of videos using mobile devices and digital video cameras.

Example of techniques for capturing videos:

- position of the camera in relation to the body
- shots and angles
- rule of thirds
- aspect ratio
- frames per second

- multiple camera setup
- tripod use

Topic 4.3

Learners should learn how to convert and edit videos using a range of tools:

Example of conversion tools:

- Convert.files
- Super
- Zamzar

Example of editing tools:

- Windows Live Movie Maker
- Serif Movie Plus
- iMovie
- Mobile editing tools
 - VidTrim Pro
 - Magisto
 - Highlight Cam Social
 - iMovie
 - Viddy
 - Viddy

Learning outcome:

5. Publish videos for sharing on the Internet

Topics

5.1 **Methods** of publishing videos for sharing

5.2 Videos published for sharing

Topic 5.1

Learners should learn the different publishing methods available for sharing videos and their functions.

Example of methods:

- social Networking (eg Vine / Instagram)
- video sharing tools (eg Flickr)
- hosting tools (eg YouTube, Amazon S8)

Topic 5.2

Learners should be able to publish videos for sharing using the methods in Topic 5.1. For each method learners should be taught how to create profiles, publish and share videos.

Guidance for delivery

To successfully complete this unit learners will need access to critical hardware and software. In order to capture images and video learners are required to use both dedicated devices such as cameras and video recorders, as well as mobile devices such as tablets and mobile phones. How this is managed is down to the individual centre. Learners are also required to use image and video editing software and centres will need to ensure that learners have access to a range of applications. Examples of these can be found in this specification.

This unit also teaches learners image and video sharing skills. It is therefore essential that learners have access to a range of social media channels in order to learn the required skills.

Much of this unit is covering practical skills therefore the delivery of this unit should be reflected in this. Theoretical sessions could be used to enhance practical workshops. Guest speakers and case studies could also be used to bring the real world into the classroom.

Opportunities for professional development include formal opportunities such as English, IT and informal opportunities such as reading journals/articles/books, watching documentaries /programmes, use of internet.

Suggested learning resources

Web designer's guide to PNG Image format: http://sixrevisions.com/web_design/web-designers-guide-to-png-image-format/

[Http://www.tv.adobe.com](http://www.tv.adobe.com)

UAN:	R/506/5079
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the range of paid digital advertising tools available to e-commerce businesses to use as push marketing techniques. Learners will gain an understanding of the differences between the types of advertising, how advertisements can be targeted and ways they could be tracked.

The unit begins by exploring why e-commerce businesses might want to use digital advertising, different digital advertising techniques and the advantages and disadvantages of the different techniques. Learners will explore different methods of digital advertising and why e-commerce businesses may choose one solution over another.

Learners will also explore the creation of a digital advertising campaign and how to track and manage it.

Learners may be introduced to this unit by asking themselves questions such as:

- What sort of digital advertising might I use?
- Why might I choose a particular type of advertising?
- How can I be certain that digital advertising has been productive?

Learning outcomes

In this unit, learners will be able to:

1. recognise digital advertising concepts
2. identify methods of digital advertising
3. create digital advertising campaigns for e-commerce businesses
4. determine the monitoring of digital advertising campaigns.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Recognise digital advertising concepts

Topics

- 1.1 Paid digital advertising including advantages and disadvantages
- 1.2 Cookies in digital advertising
- 1.3 Methods of paying for advertisements to be displayed

Topic 1.1

Learners should learn that paid digital advertising is a way of paying for a message to be displayed to an audience. The message is usually displayed visually using text, logos, animations, videos, photographs or other graphics. The audience is usually targeted (gender, demographics, interest, geography) to increase the effect of advertisements.

Learners should explore the advantages and disadvantages of paid digital advertising. The need for e-commerce businesses to have clear aims for digital advertising campaigns should also be explored.

Advantages:

- brand awareness
- drive traffic to e-commerce site
- advert targeting
- lower cost than offline advertisement
- easy to measure
- multiple ways of displaying a message
- global availability
- quick to create / deploy

Disadvantages:

- cost
- traffic to the website might not be the correct traffic to convert to sales
- banner blindness – many Internet users ignore advertisement
- fraud – competitors (or others) may click on an advertisement with no intention of buying
- advertisement or cookie locking – users have used technology to block advertisement and / or cookies
- excessive advertising can damage the brand

Topic 1.2

Learners should understand what cookies are and how they are used to track interactions (eg whether a user left a page without buying anything, or not. The advertiser can later re-target the user with advertisements).

Topic 1.3

Learners should explore a number of methods for setting up advertising and understand when to use one method over another. The methods include:

- Pay per click (PPC)
 - advertisers pay each time a user clicks on the advertisement
 - guaranteed to get a set amount of traffic for a set price
 - used when advertisers want visitors to their site
- Cost per Thousand/Pay per Thousand Impressions (CPM)
 - based on impressions or view of the advertisement
 - guarantee the advertisement will be displayed on the website the visitor sees, but with no guarantee of the number of clicks to the website
- Cost per View (CPV)
 - advertisers pay for each unique view of an advertisement
 - good for highly specialised advertisements with quick call to actions
 - need to have a highly targeted viewer base

Learning outcome:

2. Identify methods of digital advertising

Topics

- 2.1 Digital vouchers including advantages and disadvantages
- 2.2 Adwords including advantages and disadvantages
- 2.3 Social network advertising including advantages and disadvantages
- 2.4 Web banner or display advertising including advantages and disadvantages
- 2.5 Mobile advertising

Topic 2.1

Learners should explore digital vouchers, the advantages and disadvantages and how they could be used by e-commerce businesses. A digital voucher can be exchanged for a discount on a product or service. To use it in an advertising campaign an advertiser would work with a digital voucher company to send out their digital vouchers to a targeted audience. The digital voucher company will take a percentage of the money the customer pays for the coupon (eg Groupon, Vouchoffers, Vouchercloud).

Advantages:

- brand awareness
- increased sales
- a positive experience may lead to:
 - customer return
 - customer referral

Disadvantages:

- cost of commission
- it may not lead to customer retention
- vouchers intended for a particular target may be spread wider than intended
- low profit margin

Digital vouchers can be used by e-commerce businesses to launch new products, sell surplus stock and generate brand awareness. The e-commerce business needs to be careful to:

- limit the numbers of vouchers that can be sold
- ensure availability of resources to handle increased sales
- negotiate with the digital voucher company to ensure profitability.

Topic 2.2

Learners should understand that high ranking websites displayed in search engine results (and on the right hand side) are paid advertisements. E-commerce businesses pay to be listed at the top of search results relating to a series of search terms. Learners should explore the advantages and disadvantages of using 'adwords' for advertising and how e-commerce businesses can use them.

Advantages:

- enables small business to compete with larger businesses
- speed of setting up
- enables e-commerce businesses to improve search engine ranking
- potential of larger reach (exposure)
- e-commerce businesses remain in control of their budgets

Disadvantages:

- e-commerce businesses may have visitors who never intend to purchase
- restricted characters in the advertisement
- it can be expensive if not set-up correctly
- it needs to be carefully monitored and adjusted regularly

Topic 2.3

Learners should understand that a range of social networking channels (eg Twitter, LinkedIn, Facebook, etc.) offer the facility for businesses to promote their content to a targeted audience in return for payment. Advertisements can be highly targeted based on demographics, geography, interests, gender, contacts, likes, etc. Learners should explore the advantages and disadvantages of social network advertising and how e-commerce businesses can use them.

Advantages:

- highly specific targeting
- opportunity for social sharing
- viral aspect of advertisements

Disadvantages:

- low click through rate, particularly if user sees advertisements too often
- costs
- affect on customer loyalty and brand.

Social network advertising is often used by e-commerce businesses to increase brand or product awareness, capture customer information (eg email address), grow contacts or followers or increase leads / sales.

Topic 2.4

Learners should understand that web banners are usually delivered by a central advertisement server. Banner ads or display advertising can use rich media to make the advertisement more interactive. Banner ads come in various forms including:

- floating ads (an advertisement which moves across the screen)
- expanding ads (an advertisement which changes size and may alter the contents of the page)
- trick banners (looks like a dialog box, often used to deliver viruses)
- pop-ups (a new window opens on top of the page)
- pop-unders (a window opens behind the page and is not seen until the active window is closed)

Learners should explore the advantages and disadvantages of using banners for advertising and how e-commerce businesses can use them.

Advantages:

- cost effective
- targeted audience
- highly customisable with text, images and animation
- reinforcement of brand name and imagery

Disadvantages:

- over-saturation
- trust issues (linking of spam to banner ads)
- low success rate

Banner advertising can be used by e-commerce businesses to increase brand awareness of imagery and name, drive traffic to the website, and advertise new products. Online tools are available to make banner ads and purchase online advertising space.

Topic 2.5

Learners understand that mobile advertising is similar to other forms of digital advertising with key differences. The differences include:

- the possible need to use a separate campaign for mobile advertising
- mobile advertising works best for immediate user intent or products/ services which are quick buys
- mobile advertising can use a person's location and social history to make the advertisement personalised (inference advertising)
- options include which mobile device to target
- keyword phrases to target tend to be shorter (though this may change in future)
- mobile advertisements in the top two search positions perform best.

Learning outcome:

3. Create digital advertising campaigns for e-commerce businesses

Topics

- 3.1 Set SMART targets
- 3.2 Calls To Action (CTA) on digital advertisements for e-commerce businesses
- 3.3 Target audiences for digital advertisements for e-commerce businesses
- 3.4 Visuals and text for digital advertisement for e-commerce businesses
- 3.5 Develop the elements of digital advertising campaigns
- 3.6 Review digital advertisements for e-commerce businesses

Learners should learn how to create a digital advertising campaign for an e-commerce business. Learners should be taught how to:

- set SMARTER targets
- create calls to action
- target the advertisement to the audience
- create visuals and text for a digital advertisement.

Topic 3.1

Learners should be taught to set SMARTER targets for digital advertising campaigns to ensure that the campaign delivers results that can be measured and evaluated. Learners will need to know what the SMARTER acronym stands for:

- Specific- therefore clear
- Measurable - so success can be measured in terms of numbers
- Attainable - so it is possible to do
- Relevant - so it is a target relevant to the social networking channel
- Time based - so the target will be achieved in a set time frame
- Evaluated - so the target will be reviewed
- Reevaluate - so the target is reviewed regularly

Topic 3.2

Learners need to understand that each advertisement should have a clear 'Call To Action'. A 'Call To Action' (CTA) is a clickable image or line of text that prompts the viewer to take action. The action could be to download an e-book, sign up for an event, get a coupon, go to a page on a website, etc. Learners should understand that every digital advertisement should have one (in most circumstances) clear call to action. Learners should be taught that there are a range of elements which make up an effective call to action including:

- an eye-catching design – the viewers need to see the digital advertisement on the page.
- using an actionable verb to catch the viewer's attention
- being clear on what will happen when the viewer clicks on the Call To Action
- a relevant (or specific) landing page when they click

Topic 3.3

Learners should understand that digital advertisements can be targeted in a number of ways depending on the type selected. Learners should be taught that targeting options may include:

- keyword phrase (the phrase that causes the advertisement to be displayed)
- behaviour – what social behaviour has happened (follow, share, like, retweet, etc.)
- age
- location
- gender
- interests
- education level
- seniority (job role and rank)
- connections on a social network
- remarketing – based on what websites have previously been viewed

Topic 3.4

Learners should understand visual and text features to consider when creating effective digital advertisements. These may change when creating advertisements for mobile devices.

Features to consider include but are not limited to:

- use interesting, clear communication in seven words or less
- define a value proposition – explain why the viewer should click the advertisement
- create a message relevant to the target audience
- use power words (eg free, unbelievable, incredible, affordable, heart-warming)
- use contrast to attract attention (background colours, bold text messages, font sizes, images).
- limit the number of fonts used – use no more than two fonts
- use animation sparingly

- create a limited file size
- remember 'less is more'

Mobile Device additional design considerations may include:

- screen size
- increased use of text and branding
- audience engagement
- download times
- use of relevant, strong, immediate Calls To Action
- device optimisation

Topic 3.5

Learners need to learn how to apply the knowledge gained in the topics covered in 3.1-3.4 to develop a digital advertising campaign.

Topic 3.6

Learners need to understand that it is important to review both their own performance as well as the digital advertisement campaign created. They need to understand that an effective review could include:

- keywords chosen
- finished product
 - design
 - Call to Action
 - what could have been done differently

Learning outcome:

4. Determine the monitoring of digital advertising campaigns

Topics

4.1 The importance of monitoring digital advertising campaigns

4.2 Digital advertising **reporting tools**

Topic 4.1

Learners should understand the importance of regular monitoring of digital advertising campaigns. Multiple digital advertising campaigns should be run simultaneously. Learners should explore why campaigns should be monitored and tweaked in order to perform better. Learners should be able to perform comparison testing on campaigns in order to check which version is performing better. Learners should understand the different statistics used for campaign monitoring including but not limited to:

- number of clicks
- number of sales
- number of actions
- total value of sales
- cost of campaign
- total profit
- cost per click
- cost per sale
- cost per action
- return on investment

Topic 4.2

Learners should understand that there are a number of tools that can be used to assist the monitoring of digital advertising campaigns including:

Reporting tools:

- analytical tools
- paid software
- use of social networking reporting tools
- tracking URLs on call to actions (eg adding unique code to each URL used in each digital advertising campaign to enable specific identification)

Guidance for delivery

Learners are not required to produce a digital advertisement that is 'live' for this unit – learners are not expected to register credit cards. A simulated advertisement with additional information about targeting options is sufficient.

Much of the measurement of the outcomes could be delivered in practical sessions with the use of case studies and scenarios. Class discussions and lectures can be used to deliver the theoretical content of the unit.

The outside world can be brought into the classroom through the use of guest speakers. Many colleges and centres will now be using digital advertising techniques in their own marketing departments, this could provide some context for learners

Opportunities for professional development include formal opportunities such as English, IT and informal opportunities such as reading journals/articles/books, watching documentaries /programmes, use of internet.

Suggested learning resources

Mashable Targeted advertising: <http://mashable.com/category/targeted-advertising/>

Hubspot: <http://blog.hubspot.com/>

Entrepreneur: <http://www.entrepreneur.com/advertising/index.html>

Social Media Today: <http://socialmediatoday.com/alan-smith/1918461/digital-marketing-techniques-for-2014>

UAN:	L/506/5081
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the concepts and gain the practical knowledge required to effectively manage and maintain e-commerce websites.

For an e-commerce website to be successful it needs to be managed and kept up to date. Learners need to be aware that the development lifecycle does not end once the website has been created. Learners will learn and understand what is involved in managing, monitoring and improving the performance once the website has been published.

Learners will investigate different types of web hosts and services offered as well as weighing up the relative advantages and disadvantages. Learners will explore how to upload website files to a web server, as well as manage a range of web server management services. Once the website is published, learners will be able to appreciate how to carry out and document routine maintenance activities and website reviews. They will learn about monitoring, optimising, assessing and improving site performance using statistics and visitor feedback.

The need for businesses to respond to consumer needs is ever changing. It is currently estimated that consumers use on average three devices. Therefore the need for websites to effectively work and maintain a consistently good service is vital. Learners will discover how to develop a cross-device website strategy.

Learners may be introduced to this unit by asking themselves questions about e-commerce websites such as:

- What technologies are used in website hosting?
- How do I administer a website?
- How is website security managed?
- How do I ensure my website works on different devices?
- How can I measure and monitor website performance?

Learning outcomes

In this unit, learners will be able to:

1. determine e-commerce website hosting technologies
2. recognise cross-device e-commerce website strategies
3. manage e-commerce websites safely and securely
4. evaluate the performance of e-commerce websites.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Determine e-commerce website hosting technologies

Topics

- 1.1 E-commerce website hosting **technologies**
- 1.2 E-commerce website hosting **functions**
- 1.3 **Server side scripting technologies**

Learners must be aware of the technologies used in e-commerce website management and their relative functions.

Topic 1.1

Learners will need to investigate server options for hosting an e-commerce website. They should explore the different packages available and the associated costs involved. The choices made may play a key role in determining what technologies will be used later in the development lifecycle.

Technologies:

- hosting packages and services
 - shared hosting
 - dedicated hosting
 - cloud hosting
 - hosting costs
 - bandwidth issues
 - database provision (eg MySQL, PostgreS, MS SQL)
 - available plugins (eg Content Management Systems, WordPress, Joomla)
 - secure Socket Layers (SSL)
- server operating systems
 - Windows
 - Linux
 - Unix

Topic 1.2

Learners should explore the typical features of hosting technologies required to manage an e-commerce website.

Functions :

- server control panel
- email management
 - account creation
 - account management
 - email forwarding
 - auto responder

- user management and permissions
- domain management
- file and folder management
- transfer protocols
 - file transfer protocol(FTP, AFTP)
 - File transfer clients
 - HTTP
 - HTTPS and SSL

Topic 1.3

Learners should understand how Server Side Languages are used to enhance e-commerce website performance. Learners should discover the relevant merits of different server side languages and their relevance to the server platform and database provision.

Server side scripting technologies:

- Hypertext pre-processor(PHP)
- Active Server Pages(ASP)
- Java Server Pages (JSP)
- CSS
- Common Gateway Interface(CGI)
 - Perl
 - C, C++
 - Java

Learning outcome:

2. Recognise cross-device e-commerce website strategies

Topics

- 2.1 Multi-device use
- 2.2 Multi-device e-commerce website **options**
- 2.3 The cross-device user experience

Topic 2.1

Learners should learn how to analyse the needs of multi-device users in order to understand the need for a coherent cross-device strategy. Learners should investigate:

- current industry trends of multi-device use (eg competitors cross-device websites)
- the importance of analysing competitors
- brand consistency across devices
- user content appropriate for devices
- the use of mobile technologies (eg GPS, Apps)

Topic 2.2

Learners should explore current multi-device e-commerce website technologies and understand their relevant advantages and disadvantages.

Options:

- Responsive web design(RWD)
 - advantages and disadvantages

- associated costs
- common uses
- dynamic serving
 - advantages and disadvantages
 - associated costs
 - common uses
- fully separate hosting or multiple sites
 - advantages and disadvantages
 - associated costs
 - common uses
- apps
 - advantages and disadvantages
 - associated costs
 - common uses

Topic 2.3

Learners should learn how common techniques are used to improve the end users' mobile experience. Learners should investigate how to improve interaction with mobile device e-commerce websites. Learners should understand the differences between mobile devices and desktop devices.

Interaction:

- layout
 - control layout
 - friendly fonts (size and style of font)
 - page width and height
 - descriptive buttons
 - mouse vs touch screen
- content
 - relevance
 - user overload
 - content customisation (different content for different devices)
 - key action accessibility (navigation and linking)
 - feature limitations on mobile platforms
 - media file compatibility
 - checkout simplification
- speed
 - mobile device bandwidth
 - customise image/media content
 - customise server side scripts (eg Cascading Style Sheet – CSS , JavaScript code)

Learning outcome:

3. Manage e-commerce websites safely and securely

Topics

- 3.1 Administer e-commerce websites
- 3.2 Security considerations
- 3.3 **Legal and ethical considerations**

Topic 3.1

Learners need to learn to manage e-commerce websites using a combination of client and server tools.

Tools:

- server control panel
- email management
 - account creation
 - account management
 - email forwarding
 - auto responder
- user management and permissions
- file and folder management
 - file transfer protocol (FTP, AFTP)
 - file transfer clients
- setting page permissions
- server side scripting (eg URL re-direct, analytics enabling)
- back-up procedures

Topic 3.2

Learners should investigate the security considerations of website management and learn about risk management and minimising threats to websites. This include:

- physical security
- firewalls
- virus protection
- secure communication SSL
- HTTPS
- secure electronic transactions
- permissions
- structure of CMS log in pages
- potential threats
- protection of administrator account

Topic 3.3

Learners need to understand that anyone creating or managing an e-commerce website needs to be aware of both their legal and ethical obligations. In this topic learners will explore the main legal constraints involved and look at the ethical dilemmas facing businesses online. Although there are links to unit 'Set up e-commerce websites' here learning has a focus on the website host's responsibilities.

Legal and ethical considerations

- Copyright Law 1988
- Human Rights Act 1998
- Netiquette
- Ethics (as covered in the Digital business communication unit)
- Data Protection Act 1998
- Cookie Law
- Consumer Protection from Unfair Trading Regulations 2008
- Privacy and Electronic Communications (EC Directive) Regulations 2003

Learning outcome:

4. Evaluate the performance of e-commerce websites

Topics

4.1 The importance of setting targets to **measure performance**

4.2 E-commerce website performance tools

Topic 4.1

Learners need to understand that targets should be set to be able to measure the improving performance of websites.

Measure performance:

- speed of loading
- structure integrity
- conversion rate
- visits to website
- which device has been used
- visitor flow (site exploration)
- bounce rate
- mobile vs desktop conversions

Topic 4.2

Learners need to understand the available tools for measuring the performance of e-commerce websites. These may include website response diagnostic tools(eg Google Developers Chrome DevTools, Web Page Analyzer – 0.98, Pingdom Website Speed Test, Google Webmaster and Google Analytics)

Guidance for delivery

Learners will require access to a range of website management tools. A subscription account with one of the many online hosting/reseller accounts available should be considered – alternatively centres could set up their own hosting service on in house servers. The delivery of theoretical concepts should be delivered through class lectures and involve case studies looking at different websites and how they are managed. Visits to web hosting facilities could also be used to reinforce classroom delivery. Centres who host their own websites internally may be able to facilitate this easily.

For practical sessions, where learners will carry out a number of website management tasks, using a range of management tools in order to enhance and improve the performance of e-commerce websites, learners can either use an existing website they have created or be given a hosted website to work on. Learners are not required to create an e-commerce website for this unit.

This unit focuses on measuring e-commerce website performance, where learners are required to monitor its performance using appropriate tool. In order to facilitate this, it is advisable that the unit is run over a sufficient time scale to enable learners to analyse the results with meaningful data.

Suggested learning resources

Books

Elliot G – Website Management (Lexden Publishing Limited, 2007) ISBN 9781904995210

Thompson P – Website Essentials: A Guide to Planning, Designing and Managing Your Website (Frogeye Publications, 2006) ISBN 0955304008

UAN:	R/506/5082
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to develop an understanding of relational databases and how these are used in commercial e-commerce websites. Learners begin by exploring the theory of relational databases and will develop the skills to design and create relational databases. Learners will become familiar with terminology and learn how to document the process.

Learners will then learn the different methods of connecting webpages to relational databases and understand server constraints. Once learners understand how to connect e-commerce websites to databases they will learn the necessary skills to query databases and display selected data on webpages in a user-friendly format.

Finally learners will explore alternative database theories that are commonly used in web based solutions and discover the relative advantages and disadvantages of these systems.

Learners may be introduced to this unit by asking themselves questions such as:

- What is a relational database?
- How should I use relational databases in e-commerce technology?
- What packages should I use to create relational databases?
- What alternatives do I have to relational databases?

Learning outcomes

In this unit, learners will be able to:

1. determine relational database features
2. design relational databases for e-commerce websites
3. produce relational databases for e-commerce websites
4. link relational databases to e-commerce websites
5. determine non-relational database concepts used in e-commerce websites.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Please note that the supporting bullet points throughout the unit are not definitive.

Learning outcome:

1. Determine relational database features

Topics

- 1.1 The concept of relational databases
- 1.2 **Entities, relationships** and **attributes** in relational databases
- 1.3 Database **relationships**
- 1.4 **Benefits** of relational databases

Topic 1.1

Learners should understand the concept of relational databases, why relational database systems were developed and learn about common relational database management systems (RDBMS) and their use in e-commerce technology.

Examples of common relational database management systems (RDBMS):

- Oracle
- Microsoft Access
- Microsoft SQL Server
- PostgreSQL
- MySQL

Topic 1.2

Learners should explore entities, relationships and attributes in relational databases. Learners need to understand the concepts and terminology of:

- Entities
 - Tables
 - Records (tuple)
 - Indices
- Relationships
 - Referential integrity
 - Cascade update
 - Cascade delete
- Attributes
 - Fields
 - Key fields
 - ❖ Primary
 - ❖ Foreign
 - Field properties
 - ❖ Data types
 - ❖ Size

Topic 1.3

Learners should understand the different relationships available within a RDBMS, third normal form (3NF) and how to represent these as Entity Relationship Diagrams (ERD).

Relationships:

- One to many
- One to one
- Many to many

Topic 1.4

Learners will learn the benefits of relational databases.

Benefits:

- reduced data redundancy
- reduced data storage
- access speed
- improved data integrity
- efficient updating
- ease of searching, sorting and reporting

Learning outcome:

2. Design relational databases for e-commerce websites

Topics

2.1 Relational databases design

2.2 **Document designs**

Topic 2.1

Learners should explore how to design functional relational databases that can be used on e-commerce websites as specified in topic 1.2 and 1.3. Learners need to understand the importance of the design stage and the role it plays in creating effective relational databases.

Topic 2.2

Learners need to understand how to use documentation when designing relational database solutions.

Design documentation:

- Conceptual model (context diagram)
- ERDs
- Data dictionary
- Data flow diagram (DFD)

Learning outcome:

3. Produce relational databases for e-commerce websites

Topics

3.1 Create relational databases

3.2 Populate relational databases

3.3 Manipulate data in relational databases

3.4 **Test** relational databases

Topic 3.1

In this topic learners should learn how to create relational databases using the design covered in Learning outcome 2.

Topic 3.2

Learners need to explore how to populate the tables of the databases.

Topic 3.3

Learners need to explore how to manipulate data and use queries including:

- create data
- read data
- update data
- delete data

It is expected that learners should be able to use queries to extract data from two or more related tables. Such data should be limited by the use of parameters in the queries.

Topic 3.4

Learners need to learn how to test the relational databases for:

Test:

- referential integrity
- validation of data at field level.

outcome:

4. Link relational databases to e-commerce websites

Topics

- 4.1 How to link relational databases to e-commerce websites
- 4.2 Create links between relational databases and e-commerce websites

Topic 4.1

Learners should understand the different methods available to connect types of relational databases to e-commerce websites and the relative advantages and disadvantages of each, as well as understanding the impact this has on e-commerce database server requirements. Learners should understand that selection of a database server technology may require the use of particular scripting languages.

Examples of scripting languages and database server technologies:

- PHP and MySQL
- ASP.net and Microsoft Access
- JSP and Microsoft Access
- JSP and Oracle systems
- PHP and PostgreSQL
- ASP.net and Microsoft SQL Server

Topic 4.2

Learners should explore how to link relational databases to e-commerce websites as specified in topic 4.1.

Learning outcome:

5. Determine non-relational database concepts used in e-commerce websites

Topics

- 5.1 Object Oriented database systems
- 5.2 Hybrid database systems
- 5.3 Data mining
- 5.4 NoSQL databases for mobile platforms

Learners need to understand the difference between relational databases and non-relational databases and technologies as listed in topics 5.1-5-4.

Learners need to have an understanding of the above topics, exploring the key concepts of different database systems as the relative advantages and disadvantages of each and when they are used.

Guidance for delivery

Learners begin this unit by exploring relational database theory and its concepts. For Learning outcome 1 learners need to have a good understanding of the key concepts of relational databases and learn about the different platforms available to create relational databases. In learning outcome 2 learners discover how to design relational database systems for use in e-commerce websites. It is vital that learners are aware of the need for sound design and fully understand the design documentation required. This outcome should be delivered through class lectures, group discussion and the use of case studies.

Once the database has been designed, learners need to create the database using appropriate software. Learners will require access to appropriate software to enable them to create relational databases. The software used is down to the centre but it must allow relational databases to be created and be able to be integrated into a website for learning outcome 3.

Learning outcome 4 looks at recent developments in database theory for websites. Learners will understand the theory behind Object oriented and Hybrid Database systems and learn why their use on websites is growing. Case studies and research projects should be used to enable learners to gain an understanding of the key advantages and disadvantages of these systems over the relational database model.

Suggested learning resources

Books

Web Database Systems published 2001 by McGraw-Hill. ISBN 0077096002
Relational Database Design and Implementation, 3rd Edition by J Harrington ISBN :9780123747303
Ponniah P – Database Design and Development: An Essential Guide for IT Professionals: Visible Analyst Set (John Wiley & Sons Inc, 2006) ISBN 0471760943
Ritchie C – Relational Database Principles (Thomson Learning, 2002) ISBN 0826457134

Websites

<http://office.microsoft.com/en-gb/access-help/create-an-access-database-HP005187442.aspx>

Unit 336

Threats and vulnerabilities

UAN:	A/507/7257
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the range of internal and external threats that an organisation's information systems may be exposed to. The unit also provides learners with an overview of the various types of vulnerabilities that information systems may exhibit. It is through the combination of threats and vulnerabilities that risks to information systems and data are evaluated.

Questions associated with this unit:

- What is the difference between a threat, vulnerability, risk and countermeasure?
- Why is an understanding of human behaviour important in identifying threats?
- Why is changing human behaviour important for effective countermeasures?
- What are some of the most common Attack Vectors employed by hackers to attack IT systems?
- What are the common Countermeasures that are used to mitigate such attacks?

Learning outcomes

In this unit, learners will be able to

1. Determine Threats, Vulnerabilities and Countermeasures
2. Recognise Attack Vectors
3. Apply effective Countermeasures

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Determine Threats, Vulnerabilities and Countermeasures

Topics

- 1.1 Threats
- 1.2 Vulnerabilities
- 1.3 Countermeasures

This topic explains the related concepts of Threats and Threat Actors, Vulnerabilities, and Countermeasures in an Information Security context. The topic gives examples of each that could apply to any Information System.

Learners will be able to explain the terms:

Threats and Threat Actors, Vulnerabilities, Countermeasures and Risks.

Topic 1.1

Learners will be introduced to the concept of Threat as being a circumstance or event that could impact the Confidentiality, Availability and Integrity of IT services. Examples of common threats, both internal and external are introduced and explained. The learner will understand potential impact and exploitation of threats.

Describe Threats (Internal), e.g.,

- Organisational culture (e.g., Complacency, lack of effective control)
- Organisational climate
- Disgruntled employees
- Industrial espionage
- Misplaced trust
- Malpractice / Incompetence (Untrained staff)
- Criminal (Fraud, Theft, Criminal Damage)

Describe Threats (External), e.g.,

- Industrial espionage
- Environmental disaster / Weather
- Fire / Arson
- Terrorism
- Hacktivism
- Hackers
- Curious
- Criminal (Fraud, Theft, Criminal Damage)

Describe Threat Actors, e.g.,

- Nation states (i.e., Political, Economic, Military advantage)
- State sponsored terrorists
- Organised crime
- Industrial spies
- Hacktivists (i.e., networks of Hackers with a common cause)
- Hackers

Topic 1.2

Learners will understand the concept of Vulnerability as a potential weakness in Information Systems or processes that can be exploited. Examples of vulnerabilities, both physical and logical are introduced and explained and the Common Vulnerabilities and Exposures (CVE) system is introduced.

Physical Vulnerabilities, e.g.,

- Absence of security staff
- Absence of CCTV / remote monitoring
- Poor or inadequate door locks
- Inoperative badge readers
- Lack of security cables and locks for IT infrastructure

- Access to IT systems not controlled
- Access to I/O ports not disabled (e.g., USB, external storage)

Logical Vulnerabilities, e.g.,

- Absence of Information Security culture (e.g., complacency toward threats)
- Lack of effective governance (e.g., no corporate leadership)
- Poor or inadequate operating procedures (e.g., documentation not kept up to date)
- Poor or inadequate training of staff (e.g., lack of security awareness)
- Failure to implement IS policies (e.g., no control over password complexity)
- Absence of IS standards/baselines
- Software bugs / backdoors
- Poor or ineffective authentication mechanism
- Open network ports

Common Vulnerabilities and Exposures System (MITRE Corp)

- Common naming for vulnerabilities
- Security Content Authentication Protocol
- Common Vulnerability Scoring System (CVSS)

Topic 1.3

Learners will explore a range of countermeasures, both physical and logical that mitigate the risk of vulnerabilities being exploited by a threat.

Physical Countermeasures, eg:

- Secure server room
- Badge Locks / Badge Readers
- CCTV
- Fences
- Alarms
- Key locks
- Finger print / Palm / Retina scanners
- Mantraps (e.g., Revolving door)
- Security guards
- Cable locks (e.g., Kensington style)

Logical Countermeasures, eg:

- Robust Information Security Governance (e.g., based upon ISO standards)
- Implementation of security policies
- Training of staff in Information Security practices
- Code of Conduct / Disciplinary Procedures
- Vetting of employees and contractors
- IS Software (e.g., Trusted Computing Base, Firewall, Anti-virus, IDS/IPS)
- Authentication mechanism
- Data Encryption.

Learning outcome:

2. Recognise Attack Vectors

Topics

- 2.1 Network Attack Vectors
- 2.2 Software Attack Vectors
- 2.3 Hardware Attack Vectors
- 2.4 Social Attack Vectors

This topic explains some of the Attack Vectors (delivery mechanisms for a payload) employed by hackers, whether they are individuals, organised groups, or state sponsored. Attack Vectors are introduced in general terms as they apply to all Information Systems with emphasis given to those most commonly employed.

Topic 2.1

Learners will be introduced to the common Network Attack Vectors that are used by hackers to exploit vulnerabilities in networks and network connected devices.

Network Attack Vectors, eg:

- Wire tapping
- IP Spoofing
- Wireless hotspots
- Bluetooth pairing / file transfer

Topic 2.2

Learners will be introduced to the Hardware Attack Vectors that are used by hackers to exploit weaknesses in physical security and deliver a payload.

Describe Hardware Attack Vectors, eg:

- USB memory sticks / Rubber Ducky / Teensy
- CF/SD cards
- Portable storage
- CD/DVD
- Microcode
- Radio sniffer
- Counterfeit hardware
- Authentication tokens

Topic 2.3

Learners will be introduced to the Software Attack Vectors that are used by hackers to exploit weaknesses in physical security and deliver a payload.

Software Attack Vectors, eg:

- Email
 - File attachments
 - Web links (e.g., masquerading, shortened urls)
- Malware
 - Viruses
 - Worms
 - Botnet
- Backdoors

- Hidden user accounts
- Cheat codes
- Ticking Timebombs
- Software
 - SQL Injection
 - Buffer Overflows
 - Cross Site Scripting
 - Macros
- Network Protocol
 - Open ports
 - Remote commands
 - HTTP header manipulation

Topic 2.4

Learners will be introduced to the common Social Attack Vectors that are used by hackers to exploit weaknesses in human behaviour and deliver a payload.

Social Attack Vectors, eg:

- Phishing
- Spear Phishing
- Catfishing (i.e., fake identity)
- Disgruntled employees
- Tailgating
- Confidence tricks.

Learning outcome:

3. Apply effective Countermeasures

Topics

- 3.1 Identify Vulnerabilities
- 3.2 Implement Countermeasures
- 3.3 Test Countermeasures

This topic explores the application of countermeasures to an IT system and network. Learners will identify vulnerabilities and implement appropriate countermeasures to protect against possible threats.

Topic 3.1

Learners will analyse and explain a range of physical, logical and human vulnerabilities associated with an IT system. Learners will learn how to document the vulnerabilities and explain how a threat actor could exploit them.

Topic 3.2

Learners will document and explain suitable countermeasures for each of the vulnerabilities identified in Topic 3.1.

Topic 3.3

Learners will devise a test plan for countermeasures documented in Topic 3.2.

Guidance for delivery

The content of this unit is based upon the Physical (Environmental) Security and Telecommunications and Network Security chapters of the Certified Information Systems Security Professional (CISSP®) qualification from ISC². The concepts and terminology taught in this unit should be illustrated with relevant examples and where possible – case studies. Discussion should be encouraged among the learners about the role of human behaviour as the primary cause of vulnerabilities in Information Systems and human motivations (e.g., greed) as the only source of motivation for attacks upon Information Systems.

Learners should be exposed to practical examples where possible however, online examples could also be used as well as examples from recent news coverage.

For Topic 2.4, the range of different social attack vectors is an area of growing threat and sophistication and emphasis should focus on recent examples.

Suggested learning resources

Books

Analysing Computer Security: A Threat/Vulnerability/Countermeasure Approach
Pfleeger, C

Published by: Prentice Hall, 2011
ISBN-13: 9780132789462

Information Security Management Principles
Taylor, A (Ed)

Published by: BCS The Chartered Institute for IT, 2013
ISBN-13: 9781780171753

Security Architecture
Collins, J
Published by BCS The Chartered Institute for IT, 2014
ISBN-13: 9781780172200

Governance of IT
Holt, A.L
Published by: BCS The Chartered Institute for IT, 2013
ISBN-13: 9781780171548

Information Security Auditor
Goucher, W
Published by: BCS The Chartered Institute for It, 2015
ISBN-13: 9781780172163

Official ISC² Guide to the CISSP® CBK
Hernandez, S
Published by: ISC² Press
ISBN-13: 9781466569768

Authentication: From Passwords to Public Keys
Smith, R
Published by: Addison Wesley
ISBN-13: 978201615999

Journals & Magazines

- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

The Common Vulnerabilities and Exposures System operated by MITRE Corporation provides a unified database of identified Information System vulnerabilities used by providers of IT hardware and software. The database is available to any organisation wishing to record or access a list of vulnerabilities and exposures.

<https://cve.mitre.org/>

BCS The Chartered Institute for IT (formerly The British Computer Society) is the leading professional body for IT practitioners in the United Kingdom and many Commonwealth countries. BCS is a membership body with branches throughout the UK, several International Chapters, and over 50 Special Interest Groups. The BCS have SIGs specialising in Information Security (ISSG), Information Risk and Information Assurance (IRMA). The BCS also offer a range of publications and qualification in Information Security.

<http://www.bcs.org/>

The Institute for Information Security Professionals (IISP) is the professional body for Information Security practitioners operating in the United Kingdom. IISP works closely with BCS The Chartered Institute for IT and other professional bodies and had a branch network around the United Kingdom. The IISP have created a skills framework for IS practitioners.

<http://www.iisp.org/>

The International Information Systems Security Certification Consortium (ISC)²® is a not-for-profit organisation that develops education and certification for Information Security practitioners. Their primary product is the Certified Information Systems Security Professional (CISSP®) qualification.

<http://www.isc2.org/>

ISACA (formerly the Information Systems Audit and Control Association) is an international association engaged in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. ISACA is a membership organization with more than 200 international chapters, including several in the United Kingdom.

<http://www.isaca.org/>

ISACA have developed the Control Objectives for Information and Related Technology (COBIT) framework for IT management and governance. The latest iteration of the COBIT framework is version 5 (2012).

<http://www.isasca.org/COBIT>

The Centre for the Protection of National Infrastructure is the UK government authority responsible for providing advice to business and other organisations on security of national infrastructure. CPNI provides advice and guidance on a wide range of security measures including those related to Information Security (Cyber).

<http://www.cpni.gov.uk/>

UAN:	F/507/7258
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the Information Availability, particularly the concepts of Business Continuity, and the technology aspects of Disaster Recovery (geographic dispersal) and High Availability (local clustering). Learners will plan and design a high availability system and then expand the design to provide for geographic dispersal of their solution.

Questions associated with this unit:

- What is Business Continuity?
- What are the different ways a Disaster Recovery solution can be implemented?
- What are the different ways a High Availability solution can be implemented?
- Why is planning and design so important for Business Continuity, Disaster Recovery and High Availability?
- What is the difference between High Availability and Fault Tolerance?

Learning outcomes

In this unit, learners will be able to

1. Determine the concepts of Business Continuity
2. Plan and Design a High Availability solution
3. Plan and Design a Disaster Recovery solution

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Determine the concepts of Business Continuity

Topics

- 1.1 Business Continuity
- 1.2 Disaster Recovery
- 1.3 High Availability
- 1.4 Planning for Business Continuity

This topic explains the related concepts of Business Continuity, Disaster Recovery and High Availability from an IT systems and data availability perspective. The importance of Business Continuity planning and testing is also introduced in this topic.

Topic 1.1

Learners will understand the concept of Business Continuity with a particular emphasis on the availability of the complete Information Systems (IS) required by businesses in order to maintain operations.

Business Continuity from an IS perspective:

- Maintain business operations through critical events
- Reduce or eliminate impact to clients, staff and suppliers
- Comply with legislative or regulatory requirements

Impacts of IS outage:

- To clients (e.g., loss of confidence, loss of trust, degradation in service)
- To the business (e.g., loss of revenue, reduced profitability, damage to reputation)
- To suppliers (e.g., spoiled goods, late delivery, late payment)
- To staff (e.g., loss of income, disruption to working life)

Business Continuity regulations and standards:

- ISO Standards
- Centre for Protection of National Infrastructure (CPNI)
- Business Continuity Institute (BCI)

Topic 1.2

Learners will explore the concept of Disaster Recovery (DR) as an aspect of Business Continuity concerned with protecting access to IS applications and data through geographic dispersal. The various levels of DR solution are also described.

Threats that DR protects against eg:

- Environmental (e.g., fire, flood, earthquake, tornado)
- Infrastructure (e.g., power, transport, communications)
- Political (e.g., civil disturbance, general strike)
- Criminal (e.g., terrorism, theft, arson)
- Software bugs / hardware failure
- Administrative error

High level DR solutions eg:

- Hot site (i.e., synchronous operations)
 - Replication of applications and data
- Warm site (e.g., redundant servers, storage and networking)
 - Restoration of applications and data
- Cold site (e.g., backup/restore capabilities)
 - Rebuild infrastructure
 - Restoration of applications and data
- Mobile site

Topic 1.3

Learners will understand the concepts and capabilities of High Availability (HA) systems. Learners will also explore the various types of HA solution and their comparison to Fault Tolerant systems.

Purpose of HA eg:

- Continuous Availability of Applications and Data (localised to single site)
- Rapid Failover (i.e., Compared with Fault Tolerance)
- Automated failure detection, diagnosis, recovery and reintegration
- Planned vs Unplanned Downtime
- Elimination of Single Points of Failure (i.e., hardware, software, network, administration)

High level HA solutions eg:

- Standby server(s)
- Concurrent processing (e.g., distributed/parallel databases)
- RAID storage
- Duplicate networks
- Application failover
- Centralised server administration (e.g., user accounts, passwords, S/W licenses)
- HA clustering software (e.g., LinuxHA, PowerHA, VMWare vSphere, HP ServiceGuard)

Topic 1.4

Learners will understand the requirement for planning, preparation and testing as key elements of effective Business Continuity. Learners will also understand the concept of Business Continuity Management (BCM).

Business Continuity Management Lifecycle eg:

- BCM Programme Management
- Understanding the Organisation
- Determining the BCM Strategy
- Developing and Implementing BCM Response
- Exercising, maintaining and Reviewing
- Embedding BCM in the organisational culture

The steps in Business Continuity Planning eg:

- Analysis (e.g., Business Impact, Threat and Risk Analysis)
 - Recovery Point Objective (i.e., acceptable data loss)
 - Recovery Time Objective (i.e., acceptable outage period)
- Design
- Implementation
- Testing (e.g., Conducting exercises)
 - Paper based or 'table top'
 - Simulated (e.g., Virtual Worlds)
 - Complex (e.g., Practice drills)
- Maintenance.

Learning outcome:

2. Plan and Design a High Availability Solution

Topics

2.1 High Availability Planning

2.2 High Availability Design

This topic explains the steps necessary to plan and design an imagined High Availability (HA) solution for local site recovery of applications and data following the failure of hardware, software or administrative support for a mission critical Information System.

Topic 2.1

Learners will be able to develop HA plans to protect a future mission critical Information System against both planned and unplanned outage.

HA plans to include eg:

- Identification of critical applications and data
- Recovery Time Objective
- Recovery Point Objective
- Hardware requirements (e.g., servers, storage, network)
- Software requirements (e.g., operating system, licensed software)
- Administrative requirements (e.g., user accounts, password management)
- Training (e.g., For users, for administrators)
- Testing

Topic 2.2

Learners will be able to design HA systems based upon the plans. Learners will understand how the HA system will protect against the failure of both planned and unplanned system outage.

HA system designs to include:

- Topology diagram of eg:
 - Servers
 - Storage
 - Networks (only as far as 1st router)
 - Non-IP communications path
 - Power
- Details of data redundancy, e.g.,
 - Mirroring
 - RAID (specify levels and behaviour)
 - Hot-swap storage
- Elimination of Single Points of Failure, e.g.,
 - Hardware
 - Software
 - Storage
 - Power
 - Network
 - Administration
- Cluster Configuration, e.g.,
 - Hot standby server(s)
 - Many-to-one

- One-to-many
- Many-to-many
- Parallel processing (e.g., Concurrent databases)
- Round Robin
- Cluster administration, e.g.,
 - User Account synchronisation
 - Password management
 - Software license management
 - Time services
 - Documentation.

Learning outcome:

3. Plan and Design a Disaster Recovery Solution

Topics

3.1 Disaster Recovery Planning

3.2 Disaster Recovery Design

This topic explains the steps necessary to plan and design an imagined Disaster Recovery (DR) solution for geographically dispersed recovery of applications and data following the failure of an entire site where business critical Information Systems are located.

Topic 3.1

Learners will build upon the plan employed in Topic 2 to include a Disaster Recovery (DR) solution.

DR system to include eg:

- Alternative premises (e.g., hot-site, warm-site, cold-site)
- Storage of critical data, e.g.,
 - Restoration process
 - Synchronous data replication
 - Offline storage
- Maximum Tolerance Point of Disruption (MTPD)
- Recovery Point Objective (RPO)
- Recovery Time Objective (RTO)
- Hardware Requirements
- Network Requirements
- Administrative requirements (e.g., user accounts, password management)
- Training (e.g., For users, for administrators)
- Testing (e.g., Paper-based, Virtual, Full recovery drills)
- Identification of key personnel
- Succession planning for key personnel

Topic 3.2

Learners will design a DR system based upon the plan adapted in Topic 3.1, including how the DR system would protect against site wide disaster.

DR system to include eg:

- Topology diagram of both sites:
 - Servers
 - Storage
 - Networks (only as far as 1st router)
 - Non-IP communications path

- Power
- Data Replication
 - Synchronous (RPO= Zero data loss)
 - Asynchronous (RPO= Greater than zero data loss)
- Details of site level storage redundancy, e.g.,
 - Mirroring
 - RAID (specify levels and behaviour)
 - Backup (e.g., tape, optical)
- Site Recovery Strategy
 - Single or Multiple Site
 - Hot-site
 - Warm-site
 - Cold-site
 - Mobile site
 - Reciprocal Agreement / Site leasing
 - Working from home
- Location of users
 - Co-located with site
 - Dispersed / mobile / home-based
- Documentation.

Guidance for delivery

The content of this unit is based upon the Business Continuity and Disaster Recovery domain of the Certified Information Systems Security Professional (CISSP®) qualification from ISC². The concepts and terminology taught in this unit should be illustrated with relevant examples and where possible – case studies. Discussion should be encouraged among the learners about the importance of BCM and DR and in particular how Disaster Recovery and High Availability play a role in the Availability and Integrity of applications and data.

Business Continuity Management Lifecycle diagrams are available to clearly demonstrate the concept.

Suggested learning resources

Books

Business Continuity Management Systems Published by: BCS The Chartered Institute for IT, 2012 ISBN-13: 9781780171463	Estall, H
Information Security Management Principles Published by: BCS The Chartered Institute for IT, 2013 ISBN-13: 9781780171753	Taylor, A (Ed)
Governance of IT Published by: BCS The Chartered Institute for IT, 2013 ISBN-13: 9781780171548	Holt, A.L
Information Security Auditor Published by: BCS The Chartered Institute for IT, 2015 ISBN-13: 9781780172163	Goucher, W
Official ISC ² Guide to the CISSP® CBK Published by: ISC ² Press ISBN-13: 9781466569768	Hernandez, S

Journals and Magazines

- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

The Disaster Recover Journal is an online resource for all aspects of Business Continuity and Disaster Recovery. Membership is free and the Journal is published via the following website:

<http://www.drj.com>

BCS The Chartered Institute for IT (formerly The British Computer Society) is the leading professional body for IT practitioners in the United Kingdom and many Commonwealth countries. BCS is a membership body with branches throughout the UK, several International Chapters, and over 50 Special Interest Groups. The BCS have SIGs specialising in Information Security (ISSG), Information Risk and Information Assurance (IRMA). The BCS also offer a range of publications and qualification in Information Security.

<http://www.bcs.org/>

The Institute for Information Security Professionals (IISP) is the professional body for Information Security practitioners operating in the United Kingdom. IISP works closely with BCS The Chartered Institute for IT and other professional bodies and had a branch network around the United Kingdom. The IISP have created a skills framework for IS practitioners.

<http://www.iisp.org/>

The International Information Systems Security Certification Consortium (ISC)²® is a not-for-profit organisation that develops education and certification for Information Security practitioners. Their primary product is the Certified Information Systems Security Professional (CISSP®) qualification.

<http://www.isc2.org/>

ISACA (formerly the Information Systems Audit and Control Association) is an international association engaged in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. ISACA is a membership organization with more than 200 international chapters, including several in the United Kingdom.

<http://www.isaca.org/>

ISACA have developed the Control Objectives for Information and Related Technology (COBIT) framework for IT management and governance. The latest iteration of the COBIT framework is version 5 (2012).

<http://www.isasca.org/COBIT>

The Centre for the Protection of National Infrastructure is the UK government authority responsible for providing advice to business and other organisations on security of national infrastructure. CPNI provides advice and guidance on a wide range of security measures including those related to Information Security (Cyber).

<http://www.cpni.gov.uk/>

UAN:	J/507/7259
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the importance of Information Security (IS) Governance and the associated concept of Risk Management. Learners will be exposed to issues of IS Governance, organisational behaviour and the need for awareness and understanding of security threats, vulnerabilities, weaknesses and countermeasures.

Questions associated with this unit:

- What is IS Governance?
- Why is IS Governance important?
- What do the terms Confidentiality, Integrity and Availability mean?
- How is information ownership and classification determined?
- How are third parties managed from an IS Governance perspective?

Learning outcomes

In this unit, learners will be able to

1. Know the concept and purpose of IS Governance
2. Understand security roles, responsibilities and documentation
3. Understand Risk Management

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Know the concept and purpose of IS Governance

Topics

- 1.1 IS Governance concept and purpose
- 1.2 The rationale for IS Governance
- 1.3 Best practice models for IS Governance
- 1.4 Confidentiality, Integrity and Availability (CIA)

This topic explains the concept of Information Security (IS) Governance and its benefits. The topic also introduces various 'best practices' that have been defined by governments, professional bodies and other organisations.

Topic 1.1

Learners will understand the concept of Information Security Governance (IS) responsibilities, including;

- Board of directors
- External auditors/ consultants
- IT management
- IT technician
- End users

The purpose of IS Governance eg:

- Support to organisational strategy (i.e., Responsibility of the board)
- Risk Management (i.e., Manage and mitigate risks)
- Framework for Management of IS (e.g., Standards, Policies and Procedures)

Topic 1.2

Learners will understand the rationale for Information Security Governance (IS), eg:

- Security aware culture (e.g., communication and education)
- Risk management
- Compliance with legal requirements (esp. Data Protection)
- Civil liability protection
- Effective resource allocation (i.e., best allocation of available resources)
- Safeguarding of information (e.g., Intellectual Property)

Topic 1.3

Learners will know the various standards bodies and organisations that develop and maintain best practice standards related to IS Governance, eg:

- ISO Standards
- COBIT (Common Objectives for Information and Related Technology)
- NIST (National Institute of Standards and Technology)
- ITIL (IT Infrastructure Library)
- IISP Skills Framework (Competency model for IS professionals)

Learners will understand the following key standards and know their purpose:

- ITIL (IT Infrastructure Library)
- ISO Standards
- IISP Skills Framework (Competency model for IS professionals)

Topic 1.4

Learners will understand the concepts of Confidentiality, Integrity and Availability as they relate to Information Security (Data and Applications).

- Confidentiality, eg:
 - Least privilege (need to know basis)
 - Data classification
 - Identity
 - Authentication
 - Authorisation
- Integrity, eg:
 - Separation of duties
 - Testing
 - Change control procedures
 - Database integrity (referential and entity)
 - Data redundancy
- Availability, eg:
 - High Availability (localised clustering)
 - Disaster recovery (geographic dispersal)
 - Backup and Recovery
 - Denial of Service attacks.

Learning outcome:

2. Understand the security roles, responsibilities and documentation

Topics

- 2.1 Roles and key responsibilities within an IS Governance framework
- 2.2 IS Governance Documentation
- 2.3 Third-Party Governance

This topic explains the typical roles defined in Information Security (IS) Governance and their associated responsibilities. These roles are widely recognised as good practice in IS Governance. This topic also introduces the various types of documentation required to support IS Governance and outlines the requirement for managing third parties (suppliers of IS services.).

Topic 2.1

Learners will understand the various roles that are performed in an organisation with a comprehensive Information Security Governance (IS) framework.

IS Governance roles and key responsibilities eg:

- Executive management (e.g., Chief Information Officer)
 - Coordinate policies and standards
- Data or Information Custodian (sometimes Data/Information Steward)
 - Monitor compliance
- Information Systems Auditor
 - Monitor and report on compliance
- Security Officer/administrator

- Implement policies and standards
- End User
 - Comply with policies and standards
- External consultants/ auditor
 - Advise, monitor and test policies and standards

Topic 2.2

Learners will understand the need for documentation to be fit for purpose when establishing and maintaining IS Governance in an organisation.

Learners will understand the meaning of the terms 'standards', 'baselines', 'procedures' and 'guidelines' in respect of IS Governance documentation eg:

- Standards (Technical specifications), eg:
 - Physical infrastructure specifications
 - Access control specifications
 - Hardware specifications
 - Software specifications
 - Network specifications
- Baselines (Configuration requirements), eg:
 - Firewall rules
 - Password complexity and ageing
 - Automatic system updates
 - Backup / Recovery configuration
- Procedures (Operational instructions), eg:
 - Onboarding process for employees
 - Compliance training requirements
 - System backup and recovery procedure
- Guidelines (Good practices), e.g.,
 - Recommended reading list for Security Officers
 - Details of professional bodies and journals on IS Governance
 - References to third party standards (ISO)

Topic 2.3

Learners will understand the need for governance of third parties, particularly suppliers, engaged in the provision of IS services eg:

- Infrastructure as a Service (IaaS)
- Platform as a Service (PaaS)
- Software as a Service (SaaS)
- Service Level Agreement (SLA)
- Third-party Risk Assessment
- Data Jurisdiction (i.e., where the data is physically located).

Learning outcome:

3. Understand Risk Management

Topics

- 3.1 Risk Management
- 3.2 Risk Assessment Methodology

This topic introduces the concept of Information Risk Management and the associated concepts of threats, vulnerabilities and countermeasures. The topic also describes the NIST Risk Assessment Methodology.

Topic 3.1

Learners will understand the concept of Risk Management and the purpose of a Risk Assessment (also known as Risk Analysis) and the responses to risk.

Learners will understand the differences between;

- Threat
- Vulnerability
- Risk
- Countermeasure

Learners will understand the purpose and stages of Risk Assessment strategies eg:

- Identify and evaluate threats and vulnerabilities
- Evaluate likelihood of threats exploiting vulnerabilities
- Weigh the impact of an exposure (i.e., threat actor exploits a vulnerability)
- Identify effective countermeasures and controls
- Quantify the 'residual' risk

Learners will understand the possible responses to risk, to include:

- Avoidance (e.g., terminate service, relocate)
- Transfer (e.g., insurance)
- Mitigation (i.e., reduction of impact)
- Acceptance (e.g., manageable loss or revenue, profit or reputational damage)
- Assignment (e.g., company policies)

Topic 3.2

Learners will understand Risk Assessment Methodologies, eg National Institute of Standards and Technology (NIST).

The nine steps of NIST SP 800-30 and the input and outputs at each step:

1. System Characterization
2. Vulnerability Identification
3. Threat Identification
4. Countermeasure Identification
5. Likelihood Determination
6. Impact Determination
7. Risk Determination
8. Countermeasure Recommendations
9. Document Results

Guidance for delivery

The content of this unit is based upon the Information Security Governance and Risk Management domain of the Certified Information Systems Security Professional (CISSP®) qualification from ISC². The concepts and terminology taught in this unit should be illustrated with relevant examples and where possible – case studies. Discussion should be encouraged among the learners about the importance of IS Governance and in particular how the security of Information Systems is not limited to the implementation and configuration of technical countermeasures (e.g., Firewalls, Anti-Virus and Intrusion Detection systems, etc).

For Topic 1.3, learners are expected to have an understanding of the Governance best practices and standards, they should know the standards and the overarching areas they are applicable to, for example ‘standard reference relates to Subject’.

For Topic 1.4, learners will discuss examples of ways in which data and applications can be secured to ensure Confidentiality, Integrity and Availability.

For Topic 2.1, learners will understand that these roles may be implicit, shared by multiple employees or one person may perform multiple roles.

Suggested learning resources

Books

Information Security Management Principles Published by: BCS The Chartered Institute for IT, 2013 ISBN13: 9781780171753	Taylor, A. (Ed)
---	-----------------

Security Architecture Published by: BCS The Chartered Institute for IT, 2014 ISBN13: 9781780172200	Collins, J
--	------------

Governance of IT Published by: BCS The Chartered Institute for IT, 2013 ISBN13: 9781780171548	Holt, A.L
---	-----------

Information Security Auditor Published by: BCS The Chartered Institute for IT (2015) ISBN13: 9781780172163	Goucher, W
--	------------

Official ISC² Guide to the CISSP® CBK Published by ISC² Press ISBN13: 9781466569768	Hernandez, S
---	--------------

Authentication: From Passwords to Public Keys Published by Addison Wesley ISBN13: 978201615999	Smith, R
--	----------

Journals & Magazines

- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

BCS The Chartered Institute for IT (formerly The British Computer Society) is the leading professional body for IT practitioners in the United Kingdom and many Commonwealth countries. BCS is a membership body with branches throughout the UK, several International Chapters, and over 50 Special Interest Groups. The BCS have SIGs specialising in Information Security (ISSG), Information Risk and Information Assurance (IRMA). The BCS also offer a range of publications and qualification in Information Security.

<http://www.bcs.org/>

The Institute for Information Security Professionals (IISP) is the professional body for Information Security practitioners operating in the United Kingdom. IISP works closely with BCS The Chartered Institute for IT and other professional bodies and had a branch network around the United Kingdom. The IISP have created a skills framework for IS practitioners.

<http://www.iisp.org/>

The International Information Systems Security Certification Consortium (ISC)^{2®} is a not-for-profit organisation that develops education and certification for Information Security practitioners. Their primary product is the Certified Information Systems Security Professional (CISSP[®]) qualification.

<http://www.isc2.org/>

ISACA (formerly the Information Systems Audit and Control Association) is an international association engaged in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. ISACA is a membership organization with more than 200 international chapters, including several in the United Kingdom.

<http://www.isaca.org/>

ISACA have developed the Control Objectives for Information and Related Technology (COBIT) framework for IT management and governance. The latest iteration of the COBIT framework is version 5 (2012).

<http://www.isasca.org/COBIT>

The Centre for the Protection of National Infrastructure is the UK government authority responsible for providing advice to business and other organisations on security of national infrastructure. CPNI provides advice and guidance on a wide range of security measures including those related to Information Security (Cyber).

<http://www.cpni.goc.uk/>

Unit 339

Ethical hacking

UAN:	A/507/7260
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the role of the Ethical Hacker or 'White Hat Hacker' in testing the security of Information Systems using techniques such as Penetration Testing and Social Engineering on behalf of the owner(s) of the system. The unit explores some of the tools and techniques used by Ethical Hackers to identify vulnerabilities in Information Systems so that they may be eliminated or appropriate countermeasures put in place to mitigate them. The unit also explores the process that Ethical Hackers follow in order to plan, execute and evaluate attacks on Information Systems.

Questions associated with this unit:

- What is the role of an Ethical Hacker?
- How do I know I can trust an Ethical Hacker?
- What's the difference between an Ethical Hacker and a Penetration Tester?
- What tools and techniques do Ethical Hackers use?
- How do Ethical Hackers use social engineering to identify vulnerabilities?
- What process do Ethical Hackers follow?

Learning outcomes

In this unit, learners will be able to

1. Know the role of Ethical Hackers
2. Understand a range of Ethical Hacking tools and techniques
3. Plan, execute and report on the process of Ethical Hacking

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Know the role of Ethical Hackers

Topics

1.1 Ethical Hacking

1.2 Vetting Ethical Hackers

This topic explains the role of an Ethical Hacker or 'White Hat Hacker' and in particular why the role is broader than just Penetration Testing. The topic also explains how Ethical Hackers are vetted and certified to carry out their role for owners of Information Systems.

Topic 1.1

Learners will be introduced to the role of the Ethical Hacker or 'White Hat Hacker' and the typical tasks that an Ethical Hacker is engaged to perform for an organisation, eg:

- Identification of vulnerabilities in Information Systems
- Testing Information System security using Penetration Testing (PT)
- Evasion of Intrusion Detection Systems (IDS)
- Evasion of Intrusion Prevention Systems (IPS)
- Evasion of Honeypots
- Social Engineering
- Breaking encryption
- Evaluating / Reporting (i.e., for a client)

Topic 1.2

Learners will be introduced to the varying levels of scrutiny that should be applied to the process of vetting Ethical Hackers.

Vetting process for Ethical Hackers:

- Interviews
- References
- Background checks (e.g., qualifications, employment, residence)
- Professional memberships / Code of Conduct
- Professional qualification (e.g., Certified Ethical Hacker, CREST, SANS, CLAS)
- Security Vetting Code of Practice
- Government vetting
 - Baseline Personnel Security Standard (BPSS)
 - Security Clearance
 - Counter Terrorism Check
 - Disbarring and Vetting Service (formerly CRB Check).

Learning outcome:

2. Understand a range of Ethical Hacking tools and techniques

Topics

- 2.1 Physical hacking tools and techniques
- 2.2 Logical hacking tools and techniques
- 2.3 Social hacking tools and techniques

This topic explains the some of the tools (software and hardware), and techniques employed by Ethical Hackers to identify, exploit and expose weaknesses and vulnerabilities in Information System from a physical, logical and social perspective.

Topic 2.1

Learners will be introduced to a range of tools and techniques that can be employed by an Ethical Hacker to identify and exploit weaknesses in the physical security (i.e., environment, building, IT infrastructure) of Information Systems.

Physical hacking, eg:

- Public records
- Satellite images
- Cameras
- Binoculars
- Specialised hardware (e.g., Pwn Phone, Plugbot)
- Wireless sniffers (War Driving)
- VOIP (War Dialing)
- Bluetooth scanners
- Dumpster Diving
- RF Scanners
- Drone

Topic 2.2

Learners will be introduced to a range of tools and techniques that can be employed by an Ethical Hacker to identify and exploit weaknesses in the logical security (i.e., operating system, software and configuration) of Information Systems.

Logical hacking, eg:

- Port Scanners (NMAP, Angry IP Scanner, NetScanTools)
- Sniffers (Snort)
- Password crackers (Cain & Abel, THC Hydra, John the Ripper)
- Vulnerability scanners (Nessus, Nikto)
- Wireless networks (Kismet, KisMac, NetStumbler)
- Website (BurpSuite)
- Generalist (Metasploit, Wapiti)
- Forensic analysis

Topic 2.3

Learners will be introduced to a range of tools and techniques that can be employed by an Ethical Hacker to identify and exploit weaknesses in the human aspects (social, cultural, behavioural) of Information Systems.

Social hacking, eg:

- Identify theft / spoofing (Piggybacking)
- Shoulder surfing
- Pretexting
- Baiting
- Human intelligence gathering
- Deception.

Learning outcome:

3. Plan, execute and report on the process of Ethical Hacking

Topics

- 3.1 Ethical Hacking Processes and Standards
- 3.2 Develop an Ethical Hacking Plan
- 3.3 Perform Ethical Hacking
- 3.4 Report on Ethical Hacking

This topic explores the process that Ethical Hackers follow in order to identify and test weaknesses in Information Systems.

Topic 3.1

Learners should be introduced to various processes that Ethical Hackers may follow in order to identify and exploit weaknesses in Information Systems.

The process eg:

- Formulate a plan
 - Identify the system(s) to be tested
 - Risks involved
 - Timeline
 - Knowledge of the system(s)
 - Action to be taken
 - Deliverables (e.g., written / oral report)
- Execute the plan
 - Reconnaissance
 - Scanning
 - Gaining Access
 - Maintaining Access
 - Covering Tracks
- Evaluate Results

The NIST 800-42 Method

- Planning
- Discovery
- Attack
- Report

OCTAVE Allegro

- Develop Risk Measurement Criteria
- Profile Critical Information Assets
- Identify threats for each Information Asset
- Identify risks for each threat relating to an Information Asset

INFOSEC PTES

- Pre-engagement Interactions

- Intelligence Gathering
- Threat Modelling
- Vulnerability Analysis⁵
- Exploitation
- Post-Exploitation
- Reporting

Topic 3.2

Learners will develop an Ethical Hacking plan based upon a scenario for an Information System. The plan should include physical, logical and human exploits.

Topic 3.3

Learners should execute a series of Ethical Hacking attacks based upon the plan developed in topic 3.2. Learners should record the results of their attacks whether successful or not.

Topic 3.4

Learners should report on the results of the attacks conducted in topic 3.3, detailing any vulnerabilities they identify and successful exploitations they were able to perform (i.e., successful penetrations).

Guidance for delivery

The content of this unit is based upon the elements from the EC-Council Certified Ethical Hacker (CEH) qualification. The concepts and terminology taught in this unit should be illustrated with relevant examples and where possible – case studies. Discussion should be encouraged about the role of the Ethical Hacker, and how that differs from hacking for criminal, hacktivist or malicious purposes. Particular emphasis should be placed on understanding relevant hacking tools and techniques and how they are the same for ethical and non-ethical hackers (i.e., it is the motivation that is different, not the tooling).

The process used for Topic 3.1 is an example from the CEH qualification.

For Topic 3.3, learners will carry out ethical hacking within a controlled lab environment.

Suggested learning resources

Books

Certified Ethical Hacker Study Guide
Published by: Wiley, 2014
ISBN13: 9871118647677

Oriyano, S

The Hacker Playbook
Published by: CreateSpace, 2014
ISBN13: 9781494932633

Kim, P

Analysing Computer Security: A Threat/Vulnerability/Countermeasure Approach
Published by: Prentice Hall, 2011
ISBN13: 9780132789462

Pfleeger, C

Information Security Management Principles
Published by: BCS The Chartered Institute for IT, 2013
ISBN13: 9781780171753

Taylor, A (Ed)

Security Architecture
Published by: BCS The Chartered Institute for IT, 2014
ISBN13: 9781780172200

Collins, J

Information Security Auditor
Published by BCS The Chartered Institute for IT, 2015
ISBN13: 9781780172163
Official ISC² Guide to the CISSP® CBK
Published by: ISC² Press
ISBN13: 9781466569768

Goucher, W

Hernandez, S

Journals & Magazines

- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

The Common Vulnerabilities and Exposures System operated by MITRE Corporation provides a unified database of identified Information System vulnerabilities used by providers of IT hardware and software. The database is available to any organisation wishing to record or access a list of vulnerabilities and exposures.

<https://cve.mitre.org/>

BCS The Chartered Institute for IT (formerly The British Computer Society) is the leading professional body for IT practitioners in the United Kingdom and many Commonwealth countries. BCS is a membership body with branches throughout the UK, several International Chapters, and over 50 Special Interest Groups. The BCS have SIGs specialising in Information Security (ISSG), Information Risk and Information Assurance (IRMA). The BCS also offer a range of publications and qualification in Information Security.

<http://www.bcs.org/>

The Institute for Information Security Professionals (IISP) is the professional body for Information Security practitioners operating in the United Kingdom. IISP works closely with BCS The Chartered Institute for IT and other professional bodies and had a branch network around the United Kingdom. The IISP have created a skills framework for IS practitioners.

<http://www.iisp.org/>

The International Information Systems Security Certification Consortium (ISC)²® is a not-for-profit organisation that develops education and certification for Information Security practitioners. Their primary product is the Certified Information Systems Security Professional (CISSP®) qualification.

<http://www.isc2.org/>

ISACA (formerly the Information Systems Audit and Control Association) is an international association engaged in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. ISACA is a membership organization with more than 200 international chapters, including several in the United Kingdom.

<http://www.isaca.org/>

ISACA have developed the Control Objectives for Information and Related Technology (COBIT) framework for IT management and governance. The latest iteration of the COBIT framework is version 5 (2012).

<http://www.isasca.org/COBIT>

The Centre for the Protection of National Infrastructure is the UK government authority responsible for providing advice to business and other organisations on security of national infrastructure. CPNI provides advice and guidance on a wide range of security measures including those related to Information Security (Cyber).

<http://www.cpni.gov.uk/>

UAN:	F/507/7261
Level:	3
GLH:	60

What is this unit about?

The aim of this unit is for learners to understand the purpose and key concepts of encryption and the various methods for encrypting data for storage, retrieval and transmission. This unit explores some of the widely used techniques for encryption available to businesses and the general public. The limits of encryption as a means of preserving the confidentiality of data are also explored.

Questions associated with this unit:

- What is encryption?
- Why is it important to encrypt data?
- Who sets the standards for encryption of data?
- What is the difference between asymmetric and symmetric encryption techniques?
- What is the difference between a public and private key?
- How can data be encrypted?
- How secure are encryption methods?
- How can encryption be defeated?

Learning outcomes

In this unit, learners will be able to

1. Understand how data encryption has evolved and the role it plays in business
2. Understand encryption methods
3. Understand methods of defeating encryption

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand how data encryption has evolved and the role it plays in business

Topics

- 1.1 Encryption concepts and terminology
- 1.2 Bodies involved with developing encryption methods

Topic 1.1

Learners will explain the fundamentals of encryption, including

- The purposes of encryption (confidentiality, non-repudiation, etc)
- The evolution of data encryption
- What data needs to be or should be encrypted
- The reliability of data encryption
- The limitations of data encryption (eg, letter frequency in English)
- The benefits of data encryption

Learners will explain the key concepts of encryption:

- Asymmetric encryption (Public and Private Key)
- Symmetric encryption (Shared Key)
- Plaintext and cyphertext
- Hashing
- Digital signatures
- Key generation (eg, One time pad)

Topic 1.2

Learners will describe the roles and responsibilities of national and internationally bodies concerned with data encryption, including

- The Office of the Information Commissioner, responsible for:
 - Data Protection Act (1988) clause 7
 - Electronic Communication Act
- GCHQ / CESG
- The EU, responsible for
 - Data Protection Directive
- National Institute of Standards and Technology (NIST) (US).

Learning outcome:

2. Understand encryption methods

Topics

- 2.1 Methods of data encryption
- 2.2 Implement data encryption

Topic 2.1

Learners will explain the two main categories Symmetric and Asymmetric, including advantages and disadvantages of both, including

- Symmetric
 - Data Encryption Standard (DES) and Triple DES (developed by IBM)
 - Advanced Encryption Standard (AES) (developed by Rijndael)
 - Blowfish (TwoFish and ThreeFish)
- Asymmetric
 - Pretty Good Privacy (PGP)
 - Rivest-Shamir-Adleman (RSA)
 - Diffie-Hellman
 - Digital Signature Algorithm (DSA).

Topic 2.2

Learners will implement data encryption, for example:

- Symmetric
- Asymmetric.

Learning outcome:

3. Understand methods for defeating encryption

Topics

3.1 Attack vectors

3.2 Social engineering methods

Topic 3.1:

Learners will describe attack vectors that are employed to defeat encryption and thereby breach the confidentiality or integrity of data, including:

- Brute force
- Dictionary
- Boomerang
- Man-in-the-middle
- Zero day exploit

Topic 3.2

Learners will describe social engineering methods that are employed to defeat encryption and thereby breach the confidentiality or integrity of data, including:

- bribery
- blackmail
- pretexting (or scamming)
- phishing
- baiting.

Guidance for delivery

The implementation of data encryption and decryption should be carried out as an exercise using data on a computer system or if equipment is not available could be carried out as a paper based exercise.

Learning Outcome 2

The implementation may be applied to a whole disk (Whole Disk Encryption), Email, Database or other data storage mechanism.

Topic 3.2

It should be emphasized that most IT security threats and vulnerabilities are not related to encryption. Appropriate use of cryptographic techniques to encrypt data makes it time consuming and hard to decipher without access to the key and it is in part because of this that other techniques to gain access to data have been developed by criminals, terrorists, hacktivists and states.

Suggested learning resources

Books

Official ISC ² Guide to the CISSP® CBK Published by: ISC ² Press ISBN13: 9781466569768	Hernandez, S
Authentication: From Passwords to Public Keys Published by: Addison Wesley ISBN13: 978201615999	Smith, R
Encryption: A Very Short Introduction Published by: Oxford Paperbacks ISBN13: 9780192803153	Piper, F & Murphy, S
Introduction to Modern Cryptography Published by: Chapman and Hall ISBN13: 9781466570269	Katz, J & Lindell, Y

Journals and magazines

- The Journal of Encryption
Published by The International Association for Cryptologic Research
ISSN:0933-2790
- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

The Institute of Information Security Professionals (IISP) is a professional body based in the UK and part of the Tech Partnership (formerly e-skills UK). The IISP has a skills framework for Information Security professionals.

<http://www.iisp.org/>

BCS The Chartered Institute for IT has a number of Specialist Groups focussed on Information Security topics including the Information Security Specialist Group (ISSG), the Information Risk Management and Assurance Specialist Group (IRMASG) and the Cyber Crime Forensics Specialist Group (CCFSG).

<http://www.bcs.org/category/5815>

Unit 341

Access control

UAN:	J/507/7262
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand the purpose and methods of controlling access to IT systems. This unit introduces learners to the concepts of identity, authentication, and authorisation, and explores their use in IT systems to manage access control.

Questions associated with this unit:

- Why is access control important in IT systems?
- What is identity and a 'credential set' in IT systems?
- What is the difference between authentication and authorisation?
- What are some of the common methods of authentication?
- What are Access Control Lists (ACLs)?
- How can access control systems be defeated?
- What are the limits of access control?

Learning outcomes

In this unit, learners will be able to

1. Know the role and concepts of access control in IT systems
2. Understand common methods of controlling access to IT systems
3. Understand the limitations of access control

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Know the role and concepts of access control in IT systems

Topics

- 1.1 The purpose of Access Control
- 1.2 Access Control Categories
- 1.3 Types of Access Control
- 1.4 Access Control Techniques

This topic explains the role of access control in IT systems. The topic also introduces the related concepts of Access Control categories, types and techniques and how they define access to data.

Topic 1.1

Learners will be introduced to the concepts of Confidentiality, Integrity and Availability (CIA) as the basis for implementing Access Control to IT systems. Learners will be introduced to the principles of restricting (or limiting) access to systems and data, and the need to provide defence in depth.

Describe the purposes of Access Control, to include but not limited to:

- Confidentiality, Integrity and Availability
- Limiting access to systems (physical and logical aspects)
- Limiting access to data
- Providing 'defence in depth'
- Upholding the principle of least privilege
- Identifying and classifying Information Assets

Topic 1.2

Learners will understand the primary categories of Access Control.

Categories, included but not limited to:

- Directive (e.g., codes of conduct, security policies and procedures)
- Deterrent (e.g., disciplinary procedures, monitoring, reporting)
- Preventative (e.g., physically restricting access)
- Compensating (e.g., additional guards during periods of heightened threat)
- Detective (e.g., intrusion detection systems)
- Corrective (e.g., software patches, firewall reconfiguration)
- Recovery (e.g., updating of security policies to reflect changes in business)

Topic 1.3

Learners should understand the different Types of Access Control, including but not limited to:

Types of access control:

- Physical, eg:
 - Perimeter fences
 - Gates / Doorways
 - Security guards / patrols
 - Badge locks / Key locks
 - Biometric scanners (e.g., retina, palm, finger print scanner)

- Mantraps (e.g., weight based)
- Logical, eg:
 - Firewalls
 - Anti-virus
 - Encryption
 - User IDs and Passwords
 - Passphrases
 - Security tokens, One-time passwords
 - Remote Access Server (e.g., RADIUS)
- Administrative, eg:
 - Policies and procedures
 - Security clearances (e.g., Counter Terrorism Check)
 - Identity validation (e.g., passport)
 - Staff Training
 - Support / helpdesk

Topic 1.4

Learners will compare and contrast Access Control Techniques employed in IT systems, including but not limited to:

- Discretionary Controls (DAC)
 - Delegated control to the user level (e.g., Windows, Unix, Linux)
 - User / Group centric (i.e., User is the Data Owner)
 - Permissions (e.g., Read/Write/Execute)
 - Access Control Lists (ACLs)
- Mandatory Controls (MAC)
 - Organisation centric (e.g., Classification levels and clearances)
 - Security labelling for data objects (i.e., classification and categories)
 - Specially developed operating systems (e.g., SELinux)
- Non-Discretionary Controls
 - Organisation centric
 - Administrator assigns permissions
 - Role based.

Learning outcome:

2. Understand common methods of controlling access to IT systems

Topics

- 2.1 Identity and Authentication
- 2.2 Good practices for Authentication
- 2.3 Configure authentication

This topic explains the concepts of identity and authentication in IT systems. The topic also explores the common techniques employed to authenticate users and good practices associated with authentication.

Topic 2.1

Learners will explore different ways that users can identify and authenticate with a system based upon one or more authentication factors.

Describe identity management and authentication:

- Identification Methods, including but not limited to:
 - ID Badges

- User IDs
- PINs
- Account Numbers
- Digital Certificates
- RFID
- Authentication factors:
 - Something you know (e.g., Passwords, Passphrases, Challenge-Response)
 - Something you have (e.g., Smartcard, fobs and timecode devices)
 - Something you are (e.g., Biometrics)
 - Somewhere you are (e.g., Proximity to a scanner, inside a firewall)

Note: During this topic learners should also be introduced to the concept of a 'credential set' as being the combination of a form of identification and a form of authorisation.

Topic 2.2

Learners will understand and apply to given situations various good practices for implementing authentication to increase the effectiveness and usability.

Good practices associated with, to include but limited to:

- Accessibility for authentication
 - CAPTCHA Audio
 - SweetCaptcha
 - ReCaptcha
- Password management and policies
 - Complexity (i.e., length and non-alpha characters)
 - Avoidance of dictionary words
 - Ageing / expiration policy
 - Re-use policy
 - Maximum retry policy
 - Retry delay
 - Single-sign on
 - Password management applications
- Multi-factor authentication
 - One-time passwords (i.e., fobs)
 - Mobile phone time codes
 - Question / response

Topic 2.3

Learners will define a series of password policies of increasing complexity and configure password Authentication for multiple user IDs. Learners will test the effectiveness of the password policies created.

- Define and document an authentication policy covering a range of methods (as listed in topic 2.1)
- Configure password policies for user IDs
- Test the password policies
- Specify access permissions for a range of files to enable:
 - Read/Write
 - Read Only
 - Read/Execute
 - No access
 - Test user ID authorisation to access the files.

Learning outcome:

3. Understand the limitations of Access Control

Topics

3.1 The limits of Access Control

3.2 Threats to and Vulnerabilities of Access Control

This topic explores the limitations of Access Control and some of the ways in which it can be defeated. The unit explains how no form of Access Control is infallible and how human behaviour plays the greatest risk.

Topic 3.1

Learners will explore some of the limits of Access Control to illustrate the balance between restricting and enabling access for legitimate users.

Limits of Access Control, including but not limited to:

- Dichotomy of organisational needs (e.g., Government vs Business)
- Top-down organisational centric vs bottom-up user centric
- Cost effectiveness (i.e., cost of control vs value of the assets)
- Violation of MAC principles (e.g., Trusted computing base)
- Lack of effective control in DAC based systems
- Complexity of administration (especially for Role-Based Access Control)
- Biometric accuracy (False Reject Rate, False Accept Rate)

Topic 3.2

Learners will explore some of the organisational and behavioural threats to and vulnerabilities of Access Control.

Threats and vulnerabilities to Access Control:

- Internal threats
 - Organisational culture (e.g., Complacency, lack of effective control)
 - Organisational climate
 - Disgruntled employees
 - Industrial espionage
 - Misplaced trust
- Internal vulnerabilities
 - Poor or absent security policies / procedures
 - Lack of adherence to security policy
 - Lack of education and training
 - Lack of adherence to security procedures (e.g., poor administration, deliberate avoidance)
 - Poor or inadequate vetting of employees and contractors
- External threats
 - Tailgating / Piggybacking
 - Social engineering (e.g., Phishing, Baiting / Quid Pro Quo)
 - Identity theft
 - Shoulder surfing
 - Spoofing

Guidance for delivery

The content of this unit is based upon the Access Control domain of the Certified Information Systems Security Professional (CISSP®) qualification from ISC². The concepts and terminology taught in this unit should be illustrated with relevant examples and where possible – case studies. Discussion should be encouraged among the learners, and examples of Access Controls linked back to Access Control categories and Access Control types throughout.

Suggested learning resources

Books

Information Security Management Principles Published by: BCS The Chartered Institute for IT, 2013 ISBN13: 9781780171753	Taylor, A(Ed)
Security Architecture Published by: BCS The Chartered Institute for IT, 2014 ISBN13: 9781780172200	Collins, J
Governance of IT Published by: BCS The Chartered Institute for IT, 2013 ISBN13: 9781780171548	Holt, A.L
Information Security Auditor Published by: BCS The Chartered Institute for IT, 2015 ISBN13: 9781780172163	Goucher, W
Official ISC ² Guide to the CISSP® CBK Published by: ISC ² Press ISBN13: 9781466569768	Hernandez, S
Authentication: From Passwords to Public Keys Published by: Addison Wesley ISBN13: 978201615999	Smith, R

Journals & Magazines

- ITNOW Magazine
Published by BCS The Chartered Institute for IT
- Infosecurity Magazine
Published by Reed Exhibitions Ltd

Websites

BCS The Chartered Institute for IT (formerly The British Computer Society) is the leading professional body for IT practitioners in the United Kingdom and many Commonwealth countries. BCS is a membership body with branches throughout the UK, several International Chapters, and over 50 Special Interest Groups. The BCS have SIGs specialising in Information Security (ISSG), Information Risk and Information Assurance (IRMA). The BCS also offer a range of publications and qualification in Information Security.

<http://www.bcs.org/>

The Institute for Information Security Professionals (IISP) is the professional body for Information Security practitioners operating in the United Kingdom. IISP works closely with BCS The Chartered Institute for IT and other professional bodies and had a branch network around the United Kingdom. The IISP have created a skills framework for IS practitioners.

<http://www.iisp.org/>

The International Information Systems Security Certification Consortium (ISC)²® is a not-for-profit organisation that develops education and certification for Information Security practitioners. Their primary product is the Certified Information Systems Security Professional (CISSP®) qualification.

<http://www.isc2.org/>

ISACA (formerly the Information Systems Audit and Control Association) is an international association engaged in the development, adoption and use of globally accepted, industry-leading knowledge and practices for information systems. ISACA is a membership organization with more than 200 international chapters, including several in the United Kingdom.

<http://www.isaca.org/>

ISACA have developed the Control Objectives for Information and Related Technology (COBIT) framework for IT management and governance. The latest iteration of the COBIT framework is version 5 (2012).

<http://www.isasca.org/COBIT>

The Centre for the Protection of National Infrastructure is the UK government authority responsible for providing advice to business and other organisations on security of national infrastructure. CPNI provides advice and guidance on a wide range of security measures including those related to Information Security (Cyber).

<http://www.cpni.gov.uk/>

Unit 342

Designing and planning communication networks

UAN:	L/507/7263
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of the industry standards and requirements when designing and planning local area networks.

Learners will develop knowledge and practical understanding of the various techniques, skills and documentation that are necessary for planning local area networks.

In addition, the learner will develop an understanding of the Health and Safety practices and relevant legislation which are the pre-requisites for conducting any on-site surveys and assessments, as part of the planning process.

Learning outcomes

In this unit, learners will be able to

1. Understand the available information sources relating to existing networks
2. Understand how to prepare for network surveying
3. Understand hazards and environmental conditions related to surveying for networks
4. Produce planning documentation

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the available information sources relating to existing networks

Topics

- 1.1 Floor plans
- 1.2 Utility Duct prints
- 1.3 Rack Layout diagrams

Topic 1.1

Learners will describe information that can be obtained from floor plans, including:

- commonly used symbols:
 - Door
 - Window
 - Fire Exit
 - Furniture
 - Electrical
 - Mains electricity supply
 - Power points
 - Water
 - Gas
 - Heat / Smoke sensors
- Networking
 - Ethernet
 - Fibre optic
 - Wireless
 - Devices
 - Communicators
 - Wiring closet
 - Cable runs
- Environmental
 - Airflow
 - Heat exhaust
 - cooling

Topic 1.2

Learners will describe information that can be obtained from Utility Duct Prints, including:

- Internal Ducts
- External Ducts
 - Above ground
 - Underground

Topic 1.3

Learners will describe information that can be obtained from rack layout diagrams, including:

- Wiring closet
- Racks
- Devices eg:
 - Routers
 - Switches

- PSU
- Patch panels.

Learning outcome:

2. Understand how to prepare for network surveying

Topics

2.1 Internal and external survey areas

2.2 Existing infrastructure

Topic 2.1

Learners will describe the essential requirements that must be considered when undertaking a survey, including:

- Health & Safety when conducting surveys
 - Existing Health & Safety site information
 - Risk Assessments
 - Control Measures
 - Site Safety statements
 - Accident book
 - Site Safety Officer
- Internal
 - Physical internal boundaries
 - Physical internal structures
 - Heating and Ventilation systems
 - Power outlets
 - Utilities
 - Gas
 - Electricity
 - Water
 - Telephone
- External
 - External boundaries
 - Available Planning Authority documentation
 - Available Utility companies documentation
 - Underground structures
 - Raised structures
 - Services access

Topic 2.2

Learners will describe how to identify existing infrastructure that must be included as part of a survey, including:

- Wired
- Cable runs
- Network nodes
- device types, including end user devices
- device locations
- Wireless devices
- Passive
 - Radio frequency allocation
 - Interference

- Predictive
 - Radio frequency allocation
 - Interference.

Learning outcome:

3. Understand legislative and environmental requirements related to surveying for networks

Topics

- 3.1 Hazards and Environmental Conditions
- 3.2 Legislation and Regulations

Topic 3.1

Learners must describe the Hazards and Environmental Conditions that should be included in any site survey.

They must state the risks associated with hazards and describe realistic Control Measures that need to be in place for safe working.

This should include:

- Hazards
 - Working at height
 - Ladders
 - Working in confined spaces
 - Working near live equipment
 - Manual Handling
 - Hazardous Substances
 - Asbestos
 - Chemical
 - Bird / Animal Faeces
- Risks
 - Risk Assessments
 - Likelihood of harm
 - Risk matrix
- Environmental conditions
 - Weather
 - Wind
 - Rain
 - Animal / Bird habitats
- Control Measures
 - Temporary
 - Permanent
 - Cost effective
 - PPE

Topic 3.2

Learners must describe the legislation and regulations which apply when undertaking site surveys, including:

- Legislation and Regulations
 - Health and Safety at Work Act 1974 (including updates and amendments)
 - The Control of Substances Hazardous to Health Regulations 2002 (including updates and amendments)
 - The Electricity at Work Regulations 1989
 - Control of Asbestos Regulations 2012
 - Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013.

Learning outcome:

4. Produce planning documentation

Topics

4.1 Produce planning documentation

Topic 4.1

Learners will produce planning documentation to meet specified requirements, including:

- Scope
- requirements
- Site surveys
- Timescales
 - Gantt Chart(s)
- Resources
- Floor plans.

Guidance for delivery

This unit will best be delivered using case studies (real or simulated), within a 'project approach' that allows the Learners to undertake the full range of activities necessary for the production of the required documentation.

Some experience of real site surveys should be provided, although these need not be part of the final report.

Unit 343

Troubleshooting telecommunications networks

UAN:	R/507/7264
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is to provide learners with an understanding of the troubleshooting methodologies, tools and processes involved when determining faults on a communications network.

Learners will apply this understanding by demonstrating the appropriate use and selection of tools when undertaking troubleshooting of faults on a network.

Learning outcomes

In this unit, learners will be able to

1. Understand troubleshooting methodologies
2. Carry out troubleshooting using appropriate tools
3. Document issues, findings and resolutions

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand troubleshooting methodologies

Topics

- 1.1 Visual and physical methodologies
- 1.2 Logical methodologies

Topic 1.1

Learners will explain the use of visual and physical methodologies for troubleshooting, including:

- Damage
- Physical connection
 - Workstation / device
 - Patch panel
- Incorrect connection
- Connection LED
- Input to Output
- Output to Input
- Half Split methods

Topic 1.2

Learners will explain the use of logical methodologies for troubleshooting, including:

- Network Monitoring
- Remote Management
- Remote Access
- Connectivity checks / tests
- Flow charts
- Decision trees.

Learning outcome:

2. Carry out troubleshooting using appropriate tools

Topics

- 2.1 Carry out troubleshooting using physical tools
- 2.2 Carry out troubleshooting using logical tools
- 2.3 Carry out troubleshooting visually

Topic 2.1

Learners will describe physical tools for troubleshooting, including:

- Cable Tester
- Multi-meter
- Oscilloscope

- Signal Generator
- Optical Power Meters
- Radio Frequency Analyser

Learners will carry out troubleshooting using appropriate physical tools, including:

- Cable Tester
- Multi-meter

Topic 2.2

Learners will carry out troubleshooting using appropriate logical tools, including:

- PING
- TRACERT
- IPConfig
- IPConfig /all
- NSLookup
- NetStat
- Internet
 - Speedtest
- PathPing
- Remote access
- IP Scanners
- Wireless Scanners
- Protocol Analysers

Topic 2.3

Learners will carry out troubleshooting visually, including checking:

- Damage
- Physical connection
 - Workstation / device
 - Patch panel
- Incorrect connection
- Connection LED
- Output.

Learning outcome:

3. Document issues, findings and resolutions

Topics

3.1 Documentation related to troubleshooting

3.2 Document troubleshooting resolutions

Topic 3.1

Learners will explain the reasons for maintaining documentation relating to troubleshooting, including:

- Record Issues
 - Fault Log
 - Help desk software
 - Fault
 - Location
- Record Tests

- Help desk software
- Fault Log
- Physical
- Logical

Topic 3.2

Learners will complete documentation for troubleshooting data and telecommunications networks.

Guidance for delivery

This unit requires a mix of classroom theory and practical activities, testing / troubleshooting existing network(s). It is not required that learners use all of the identified test instruments.

Unit 344

Fibre optic cabling

UAN:	D/507/7266
Level:	3
GLH:	60

What is this unit about?

The aim of this unit is to give learners an understanding of the different types of fibre optic cabling that are commonly available in industry.

Learners as part of this unit will consider the differing types of cable, their uses, and some of the standards associated with them.

Learners will also learn about some of the testing methods used in fibre optic cabling.

Learning outcomes

In this unit, learners will be able to

1. Understand types of fibre optic cabling
2. Understand characteristics of fibre optics
3. Understand fibre optic cabling standards and testing

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand types of fibre optic cabling

Topics

1.1 The purpose of different cable types

1.2 Transmitting devices

Topic 1.1:

Learners will describe different cable types according to their specifications and connectors, including:

- Single Mode
- Multi-Mode
- Grade indexed
- Stepped indexed
- Special purpose Fibre

Topic 1.2

Learners will describe different transmitting methods for different types of cabling, including:

- LEDs (Light Emitting Diodes)
- Photovoltaic Cells
- Optical Lamps

Learners will also explain safe working practices when dealing with Fibre optic cabling and transmitting devices.

Learning outcome:

2. Understand characteristics of fibre optics

Topics

2.1 Characteristics of different fibre optic cable types

2.2 Types of fibre optic cable termination

Topics 2.1

Learners will describe the different characteristics of types of Fibre Optic available including:

- Segment Length
- Appropriate transmission methods
- Insulation
- Sensors
- Power transmission
- Index of reflection
- Internal reflection

- curvature

Topic 2.2

Learners will describe appropriate termination methods for fibre optic cabling.

Learning outcome:

3. Understand fibre optic cabling standards and testing

Topics

3.1 Standards in Fibre Optic cabling

3.2 Testing methods in Fibre Optic Cabling

Topics 3.1

Learners will describe the purpose of different standards in fibre optic cabling including:

- SONET (Synchronous optical networking)
- SDH (Synchronous Digital Hierarchy)
- NECA/FOA301 Standard, Installing and Testing Fibre Optics

Topic 3.2

Learners will explain different testing methods for Fibre optic cabling including:

- Visible light source
- Optical time domain reflector

UAN:	H/507/7267
Level:	3
GLH:	60

What is this unit about?

The aim of this unit is to give learners a detailed understanding of the equipment, protocols and standards used in PSTN and Data Networks. This is a reflection of the fact that more and more businesses and organisations are moving towards combining data and voice networks using technologies that can be found within this unit.

Learners will apply the knowledge from this and other units to implement a data network or PSTN.

Learning outcomes

In this unit, learners will be able to

1. Understand types of cabling
2. Implement Standards controlling PSTN and Data Networks
3. Implement a PSTN / Data Networks

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand types of cabling

Topics

- 1.1 Cable types
- 1.2 The use and purpose of cable types

Learners must explain different cable types, connectors, and their associated specifications, including:

- UTP
- STP
- Plenum
- Coaxial
- Fibre Optic
- PowerLine

Topic 1.2

Learners must describe categories and ratings of data network cabling, including:

- CAT 3 – 7
- Speed
- capacity
- Maximum distance of individual cable runs
- Interference
- Resistance.

Learning outcome:

2. Implement Standards controlling PSTN and Data Networks

Topics

- 2.1 Apply standards in data networks
- 2.2 Deploy protocols to data networks

Topics 2.1 and 2.2

Learners will implement protocols and standards to meet a given specification, for example:

- Standards
 - E. 163 and 164
 - TIA-TSB-116 for voice quality
 - Signalling System No. 7 (SS7)
 - High-level Data Link Control (HDLC)
- Protocols
 - PPP (Point to Point)
 - PPPoE (PPP over Ethernet)
 - SLIP (Serial Line Interface)
 - VoIP (Voice over IP)

- LAP (Line Access Procedure)
- X25

Learners are expected to correctly deploy at least two protocols and apply two standards.

Learning outcome:

3. Implement a PSTN / Data Network

Topics

3.1 Equipment used in data networks

3.2 Implement data networks

Topics 3.1

Learners will explain the purpose and function of differing technologies used in data networks, including:

- Switches
- Routers
- Servers
- Storage
- VLANS
- Wireless access points
- End user devices
- PBX

Topic 3.2

Learners will implement data networks to transmit differing media types.

Guidance for delivery

Topic 3.2

Learners can be asked to implement either a PSTN or a data network to achieve this topic area. It is recognised that not all providers will be in a position to implement a PSTN.

Unit 346

Telecommunication Fundamentals

UAN:	M/507/7269
Level:	3
GLH:	60

What is this unit about?

This unit covers the core understanding of the telecommunications and data cabling industry, providing learners with the underpinning knowledge required to progress within the sector. The concepts discussed will be relevant to both the wired and wireless components of data and telecommunications networks. Learners will be expected to explore issues such as protocols and transmission methods associated with the delivery of both analogue and digital telecommunications.

The purpose of this unit is for learners to develop an awareness of the concepts that provide the underpinning knowledge required in the other units that are delivered as part of this qualification.

Learning outcomes

In this unit, learners will be able to

1. Understand the characteristics of analogue and digital signals
2. Describe the Media used as part of data and telecommunications networks
3. Understand the standards and protocols associated with data and telecommunications networks.

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the characteristics of analogue and digital signals

Topics

- 1.1 Characteristics of signals
- 1.2 Methods of converting digital signals into analogue signals
- 1.3 Digital Encoding methods

Topic 1.1

The learner will develop an understanding of the characteristics of digital and analogue signals.

The learner will investigate the characteristics of analogue signals, including:

- Amplitude
- Frequency
- Phase
- Harmonics

The learner should explore the characteristics of Digital signals, for example:

- A series of discrete wave forms representing one bits and zero bits

Topic 1.2

The learner must be able to describe the methods that can be used to convert a digital signal in to an analogue signal, including:

- Phase Shifting Key (PSK)
- Quadrature Amplitude Modulation (QAM)
- Amplitude Shifting Key (ASK)
- Frequency Shifting Key (FSK)

Topic 1.3

The learner must be able to explain the digital encoding methods that can be used to transmit data, including:

- Non-return to zero Level (NRZ-L)
- Non-return to zero Inversion (NRZ-I)
- Manchester
- Differential Manchester.

Learning outcome:

2. Describe the Media used as part of data and telecommunications networks

Topics

- 2.1 Media
- 2.2 Characteristics of Media
- 2.3 Transmission methods

Topic 2.1

The learner must describe the uses of the different types of media associated with data and telecommunications networks. This must include:

- Wired
 - Twisted pair cable
 - Coaxial cable
 - Fibre optic cables
 - PowerLine
- Wireless
 - Microwave
 - Satellite
 - Bluetooth
 - Wi-Fi
 - Cellular

Topic 2.2

The learner must explain the characteristics of different media that are used as part of data and telecommunications networks. This must include:

- Baseband
- Broadband
 - Public Switched Telephone Network (PSTN)
 - Integrated Services Digital Network (ISDN)
 - Digital Subscriber Line (DSL)
 - Synchronous Optical Networking (SONET)
- Bandwidth
 - Baud rate
 - Bits per second
 - Kbps
 - Mbps
 - Gbps
- Attenuation
- Gain

Topic 2.3

The learner must be able to describe the data transmission methods used as part of data and telecommunications networks. This must include:

- Serial
- Simplex
- Half Duplex
- Full Duplex
- Circuit switching
- Packet switching
- Asynchronous Transfer Mode (ATM)
- Low frequency
- Medium frequency
- High frequency
- Ultra High Frequency
- Cellular.

Learning outcome:

3. Understand the standards and protocols associated with data and telecommunications networks

Topics

- 3.1 Organisations that establish data and telecommunications standards
- 3.2 OSI Model
- 3.3 Standards associated with data and telecommunications networks
- 3.4 Protocols associated with data and telecommunications networks

Topic 3.1

The learners will state the organisations that are responsible for establishing telecommunications and data networking standards. This must include:

- European Telecommunications Standards Institute (ETSI)
- Institute of Electrical and Electronics Engineers (IEEE)
- International Standards Organisation (ISO)
- American National Standards Institute (ANSI)

Topic 3.2

Learners will describe the layers of the OSI model and explain the function of each layer, referencing this against the TCP/IP model.

Topic 3.3

The learners will describe the purpose of standards associated with data and telecommunications networks, covering:

- Interoperability
- Quality assurance
- Consistency

Standards must include:

- Data and Telecommunications
 - Ethernet
 - VoIP
 - PoE
 - PPP
- PowerLine
 - ETSI TR 101 562 PowerLine Telecommunications (PLT)
- Mobile
 - ETSI EN 301 893 Broadband Radio Access Networks (BRAN)
 - Code Division Multiple Access (CDMA)
 - Global System for Mobile Communications (GSM)
 - General packet radio service (GPRS)
 - Universal Mobile Telecommunications System (UMTS)
 - High Speed Packet Access (HSPA)
 - IEEE 802.11
 - IEEE 802.15

- Error checking
 - Hamming code
 - Cyclic Redundancy Checking (CRC)

Topic 3.4

The learner will describe the role of protocols in data and telecommunications networks, including:

- IP
- TCP
- X25
- E. 163 and 164
- PPP
- PPTP
- PPPoE
- SLIP
- Signalling System No. 7 (SS7)
- High-level Data Link Control (HDLC)
- Quality Of Service (QoS)
- VoIP.

Guidance for delivery

The expectation is that this unit is delivered early in the teaching, in order to give learners the underpinning knowledge required to successfully complete the remaining units.

When delivering the content for outcome 1 the use of an oscilloscope would help the learners investigate the various characteristics of a signals. Diagrammatic examples of how each encoding method is implemented will aid in the learners' understanding.

When discussing outcome 2 it would be beneficial to contextualise the concepts and discuss how they apply to a data and telecommunications network.

Suggested learning resources

Books

Telecommunications Crash Course
 Published by: McGraw-Hill Professional, 3rd edition, 2014
 ISBN-10: 0071832661
 ISBN-13: 978-0071832663

Shepard, S

The Essential Guide to Telecommunications (Essential Guides (Prentice Hall))
 Dodd, A. Z

Published by: Prentice Hall, 5th edition, 2012
 ISBN-10: 0137058918
 ISBN-13: 978-0137058914

UAN:	K/507/7271
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to develop an insight into the concepts involved in using mobile and wireless networks to communicate both in a business and personal environment. This will involve investigating how the components of a cellular network interact to enable data and voice signals to be transmitted.

Learners may be introduced to this unit by asking themselves questions such as:

- Which components are required to allow mobile communications?
- Which standards are associated with wireless networks?
- What do I have to configure to implement a wireless network?

Learning outcomes

In this unit, learners will be able to

1. Understand wireless technologies
2. Understand the technologies used to implement cellular networks
3. Configure a wireless LAN

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand wireless technologies

Topics

- 1.1 Wireless technologies
- 1.2 Wireless topologies
- 1.3 Components of a wireless LAN

Topic 1.1

The learner will describe wireless technologies associated with telecommunications and data networks, including:

- wireless communication technologies
 - Near Field Communications (NFC)
 - IEEE 802.11
 - IEEE 802.15 (Bluetooth)
- microwave (WiMax – Worldwide Interoperability for Microwave Access)
- free space optics (FSO)
- direct broadcast Satellite (DBS)
- mobile phone networks

Topic 1.2

The learners will describe wireless network topologies, including:

- Ad-hoc mode
- Infrastructure mode

Topic 1.3

The learner will explain the components required to implement a wireless LAN, including:

- Routers (wired and wireless)
- Wireless access points
- Network interface cards/devices
- Network security
 - WPA
 - Broadcasting SSID

Learning outcome:

2. Understand the technologies used to implement cellular networks

Topics

- 2.1 Cellular Technologies
- 2.2 Components of a Cellular Network
- 2.3 How a Cellular network functions

Topic 2.1

Learners will describe the technologies that are used to enable communications via cellular networks, including:

- Global system for mobile communication (GSM)
- General packet radio service (GPRS)
- Global Positioning System (GPS)
- Short messaging service (SMS)
- Multimedia messaging service (MMS)
- 3G
- 4G
- Long Term Evolution (LTE)

Topic 2.2

The learner will explain the components that form a cellular network, including:

- Cells
- Base Transceiver Station (BTS)
- Radio Network Controller (RNC)
- Servicing General Packet Radio Support Node (SGSN)
- Mobile Switch Centre (MSC)
- Visitor Location Register (VLR)
- Home Location Register (HLRs)
- Public Switch Telephone Network (PSTN)
- End user devices

Topic 2.3

The learner will describe how cellular networks enable mobile communications, including:

- Cell repeat patterns
- Cell Splitting
- System identification code (SID)
- Registration signals
- Hand-off.

Learning outcome:

3. Configure wireless LANs

Topics

3.1 Install components

3.2 Configure components

Topics 3.1 and 3.2

The learner will install and configure the required components to enable wireless LANs to be implemented, including:

- Following safe working practices, install and configure:
 - Routers
 - Wireless access points
 - Network interface cards/devices
 - End user devices
- IP addresses
- SSID

- Name
- Broadcasting
- WPA
- Firewalls on wireless routers.

Guidance for delivery

This unit can be used alongside any of the units that focus on developing and implementing telecommunications networks, as it provides an overview of the how cellular and wireless technologies can be combined to extend the remote capabilities of a network.

Suggested learning resources

Books

Wireless Networks Smith, C & Collins, D
Published by: McGraw-Hill Professional, 3rd edition, 2014
ISBN-10: 0071819835
ISBN-13: 978-0071819831

Websites

CISCO http://www.cisco.com/cisco/web/solutions/small_business/resource_center/articles/work_from_anywhere/what_is_a_wireless_network/index.html

Forbes <http://www.forbes.com/sites/ericsavitz/2012/08/01/3-wireless-technologies-that-will-change-home-networking/>

UAN:	M/507/7272
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to understand systems analysis methodologies and develop the skills needed to undertake a systems analysis investigation by following a recognised methodology.

Learners will explore the Systems Development Life Cycle (SDLC) models based upon Waterfall and Rapid Application Development approaches. Learners will understand how various models operate through a feasibility study utilising fact-finding techniques. Learners will understand how to identify and consider stakeholder interests as well as the wider implications of any considered developments. Learners will investigate different life cycle models and understand their particular strengths and weaknesses. Learners will also develop the skills that will allow them to determine which model is most appropriate for different situations.

Learners may be introduced to this unit by asking themselves questions such as:

- What is systems analysis and design?
- What are the differences between the various lifecycle models?
- What role does a feasibility study play in the process of developing systems?
- What common design tools are used in systems analysis?

Learning outcomes

In this unit, learners will be able to

1. Understand the Principles of Systems Analysis and design
2. Analyse Business Systems
3. Design Business solutions

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand the Principles of Systems Analysis and design

Topics

- 1.1 What is systems analysis and design?
- 1.2 Life Cycle Models
- 1.3 Compare and Contrast Life Cycle Models
- 1.4 Drivers for Systems Change
- 1.5 Benefits of Structured Analysis

Topic 1.1

Learners understand and can explain what is meant by the term systems analysis and design.

Systems Analysis

Dissecting and analysing a system into components to enable investigation of how those components function and interact.

System Design

The definition of the architecture, components, modules data and interfaces for a system to meet customer requirements

Learners can describe the role and qualities of the Systems Analyst:

- Role
 - To solve business problems using technology
 - Identify opportunities for organisational improvement
- Qualities
 - Problem solver
 - Good communicator
 - Self disciplined
 - Organised

Topic 1.2

Learners will describe the different Systems Development Life Cycle (SDLC) models used in system analysis. Learners will understand the features of each method.

Systems Development Life Cycle (SDLC)

- Waterfall models
 - Structured Systems Analysis and Design Method (SSADM)
 - Unified Process (UP)
- Spiral models
- Rapid Application Development/Evolutionary Models
 - SCRUM
 - AGILE
 - Dynamic System Development Methodology (DSDM)

- Checkland soft systems methodology

Learners will also understand the importance a structured analysis approach has on the following, describing any associated benefits:

- Achievement of objectives
- Budgets
- Time scales
- Product quality
 - Resilience
 - Maintainability

Topic 1.3

Learners need to compare and contrast the models from topic 1.1 describing the relative advantages/disadvantages of each and explaining when to use each model.

Topic 1.4

Learners will explain the Key Drivers for change from an organisational system context:

- Business Need
 - Growth
 - Cost Cutting
 - Competitor analysis
 - Technologies becoming dated
- Changing legal requirements
- New business opportunities

Topic 1.5

Learners **can explain** the benefits of following a structured approach:

- Benefits:
 - Ensure projects stay within budget and are delivered on time
 - Produce good quality software that meets requirements
 - Produce manageable projects

Production of maintainable systems and code.

Learning outcome:

2. Analyse Business Systems

Topics

- 2.1 Purpose of feasibility
- 2.2 Investigative Techniques
- 2.3 Feasibility Criteria
- 2.4 Develop Requirements Specifications

Topic 2.1

Learners describe the purpose of feasibility studies and can explain the output(s) they produce:

- Findings
- Recommendations
- draft project plan

- model or prototype of the new system
- a simulation of the new systems behaviour
- identification of new requirements)

Topic 2.2

Learners will explore the different Investigative Techniques used to determine project feasibility. Learners will understand the importance of undertaking a range of techniques and the role that feasibility studies play in developing quality systems:

- Interviews
- Observation
- Questionnaires
- Focus Groups
- Documentation review
- Company history

Topic 2.3

Learners will describe the different types of feasibility criteria. In order to determine whether a project should progress:

- Suitability for organisational culture and climate
- Functional Feasibility
- Technical Feasibility
- Financial Feasibility
- Operational Feasibility
- Organisational Feasibility
- Risk analysis

Topic 2.4

Learners will learn how to develop and document requirement specifications:

- Functional Requirements
- Non-Functional requirements
 - Technical constraints
 - Access requirements

Learners must create a requirements gathering and validation document and specify the techniques they will use to capture the information for a range of feasibility criteria.

Learning outcome:

3. Design business systems

Topics

3.1 Design tools

3.2 Developmental tools

Topic 3.1

Learners will demonstrate a range of design techniques associated with developing quality business systems. These include but are not limited to:

- Diagramming techniques
 - Data modelling
 - Logical
 - Physical
 - Entity Relationship Models
 - Flow Charts
 - Decision tables
 - Business Process Documentation
 - Application Simulations
- Input/output
 - Application Mock-up / Prototype
 - Screens
 - Reports
- Data dictionaries

Topic 3.2

Learners will explain the role Computer-Aided Software Engineering software (CASE) plays in developing quality systems and learn how to develop System Analysis Designs using appropriate for eg:

- Tools
- Workbenches
- Environments.

Guidance for delivery

Tutors should place an emphasis on developing learners understanding of the role and principles of systems analysis. Learners need to know the importance of creating clear documentation and the reasons behind the development of lifecycle methodologies.

Much of the learning will need to be carried out through tutor provided case studies, although guest speakers through centre links to industry can provide a valuable resource. Where possible, case studies should be detailed and learners should be able to pose questions that allow them to gain insights into the processes involved from an organisational context.

Suggested learning resources

Books

Systems Analysis and Design
Published by: John Wiley and Sons, 4th Edition, 2009
ISBN-10 0470400315
ISBN-13 978-0470400319

Dennis, A & Wixom, B

Systems Analysis and Design
FT Prentice Hall, 2nd Edition, 2003
ISBN-10 0273655361
ISBN-13 978-0273655367

Yeates, D & Wakefield, T

Systems Analysis A Beginner's Guide
Published by: Palgrave Macmillan, 2003
ISBN- 9780333986301

Bowman, K

Websites

Free Tutes

www.freetutes.com/systemanalysis

www.tutorialized.com/view/tutorial/Systems-Analysis/31659

UAN:	A/507/7274
Level:	3
GLH:	60

What is this unit about?

Businesses require sources of finance (profits, savings, loans, share capital) to operate. However, money on its own is not a guarantee of success. Businesses also need a financial strategy and the appropriate combination of financial instruments, effectively managed, to ensure the success of the business.

The funding available to an organisation must allow it to operate at several levels and phases of its operations cycle.

The money needed will help an organisation establish itself, design and produce its products, and market them to the desired audience. The money or finance may not come from the people who set up the organisation and there is a legal responsibility to use it properly.

Governments set up systems of laws and regulations designed to control the use of finance so that investors are protected as far as possible. The systems are also designed to help to measure the success of the organisation in terms of its profits that may lead to taxes and duties being paid to the government.

Even small start-up companies have the potential to become very successful and it is important to follow correct procedures to find and use the finance, and then report the progress made to make sure that the people who control the organisation have important information that may allow them to make good decisions that will impact on its future.

Learners may be introduced to this unit by asking themselves questions such as:

- How does an organisation get its money at the start?
- How does a company plan for its financial needs?
- How is organisational finance supervised?
- Do different parts of the organisation need special control?

Learning outcomes

In this unit, learners will be able to

1. Identify sources of finance
2. Plan for spending during the product life-cycle
3. Identify financial control systems
4. Apply the principles considered in a case study

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Identify sources of finance

Topics

- 1.1 Sources of money
- 1.2 Capital in an organisation
- 1.3 Loans to a company
- 1.4 Sources of income

Topic 1.1

Learners will identify different sources of money for organisations of different sizes. Such sources will include but may not be limited to:

- Banks and Building Societies
 - High street banks
 - Online banks
 - Building societies
 - Private banks
- Venture capital funds
- Government development funding
- Charitable grant funding
- Crowd-sourced funding
- Share issues
- Principals' loan accounts

It is important to separate the expectations of risk and repayment between sources of debt and sources of equity.

Topic 1.2

Learners will understand how the worth of a company is described by its capital value and know which items are typically included in the valuations made. Learners must be able to identify the items identifying the company's worth are included in a balance sheet.

Such items will include but not be limited to:

- Bank accounts
- Shares issued
- Loans/Assets
 - Property including intellectual property
 - Stock
 - Orders in place
- Goodwill

Topic 1.3

Learners will understand about types of loans that might be made to a company or the individuals representing it. The types of loans are numerous, e.g. overdraft, short and long-term loans, mortgages, bonds, credit facilities etc., but the learner must understand the principles of arrangements that are:

- Secured
- Unsecured

Learners must be able to describe the legal responsibilities of the lender and the borrower in the arrangement of loans.

Topic 1.4

Learners must understand how different companies generate their income. Different sources may include but not be limited to:

- Product Sales
 - Provision of services
 - Service contracts and annuity agreements
 - Intellectual property licencing
 - Physical Property rental
-
- Loans (i.e., Credit agreements with consumers such as store cards)
 - Investments

The learner will need to understand that some payments are made within a fixed time window such as 30 days, and others such as subscription models will be paid in instalments over a period of time.

Learning outcome:

2. Plan for spending during the product life-cycle

Topics

- 2.1 Research and design costs
- 2.2 Prototyping costs
- 2.3 Manufacturing costs
- 2.4 Marketing costs

The product life cycle applies to the consideration of physical products such as tablet computers and logical products like the software apps that run on them.

Much of the elements studied in these topics should be based around consideration of companies known internationally or locally. The consideration of these issues would offer some excellent opportunities to engage with employers and seek information on their experiences in each topic area.

This unit should focus on the use of technology in the topic areas.

Topic 2.1

Learners must describe the possible costs involved in research and design of a product before the manufacturing begins.

Research and design may involve but not be limited to:

- Market research activities
- New product development processes
- Trial products

Topic 2.2

Learners must consider design and prototyping of products and be able to identify costs raised in the provision of the resources needed to complete the processes. Learners must outline the processes that would be used in a given scenario.

Learners should explain a range of methods that might be used to create the research and design documentation needed to start the next phase, prototyping.

- Materials
- Equipment
- Staffing
- IP (procurement of)

Learners must know about the costs of use of prototypes and their value in the development life-cycle. They must be able to describe where and with whom they might be used.

Learners describe how technology is used in the preparation of physical and logical prototypes.

The production of Physical prototypes may involve but not be limited to:

- Scale models
- Traditional mock-up models
- 3D printed models
- Working versions with limited facilities
- Prototypes of system components

Logical prototypes demonstrate such things as, but not limited to:

- Sketches
- Wireframes
- Websites
- Publications
- Simulations
- Virtual worlds
- Software systems

Topics 2.3

Learners must identify what is required to provide manufacturing facilities. It would be difficult to be specific about all manufacturing technologies and systems, and learners should focus on the broad range rather than the detailed costs in particular systems. They will use two case studies to learn how to describe how different organisations might place emphasis in different cost areas and where legislation may demand particular standards to ensure the safety of people engaged in the processes.

Learners must know that manufacturing costs may include, but not be limited to:

- Manufacturing space
- Raw materials storage facilities
- Plant used in manufacturing to suitable safety standards
- Plant used in finishing products e.g. cleaning facilities
- Packaging
- Warehousing
- Labour

Topic 2.4

Learners must explore the areas of cost involved in the marketing of different types of products. The learner must understand the costs of items such as, but not limited to, these:

- Marketing plans
- Advertising design
- Advertising costs
 - Publication based advertising

- Internet hosted advertising
 - Traditional media based advertising
 - Product packaging
 - Sales expenses
 - Sales teams including specialist agencies
 - Client awareness and orientation
 - Training costs
 - Documentation
- Product placement expenses.

Learning outcome:

3. Identify financial control systems

Topics

- 3.1 Management accounting
- 3.2 Financial accounting
- 3.3 Stock control
- 3.4 Auditing

Topic 3.1

Learners will describe the role of management accounting in business. They must know that its use is for internal stakeholders to help them make decisions and control of resources used in the product life cycle.

Accounting tools and methods include but not be limited to:

- Bookkeeping systems
- Cash flow forecasts
- Breakeven analysis
- Budgets

They must know that many of the management accounting processes rely on the prediction of current and future trends through acquiring market intelligence, and be able to describe how this might be achieved. They must realise that many such forecasts may not be accurate and consider how fluctuations and changes in conditions might affect the processes.

Learners will also need to appreciate that as a business grows additional enterprise resource planning (ERP) systems will be required. These will support the business in being able to forecast cash flow and budgets based upon analysis of actual financial data.

Topic 3.2

Learners should explain the purpose of financial reporting in business, principally that concerned with the needs and requirements of internal and external audiences. Such audiences will include but not be limited to:

- Tax authorities (Fiscal responsibility will vary in different types of organisations)
- Investors
- Creditors
- Lenders
- Directors or trustees
- Financial institutions

They should know that such accounting records the state of the organisation within specified time periods and that different organisations may be obliged to make reports public.

Topic 3.3

Learners should explore technology enables the tracking of stock items and the reporting of their worth. Such systems may include but not be limited to:

- Barcoding and scanning and differences in their standards
- Passive and active identification devices, e.g. RFID
- Presence scanning e.g. Infra-red and ultrasonic detection systems

Topic 3.4

Learners must explore the role of formal auditing with a particular emphasis on its role in working out any liabilities for taxes or duties. They should learn about the legal requirement to conduct audits in different types of organisations to include, but not limited to:

- Sole trader organisations
- Limited companies (reporting to Companies House)
- Public Limited Companies (reporting to Companies House)
- Charities (reporting to the Charities Commission)
- Clubs and societies
- Partnerships
- Exceptions: Royal Charter Companies (no legal requirement to report), e.g., Some universities, learned societies, professional bodies, awarding bodies.

Learning outcome:

4. Apply the principles of financial modelling

Topics

- 4.1 Product development costs
- 4.2 Product development planning

Topic 4.1 and 4.2:

Learners will outline how a nominated organisation described in a scenario might use the topics 1, 2 and 3 of the unit to bring a new product to market. They must focus on identifying the ranges of costs involved in all of the identified stages from design to sale and be able to create a Business Plan that is presented in a professionally competent format.

The Plan should include information presented in both text and images and should allow a non-technical reader to understand the costs of the project.

The Plan should be in an electronic format allowing easy sharing with interested stakeholders.

Guidance for delivery

This unit must not be just about the processes described in topics 1, 2 and 3. It should focus on the use of technologies and their advantages over traditional methods, or a recognition of the value of such traditional methods in some cases.

It is important to note that this unit will not require learners to be able to apply all of the science and technology fully. At this level of study, the learner is gathering knowledge about the range of possibilities through an understanding of the principles.

Much of this unit could be based around carefully selected case studies and scenarios to allow the learners to explore the nature of strategies that may be implemented across a range of different company types and sizes. The depth of coverage should allow the learner to be competent in description of the topics but not necessarily in the complete execution of the processes described in each.

Emphasis should be placed on a technology driven approach and the advantages offered by this over traditional methods where that is the case and learners should be encouraged to use the Internet to research current material as well as using textbooks.

In the synoptic task described in Learning Outcome 4 it may be useful for the tutor to provide a range of nominated organisations so that the topics can focus usefully on the application of the principles rather than the investigation of organisations.

It is very likely that the information available about how the nominated organisation completes the phases of the development cycle will be incomplete but it must be clear that the emphasis is on the learner providing coherent and reasonable explanations of the potential use of technologies and the processes, rather than an accurate report of how the organisation operates in fact.

Of course, some information may be available, particularly through the engagement of local employers and developers, and the use of such material should be encouraged if appropriate provenance is provided.

Suggested learning resources

Books

Accounting and Finance for Non-Specialists

Atrill, P & McLaney, E

Published by: Pearson, 9th edition, 2014

ISBN-10: 1292062711

ISBN-13: 978-1292062716

Business Accounting: Volume 1

Wood, F & Sangster, A

Published by: Financial Times/ Prentice Hall, 12th edition, 2011

ISBN-10: 0273759280

ISBN-13: 978-0273759287

Websites

CGMA, Essential tools for Management Accountants

<http://www.cgma.org/Resources/Tools/essentialtools/Pages/list.aspx?TestCookiesEnabled=redirect>

UK Government. Start your own business

<https://www.gov.uk/starting-up-a-business/get-funding>

The Start Up Donut. Start-up funding

<http://www.startupdonut.co.uk/startup/financing-a-business/start-up-funding>

UAN:	R/507/7278
Level:	3
GLH:	60

What is this unit about?

Business continuity management encompasses a set of planning, preparatory and related activities which are intended to ensure that an organisation's critical business processes will either continue to operate during or after serious incidents or disasters that might otherwise have interrupted them, or will be a risk to their future plans.

Businesses who make plans for the adverse effects of disasters will be able to mitigate the impact of the disaster on business operations. It is unlikely that all adverse effects can be mitigated but business of all sizes should prepare for the most likely disasters (e.g., fire, flood, power loss, etc.).

The process of Business Continuity Management (BCM) planning is logical and quite straightforward but requires a framework to work with. The unit will help learners understand and follow the processes that should be a basis for planning in the future.

Learners may be introduced to this unit by asking themselves questions such as:

- What is a disaster in business context?
- How does a business plan and prepare for disasters?
- Who will be affected when a disaster occurs?
- What actions should businesses take to mitigate disasters?
- How is organisational risk measured?
- How does an organisation plan for getting back to normal?

Learning outcomes

In this unit, learners will be able to

1. Identify business continuity management (BCM) principles
2. Describe processes of risk identification
3. Identify business continuity strategies
4. Apply the principles of BCM

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Identify business continuity management (BCM) principles

Topics

- 1.1 Definitions and concepts
- 1.2 Legislation and frameworks
- 1.3 Essential organisational components
- 1.4 Identify critical resources

Topic 1.1

Learners will describe the key terms included in the unit so that essential vocabulary will be used effectively and correctly.

- Business Continuity
- Disaster
- Disaster Recovery
- Etc,

Topic 1.2

Learners will describe the UK legislation established to protect key businesses and services. The legislation is coupled with a British Standards framework that is used in many other countries to help them with strategic planning where no formal local systems have been established.

The learner must be able to describe the main features of:

- Civil Contingencies Act 2004
- British Standards (BS) 25999 Business Continuity Management Standard parts 1 and 2

Note: These two following topics (1.3 and 1.4) should be considered together in the context of a tutor approved scenario so that the concepts might easily be described in more realistic terms.

Learners will use a scenario to consider the learning covered in 1.3 and 1.4.

Topic 1.3

Learners will explore the key components of the organisation to be considered in the planning process. The learner must be able to create a Business Impact Analysis based on an interruption to a business' processes in the following aspects:

- The impact on the organisation's ability to meet its aims and objectives
- The identification of information systems which support critical business processes

Learners will analyse the impact over a range of time periods so that they can determine how long it might take to have a substantially damaging effect. This allow the organisation to establish point at which services must resume. They must be able to define:

- Minimum Tolerable Points of Disruption (MTPD)
- Recovery Time Objective (RTO)

Topic 1.4

Learners will describe the critical resources needed to meet the Recovery Time Objective. The learners should consider these resources:

- People (including identification of specialists across the organisation who support critical business processes)
- Premises (e.g., offices, warehouses, factories)
- Technology
- Information
- Transport
- Utilities (power, water, telecoms)
- Suppliers and partners.

Learning outcome:

2. Describe processes of risk identification

Topics

- 2.1 Risks and hazards, and inherent risk
- 2.2 Likelihood and impact
- 2.3 Decide actions

Note: These two following topics should be considered together in the context of a tutor approved scenario so that the concepts might easily be described in more realistic terms.

Topic 2.1

Learners will compare the differences between risks and hazards. Learners will describe the principle of inherent risk that is a feature of many fundamental business processes.

Topic 2.2

Learners must know evaluate contextualised risks in risk assessment matrix table. The steps must follow the process:

- Identify the risk
- List the likelihood of the risk occurring
- List any possible arrangements that may reduce likelihood and impact
- Assign a likelihood score
- Plot the risk in the matrix

B High Impact Low Likelihood	A High Impact High Likelihood
D Low Impact Low Likelihood	C Low Impact High Likelihood

- Rank the risk A - D

The learners should also consider other means of risk and threat assessment, for example; SWOT, PESTLE.

Topics 2.3

Learners must analyse how an identified organisation might act in respect of the risk to IT systems. They should consider these options:

- Treat – reduce likelihood and impact scores by doing different things
- Tolerate – accept the risk as cost of change is too high

- Transfer – take out insurance or contract the risk activity to someone else
- Terminate – stop the activity and accept the consequences.

Learning outcome:

3. Identify business continuity strategies

Topics

- 3.1 Contingency planning
- 3.2 BCM Response

Learners must know how to create a contingency plan to help an organisation implement Business Continuity Management.

Topic 3.1

Learners understand the steps required to create a Contingency Plan (CP) for businesses' critical processes. The learners must consider the effect of disruption to their own activities and others who may affect such activities.

The learners must consider options for the operation of the organisations under several key headings:

- People
Possible tactics may include:
 - Redeploy
 - Change roles
 - Train in multiple activities
 - Succession planning
 - Third-party support
 - Geographical separation of key people
 - Knowledge transfer/mentoring by specialists that support critical business processes
- Premises
Possible tactics may include:
 - Relocate
 - Remote working
 - Rent premises
 - Rent plant and equipment
- Suppliers and partners
Possible tactics may include:
 - Backup storage of raw material
 - Multiple-supplier sourcing
 - Alternative supplier identification
 - Assurance of supplier BCM strategy
 - Penalty clauses
- Stakeholders
Possible tactics may include:
 - Mechanisms to provide information (internal and external stakeholder communications plans)
 - Protection of any vulnerable stakeholder
- Technology
Possible tactics may include:
 - Distribute technology across different locations
 - Retain old equipment to provide backup
 - Rent or lease similar technology

- Utilisation of cloud storage and/or cloud computing facilities
- Information
 - Possible tactics may include:*
 - Backup onsite
 - Backup offsite
 - Backup to cloud storage providers
 - Essential documentation stored securely
 - Copies of essential documentation kept offsite
- Transport Routes
 - For staff
 - For customers
 - For good in/out
- Utilities
 - Power supply
 - Gas supply
 - Telecommunications services

Topic 3.2

Having evaluated risk and created Contingency Plan learners must understand what may be done to make sure that it can be used effectively when needed.

The implementation response plan must clearly define at least these aspects:

- Purpose and scope: relationship with any other plans or policies
- Document owner: who will keep it up-to-date
- Roles and responsibilities within the response plan
- Succession planning (who takes over in the event of a named responsible person not being available).
- Invocation authority: who mobilises the plan or suspends it after its start.
- Contact details of key stakeholders

Initial activities e.g. evacuation, first aid, personnel audit, communication chain establishment.

Learning outcome:

4. Apply the principles of BCM

Topics

- 4.1 Initial analysis
- 4.2 Risk assessment
- 4.3 Contingency and Response plan

Depending on the approach used in covering Topics 1, 2 and 3, the learner may only have to consolidate previously completed work into a coherent format that enables the organisational approach to Business Continuity to be considered holistically.

Alternatively, a new scenario may be considered to bring the elements together from scratch. There may be value in this approach in some institutions and delivery structures.

The learners must create a set of documents prepared to a professional standard, capable of electronic distribution to a variety of required interested parties.

Topic 4.1

Learners outline how a nominated organisation might establish the processes considered in topics 1, 2 and 3.

Using a scenario, create:

- Minimum Tolerable Points of Disruption (MTPD)
- Recovery Time Objective (**RTO**)

Topic 4.2

Create a Risk Assessment

Topic 4.3

Create a Contingency Plan and a Response Plan.

Guidance for delivery

This unit focuses on essential strategies for the effective conduct of business in small and large organisations. Care must be taken to moderate the depth of coverage so that all concepts are covered.

Much of this unit could be based around carefully selected case studies and scenarios with a focus on IT dependent systems to allow the learners to explore the nature of strategies that may be implemented across a range of different company types and sizes. The depth of coverage should allow the learner to be competent in description of the topics but not necessarily in the complete execution of the processes described in each.

Emphasis should be placed on a technology driven approach to planning and documenting business continuity processes, and the advantages offered by this over traditional methods where that is the case and learners should be encouraged to use the Internet to research current material as well as using textbooks.

In the synoptic task described in Learning Outcome 4 it may be useful for the tutor to provide a range of nominated organisations so that the topics can focus usefully on the application of the principles rather than the investigation of organisations.

It is very likely that the information available about how the nominated organisation completes the phases of the development cycle will be incomplete but it must be clear that the emphasis is on the learner providing coherent and reasonable explanations of the potential use of technologies and the processes, rather than an accurate report of how the organisation operates in fact. The learners should focus on what the organisation could do rather than what they actually do.

Of course, some information may be available, particularly through the engagement of local employers and developers, and the use of such material should be encouraged if appropriate provenance is provided.

Suggested learning resources

Books

- | | |
|--|--------------|
| A manager's guide to BS25999: a Practical Guide
Published by: IT Governance Publishing, 2008
ISBN-10: 190535651X
ISBN-13: 978-1905356515 | Drewitt, T |
| Definitive Handbook of Business Continuity Management
Published by: Wiley, 3 rd edition, 2010
ISBN-10: 0470670142
ISBN-13: 978-0470670149 | Hiles, A |
| Fundamentals of Risk Management: Understanding, Evaluating and Implementing Effective Risk Management

Published by: Kogan Page, 3 rd edition, 2014
ISBN-10: 0749472448
ISBN-13: 978-0749472443 | Hopkin, P |
| Business Continuity Management: in Practice
Published by: British Computer Society, 2010
ISBN-10: 1906124728 | Hotchkiss, S |

ISBN-13: 978-1906124724

Disaster Recovery, Crisis Response, and Business Continuity: A Management Desk Reference
Watters, J

Published by: Apress, 2013

ISBN-10: 1430264063

ISBN-13: 978-1430264064

Websites

Tech Target. Business Continuity <http://searchcompliance.techtarget.com/tip/Are-mandatory-business-continuity-management-standards-good-business>

Gov.UK Business Continuity Toolkit https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/137994/Business_Continuity_Management_Toolkit.pdf

Business Continuity Institute. What is Business Continuity
<http://www.thebci.org/index.php/resources/what-is-business-continuity>

Centre for the Protection of National Infrastructure
<http://www.cpni.gov.uk>

Disaster recovery <http://www.dri.org>

Disaster Recovery Journal <http://www.drj.com>

UAN:	K/507/7285
Level:	3
GLH:	60

What is this unit about?

This unit introduces learners to the use of data in the management of business processes. There has been a recent explosion in the amount of available data to businesses driven by the advent of embedded computing and smart devices. As this data is gathered, analysed and shared, businesses are able to make better and faster decisions that are based on verifiable facts and the observable trends they show, rather than speculation based purely on gut instinct and past experience. In industry this field of data-driven solutions is referred to generically as 'big data'.

Learners will use case studies to consider impacts of the availability of more information and the increasing possibility of collating it on stakeholders and look for advantages and implications of decisions based on data. They must consider the role played by technology in the processes of data gathering and collation considered and the advantages offered over traditional methods. Learners will examine how the volume of data gathered can offer advantages and challenges, and will consider these in a modelling exercise using a real or imaginary scenario.

Learners will also understand that in some cases decisions must be made, or supported by, past experience and wisdom, rather than by the use of data. It is not possible to gather data to support every decision that must be made in business.

Learners may be introduced to this unit by asking themselves questions such as:

- What means do organisations use to collect data?
- How is data analysed scientifically?
- How is data stored and accessed?
- What advantages lie in a structured approach?
- What are the limits of using data for decision making?

Learning outcomes

In this unit, learners will be able to

1. Identify fundamental aspects of data mining
2. Consider approaches to data analysis
3. Identify options for data storage
4. Apply the principles considered in a case study

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Identify fundamental aspects of data mining

Topics

- 1.1 Data gathering
- 1.2 Data and Information Management
- 1.3 Machine learning
- 1.4 Reporting

Topic 1.1

Learners will explore some of the strategies and technologies used to gather the data used by organisations to make decisions. Learners should be aware of gathering strategies that should include:

- Traditional, non-electronic gathering (e.g., paper surveys, observation, mechanical counters, turnstiles)
- Electronic gathering (e.g., point-of-sale technologies, CCTV, Smartphones, and embedded devices)
- Gathering through loyalty and reward schemes
- Gathering through measurement of interaction with marketing material
- Behaviour monitoring
- Prolonged or systematic data gathering

Note: Emphasis should be made of the way that digital data gathering technologies (eg, Smartphones, Smartmeters) differ from mechanical data capture tends to gather only a single type of data (eg, number of customers passing through a door).

Topic 1.2

Learners will describe software tools used to manage data and information.

- Relational Databases
- Distributed Databases
- Information Management Systems
- Content Management Systems
- Cloud based Information Management Systems (eg Informatica Cloud)

Topic 1.3

Learners will explain use of software to analyse data and structure it into useable information.

Note: This topic will focus on electronic data analysis only and should include:

- The Data, Information, Knowledge, Wisdom (DIKW) pyramid
- Software for statistical analysis. The learner should consider
 - Commercial software packages
 - Freely-distributed software packages
- Software for machine learning based on statistical analysis. They must learn about the principles of:
 - Regression analysis
 - Linear modelling
 - Instance based modelling

Topic 1.4

Learners must compare and contrast a range of ways that may be used to present data in a structured and usable format. Learners should consider the advantages and disadvantages of:

- Tabular (numerical) presentation of information

- Graphical presentation of information (charts, graphs, images, video)
- Text-based and audio presentation of information

Note: The appropriate presentation of information should be illustrated through examples using the same data p

Learning outcome:

2. Consider approaches to data analysis

Topics

- 2.1 Statistics and modelling
- 2.2 Predicting and inferring
- 2.3 Clustering data
- 2.4 Risk assessment

Topic 2.1

Learners should learn about aspects of statistics that may be useful in the processes of analysing data. Consideration should be given to analysis of different volumes of data that might be used and why the volume of data available might have an effect on the way the reliability of the data may be perceived.

Learners should be able to give a useful broad description of the science of statistics, an outline of its history and how new and emerging technology may be changing its use. Learners should be able to define basic principles of statistical modelling and its main values in industry.

Learners should be encouraged to focus on the technologies of statistical science in a modern, industrial framework wherever possible and use examples of methods that might be useful in different situations.

Topics 2.2 and 2.3

Learners must explore the difference between prediction and inference and the value and limitations of each. They should identify how predictions and inference can be created from identified trends, patterns and clusters of data. They must consider the advantages offered by a technological approach to these techniques and explain how different companies might be able to use them.

The learner should understand that their knowledge of competitor data and performance might help them maintain or improve their position in the market.

They should consider how monitoring of social network channels might help prediction and inference, or act as a barrier to useful data for decision making.

Topic 2.4

Learners must explore how technology can assist organisations consider and use risk management strategies when making decisions. Learners must consider how risks are identified and modelled, and how Risk Modelling Tools, such as spreadsheets and statistical software, might help organisations consider identified risks effectively.

Learning outcome:

3. Identify options for data storage

Topics

- 3.1 Local storage
- 3.2 Cloud storage
- 3.3 Data transmission
- 3.4 Backup strategies

Data is being collected in increasingly greater volumes for example through Google clicks, supermarket loyalty systems, Mobile Applications. This explosion in the scale of available data, and sources of data gathering is sometimes referred to as 'big data'.

Topic 3.1

Learners should explain the features and benefits of local, centralised computing facilities used by organisations to store data. Such systems should include, but may not be limited to:

- mainframe computers
- distributed systems
- data warehousing
- server facilities
- local, machine-level storage

Topic 3.2

Learners should consider options of the storage of data remotely in provision that is provided by a different organisation as a service. Such services are often described as cloud storage and learners should contrast the options considered for local storage of data with facilities available for remote storage. They must be able to describe how each option may have an impact on the organisations ability to make decisions using the data and consider any perceived limitations or advantages. The learner should be able to describe the importance of considering security and appropriate access management controls when using remote storage.

Topic 3.3

Learners will describe how data storage and transmission strategies will be affected by functional and non-functional requirement.

Requirements affecting data storage and retrieval:

- Volume of data
- Rate of growth in data
- Rate of change in data (how often is it updated)
- Speed of access (how quickly must access be obtained)
- Frequency of access
- Regulatory / legislative requirements
- Confidentiality of data (restrictions on access)
- Availability of data (to various users)
- Integrity of data (restriction on editing)

Learners should be able to appreciate that difference between the storage and transmission of data compared to the storage and transmission of information.

The transmission of data must consider situations where data is used to help organisations make decisions at these different logical levels of their structure:

- Operational
- Managerial
- Strategic

Topic 3.4

Learners must explore the advantages of robust strategies for the backing up of data using systems considered in topics 3.1, 3.2 and 3.3. Learners must understand the advantages offered by data archiving strategies and be able to describe general hardware architecture used for the storage of archived data.

The exploration should be balanced and also consider potential disadvantages which may be introduced by the implementation of robust backup strategies. Learners must consider the general issues of cost, efficiency of data availability and retrieval when data is stored locally, remotely or with a cloud storage provider.

Learning outcome:

4. Apply the principles considered in a case study

Topics

4.1 Data gathering strategies

4.2 Data analysis and reporting

Topic 4.1 and 4.2

Learners will describe how an organisation (real or imagined) might use the concepts and tools taught in topics 1-3 to make better business decisions based on data. Learners must create a report based on a scenario provided covering the gathering, analysis and storage of large amounts of data. The report must describe the tools and techniques the organisation might use in each of these aspects of the report. Learners must also describe how the data and its analysis might be published electronically online and offline.

The consideration should include items such as these, and any other aspects considered relevant:

- the importance or value of the processes
- technologies used in
 - gathering data
 - storing data
 - analysing data
 - reporting methods
- the legality of data gathering, storing and publication.

Guidance for delivery

It is important to note that this unit will not require learners to be able to apply all of the science and technology fully. At this level of study, the learner is gathering knowledge about the range of possibilities through an understanding of the principles.

It may be good practice that outcome 4 would be used to confirm the understanding covered in learning outcomes 1, 2 and 3.

Much of this unit could be based around case studies and scenarios to allow the learners to explore the nature of strategies that may be implemented across a range of different company types and sizes. The depth of coverage should allow the learner to be competent in description of the topics but not necessarily in the complete execution of the processes.

Emphasis should be placed on a technology driven approach and the advantages offered by this over traditional methods.

In the synoptic task described in Learning Outcome 4 it may be useful for the tutor to provide a range of nominated organisations so that the topics can focus usefully on the application of the principles rather than the investigation of organisations. It is very likely that the information available about how the nominated organisation uses data in decisions will be incomplete but it must be clear that the emphasis is on the learner providing coherent and reasonable explanations of the potential use of technologies, rather than an accurate report of how the organisation operates in fact. Of course, some information may be available and the use of such material should be encouraged if appropriate provenance is provided.

Suggested learning resources

Books

Data Mining Techniques for Marketing, Sales and Customer Relationship Management

Linoff, GS & Berry, MJA

Published by: Wiley Publishing Inc., 2011

ISBN-10: 0470650931

ISBN-13: 978-0470650936

Data Storage Networking: Real World Skills for the CompTIA Storage+ Certification and Beyond

Poulton, N

Published by: Wiley Publishing Inc., 2014

ISBN-10: 1118679210

ISBN-13: 978-1118679210

Data Mining: Practical Machine Learning Tools and Techniques

Witten, IH & Elbe, F

Published by: Morgan Kaufmann Publishers Inc., 3rd edition, 2011

ISBN-10: 0123748569

ISBN-13: 978-0123748560

Websites

Harvard Business Review: An introduction to data-driven Decisions for managers

<https://hbr.org/2014/05/an-introduction-to-data-driven-decisions-for-managers-who-dont-like-math>

Idealware: Getting started with data-driven decision making

<http://idealware.org/reports/getting-started-data-driven-decision-making-workbook>

What-is: What is data-driven decision management?

<http://whatis.techtarget.com/definition/data-driven-decision-management-DDDM>

UAN:	T/507/7287
Level:	3
GLH:	60

What is this unit about?

This unit provides learners with the knowledge and understanding of factors, both internal and external which can lead to change within an organisation.

The unit covers a range of common theoretical Change Management models and allows learners to explore these in detail prior to comparing and contrasting models analysing their various strengths and weaknesses.

Learners will then learn a number of change management tools and understand when to utilise them. Finally, learners will learn how to put the theory into practice. Working to tutor set scenarios, learners will need to apply appropriate change management models and tools justifying their choices.

Learners may be introduced to this unit by asking themselves questions such as:

- What are the factors that can lead to change within an organisation?
- How can organisations drive through change?
- What resistance can organisations face?
- What are the differences between common change management models?

Learning outcomes

In this unit, learners will be able to

1. Understand Change in an Organisational Context
2. Understand Common Theoretical Models of Change Management
3. Propose Organisational Change

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand Change in an Organisational Context

Topics

1.1 Reasons for Organisational Change

1.2 Factors Hindering Successful Change

Learners will develop an understanding of why desirable change is driven within organisations and the factors both negative and positive that influence change.

Topic 1.1

Learners will explore and understand the Reasons for Change within Organisations and how these may affect stakeholders, including but not limited to:

- External factors (Opportunities and Threats):
 - Changes in markets (product, territory, route to market)
 - Economic Climate
 - Changing Customer Expectations
 - Competitive pressures (i.e. 5-forces model, threat of substitute products, threat of new entrants, intense rivalry among existing players, bargaining power of suppliers, bargaining power of buyers)
 - Changing Legislation
 - Budget Pressures
 - Changing Demographics
 - Changes in Technologies (e.g., product development)
- Internal factors (Strengths and Weaknesses)
 - Organisational restructure
 - Change in Mission
 - Business priorities (e.g., market share versus profit)
 - New capabilities/products
 - Organisational mergers/acquisitions
 - New applications of core competencies

Topics 1.2

Learners will understand that although there may be a need for Organisational Change there will also be factors that can hinder successful change, including but not limited to:

- Cultural inertia
 - Values
 - Climate
- Existing Internal Power Structures
 - Leadership
 - Politics
 - Unions
- Employee Attitudes
- Communication Barriers
- Current Organisational Processes

- Staffing
 - Lack of knowledge / skill
 - Fear of change
 - Insufficient turnover.

Learning outcome:

2. Understand Common Theoretical Models of Change Management

Topics

- 2.1 The ADKAR model
- 2.2 Lewin's Change Management Model
- 2.3 Casual Change Management Model
- 2.4 The 7S Framework
- 2.5 The Oakland and Tanner Model
- 2.6 Compare the Change Management Models
- 2.7 step change

Learners will understand a variety of Change Management Models, their history, and how they are used in an organisational context, comparing and contrasting the key differences between the models.

Topic 2.1

Learners will describe the features of Prosci's Awareness, Desire, Knowledge, Ability, Reinforcement (ADKAR) model.

Learners need to understand the 5 building blocks of ADKAR:

- A - Awareness of the need for change
- D – Desire to participate and support the change
- K – Knowledge on how to change
- A - Ability to implement required skills and behaviours
- R – Reinforcement to sustain the change

Topic 2.2

Learners will describe the features of Kurt Lewin's Change Management Model:

- Unfreeze
- Change
- Freeze (Refreeze)

Topic 2.3

Learners will describe the features Burke-Litwin's Causal Change Model:

- External Environment
- Mission and Strategy
- Leadership
- Organisation Culture
- Structure
- Work Unit Climate
- Task Requirements and Individual Skills/Abilities
- Individual Needs and Values

Learning outcome:

3. Planning for Organisational Change

Topics

- 3.1 Change Management Theoretical Models within Organisational Contexts
- 3.2 Change Management proposal

Topic 3.1

Learners will understand Change Management tools and how they can be applied in different organisational contexts Change Management within an organisational context:

- action planning
- flow diagrams
- task analysis
- performance Management
 - agreeing timescales
 - setting and measuring outcomes
- processes/systems analysis
 - regular and exception reporting
- surveys and interviews
- formal and informal knowledge channels
- disseminating awareness; sustainability
- review and evaluate progress

Strategies for Overcoming Resistance to Change:

- Leadership
- Emotional buy-in
- Education and Training
- Effective Communication
- Engagement/Empowerment
- Negotiation and Agreement
- Manipulation
- Coercion
 - implicit
 - explicit

Topic 3.2

Learners will apply the different models in outcome 2 to different organisational scenarios.

Learners must present proposals for change to Key Organisational Stakeholders. The proposals learners produce must include strategies to manage Change and strategies for dealing with resistance to change.

Guidance for delivery

Learning Outcome 1 sees learners exploring factors that drive change within organisations as well as investigating those that can hinder change. This outcome would be best taught using a range of recent industry examples in both the public and private sector.

For Learning Outcome 2 learners will explore a range of common change management theoretical models. These will need to be covered in some detail using class lectures backed up with relevant resources. Tutors should note that it is important learners understand the building block nature of the ADKAR model and that Knowledge, Ability and Reinforcement cannot be attained without Awareness and Desire being achieved. Learners also need to understand that Burke- Litwin believed environmental factors to be the most important driver for change within his model.

For outcome 3 learners will explore change management tools and investigate how these are applied in different organisational contexts. The tutor will need to devise a range of scenarios that allow learners to be able to apply the theoretical models from outcome 2. Learners will understand how these models would work within different organisations and cultures. Finally learners will present a change management proposal outlining key strategies for managing the change process and for dealing with any resistance.

Suggested learning resources

Making Sense of Change Management Published by: Kogan Page, 2009 ISBN: 0749453109	Cameron, E and Green, M
Managing Change in Organizations Published by: Financial Times/ Prentice Hall, 5 th edition, 2007 ISBN: 0273704141	Carnall, C
Organizational Change for Corporate Sustainability Published by: Routledge, 2007 ISBN: 0415393302	Dunphy, D; Griffiths, A and Benn, S
Change Management Masterclass Published by: Kogan Page, 2007 ISBN: 0749445076	Green, M
Understanding Organizational Change Published by: Routledge, 2008 ISBN: 041535577X	Helms-Mills, J; Dye, K and Mills, A J
Change the Way You Lead Change Published by: Stanford University Press, 2008 ISBN: 0804758751	Herold, D M and Fedor, D B
Leading and Managing Change Published by: McGraw-Hill Professional, 2008 ISBN: 0070137889	Kehoe, D

Journals and magazines

- Academy of Management Journal (Academy of Management)
- British Journal of Management (John Wiley and Sons)
- Harvard Business Review (Harvard Business Publishing)
- Journal of General Management (Braybrooke Press Ltd)

Journal of Management Studies (John Wiley and Sons) Management Today (Haymarket Business Media)

Websites

Kotter International	http://www.kotterinternational.com/the-8-step-process-for-leading-change/
Businessballs	www.businessballs.com
Changing Minds	www.changingminds.org
Free Management Library	www.managementhelp.org
Mind Tools	www.mindtools.com

Unit 353

Databases

UAN:	A/507/7288
Level:	3
GLH:	60

What is this unit about?

The purpose of this unit is for learners to develop an understanding of relational databases and how these are used within a business context. Learners begin by exploring the terminology of relational databases and developing the skills to design and create relational databases. Learners will learn how to document the process.

Learners will then have the necessary skills to query databases and display selected data in a user-friendly format.

Learners may be introduced to this unit by asking themselves questions such as:

- What is a relational database?
- How can I use relational databases in business?
- What software can I use to create a relational databases?

This unit links to 'Setting up e-commerce websites', Database Systems for E-commerce.

Learning outcomes

In this unit, learners will be able to

1. Understand database terminology
2. Design relational databases
3. Create relational databases

Scope of content

This section gives details of the scope of content to be covered in the teaching of the unit to ensure that all the learning outcomes can be achieved.

Learning outcome:

1. Understand database terminology

Topics

1.1 Entities, relationships and attributes in relational databases

1.2 Database relationships

Topic 1.1

Learners will describe entities, relationships and attributes in relational databases, including:

- Entities
 - Tables
 - Records (tuple)
 - Indices
- Relationships
 - Referential integrity
 - Cascade update
 - Cascade delete
- Attributes
 - Fields
 - Key fields
 - Primary
 - Foreign
 - Field properties
 - Data types
 - Size

Topic 1.2: Learners will be able to describe the different relationships available within a RDBMS, third normal form (3NF) and how to represent these as Entity Relationship Diagrams (ERD), including:

- One to many
- One to one
- Many to many.

Learning outcome:

2. Design relational databases

Topics

2.1 Design relational databases

2.2 Document database designs

Topic 2.1 and 2.2

Learners will design relational databases. Learners will explain the importance of the design stage and describe the role it plays in the creation of effective relational database systems.

Learners will produce documentation when designing relational database solutions, including:

- ERDs
- Data dictionary
- Input and output screen designs

Human computer interaction.

Learning outcome:

3. Create relational databases

Topics

- 3.1 Create relational databases
- 3.2 Populate relational databases
- 3.3 Manipulate data in relational databases
- 3.4 Test relational databases

Topic 3.1

Learners will create relational databases.

Topic 3.2

Learners will describe methods of populating the tables of a database, including:

- importing data from external sources
- using input forms.

Learners will populate relational databases, including:

- importing data from external sources
- using input forms.

Topic 3.3

Learners will be able to describe queries, including:

- Query design
 - data types
 - logical operators
 - Query type
 - Select
 - Parameter
 - Update

Learners will manipulate data and use queries.

It is expected that learners will learn to use queries to extract data from two or more related tables.

Learners will represent extracted data using queries in user friendly reports.

Topic 3.4

Learners will test relational databases for:

- referential integrity
- validation of data at field level.

Guidance for delivery

Learners begin this unit by exploring the different types of database technologies.

Learning Outcome 1 should focus on providing learners with an overview of the concepts that enables learners to compare and contrast the technologies listed. Relational database theory and its concepts are covered in further detail in the learning outcomes that follow. For outcome 2 learners further explore the key concepts of relational databases and learn about the different platforms available to create relational databases. In Learning Outcome 3 learners learn how to design relational database systems and understand the importance of documentation plays in the process. It is vital learners are aware of the need for sound design and fully understand the design documentation required. This outcome should be delivered through class lectures, group discussion and the use of case studies.

Once the database has been designed, learners need to create the database using appropriate software. Learners will require access to appropriate software to enable them to create relational databases. The software used is down to the Centre but it must allow relational databases to be created. Once the database has been created learners need to understand different methods of populating the database and then be able to extract data based on user requirements. Finally learners need to understand how to test the database appropriately.

Suggested learning resources

Books

Relational Database Design and Implementation
Published by: Morgan Kaufmann, 3rd Edition
ISBN-10: 0123747309
ISBN-13: 978-0123747303
Harrington, J

Database Design and Development: An Essential Guide for IT Professionals: Visible Analyst Set
Published by: John Wiley & Sons Inc, 2006
ISBN-10: 0471760943
ISBN-13: 978-0471760948
Ponniah, P

Relational Database Principles
Published by: Thomson Learning, 2002
ISBN-10: 0826457134
ISBN-13: 978-0826457134
Ritchie, C

Appendix 1 Sources of general information

The following documents contain essential information for centres delivering City & Guilds qualifications. They should be referred to in conjunction with this handbook. To download the documents and to find other useful documents, go to the **Centres and Training Providers homepage** on www.cityandguilds.com.

City & Guilds Centre Manual

This document provides guidance for organisations wishing to become City & Guilds approved centres, as well as information for approved centres delivering City & Guilds qualifications. It covers the centre and qualification approval process as well as providing guidance on delivery, assessment and quality assurance for approved centres.

It also details the City & Guilds requirements for ongoing centre and qualification approval, and provides examples of best practice for centres. Specifically, the document includes sections on:

- the centre and qualification approval process
- assessment, internal quality assurance and examination roles at the centre
- registration and certification of candidates
- non-compliance and malpractice
- complaints and appeals
- equal opportunities
- data protection
- management systems
- maintaining records
- internal quality assurance
- external quality assurance.

Our Quality Assurance Requirements

This document explains the requirements for the delivery, assessment and awarding of our qualifications. All centres working with City & Guilds must adopt and implement these requirements across all of their qualification provision. Specifically, this document:

- specifies the quality assurance and control requirements that apply to all centres
- sets out the basis for securing high standards, for all our qualifications and/or assessments
- details the impact on centres of non-compliance

Our Quality Assurance Requirements document encompasses the relevant regulatory requirements of the following documents, which apply to centres working with City & Guilds:

- Ofqual's General Conditions of Recognition

The **centre homepage** section of the City & Guilds website also contains useful information on **Walled Garden**: how to register and certificate candidates on line

Events: dates and information on the latest Centre events

Online assessment: how to register for e-assessments.

Useful contacts

UK learners

General qualification information

E: learnersupport@cityandguilds.com

International learners

General qualification information

E: intcg@cityandguilds.com

Centres

Exam entries, Certificates, Registrations/enrolment, Invoices, Missing or late exam materials, Nominal roll reports, Results

E: centresupport@cityandguilds.com

Single subject qualifications

Exam entries, Results, Certification, Missing or late exam materials, Incorrect exam papers, Forms request (BB, results entry), Exam date and time change

E: singlesubjects@cityandguilds.com

International awards

Results, Entries, Enrolments, Invoices, Missing or late exam materials, Nominal roll reports

E: intops@cityandguilds.com

Walled Garden

Re-issue of password or username, Technical problems, Entries, Results, e-assessment, Navigation, User/menu option, Problems

E: walledgarden@cityandguilds.com

Employer

Employer solutions, Mapping, Accreditation, Development Skills, Consultancy

E: business@cityandguilds.com

Every effort has been made to ensure that the information contained in this publication is true and correct at the time of going to press. However, City & Guilds' products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time. City & Guilds cannot accept liability for loss or damage arising from the use of information in this publication.

If you have a complaint, or any suggestions for improvement about any of the services that we provide, email: **feedbackandcomplaints@cityandguilds.com**

About City & Guilds

As the UK's leading vocational education organisation, City & Guilds is leading the talent revolution by inspiring people to unlock their potential and develop their skills. City & Guilds is recognised and respected by employers across the world as a sign of quality and exceptional training.

City & Guilds Group

The City & Guilds Group is a leader in global skills development. Our purpose is to help people and organisations to develop their skills for personal and economic growth. Made up of City & Guilds, City & Guilds Kineo, The Oxford Group and ILM, we work with education providers, businesses and governments in over 100 countries.

Copyright

The content of this document is, unless otherwise indicated, © The City and Guilds of London Institute and may not be copied, reproduced or distributed without prior written consent. However, approved City & Guilds centres and candidates studying for City & Guilds qualifications may photocopy this document free of charge and/or include a PDF version of it on centre intranets on the following conditions:

- centre staff may copy the material only for the purpose of teaching candidates working towards a City & Guilds qualification, or for internal administration purposes
- candidates may copy the material only for their own use when working towards a City & Guilds qualification

The Standard Copying Conditions (see the City & Guilds website) also apply.

City & Guilds

1 Giltspur Street

London EC1A 9DD

www.cityandguilds.com
