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Cambridge TECHNICALS LEVEL 3

IT

Cambridge TECHNICALS 2016

Unit 7 – Data analysis and design
DELIVERY GUIDE

Version 2

ocr.org.uk/it

CONTENTS

INTRODUCTION

This Delivery Guide has been developed to provide practitioners with a variety of creative and practical ideas to support the delivery of this qualification. The Guide is a collection of lesson ideas with associated activities, which you may find helpful as you plan your lessons.

OCR has collaborated with current practitioners to ensure that the ideas put forward in this Delivery Guide are practical, realistic and dynamic. The Guide is structured by learning outcome so you can see how each activity helps you cover the requirements of this unit.

We appreciate that practitioners are knowledgeable in relation to what works for them and their learners. Therefore, the resources we have produced should not restrict or impact on practitioners' creativity to deliver excellent learning opportunities.

Whether you are an experienced practitioner or new to the sector, we hope you find something in this guide which will help you to deliver excellent learning opportunities.

If you have any feedback on this Delivery Guide or suggestions for other resources you would like OCR to develop, please email resources.feedback@ocr.org.uk.

OPPORTUNITIES FOR ENGLISH AND MATHS SKILLS DEVELOPMENT AND WORK EXPERIENCE

We believe that being able to make good progress in English and maths is essential to learners in both of these contexts and on a range of learning programmes. To help you enable your learners to progress in these subjects, we have signposted opportunities for English and maths skills practice within this resource. We have also identified any potential work experience opportunities within the activities. These suggestions are for guidance only. They are not designed to replace your own subject knowledge and expertise in deciding what is most appropriate for your learners.

English   123 Maths   Work

Please note

The timings for the suggested activities in this Delivery Guide **DO NOT** relate to the Guided Learning Hours (GLHs) for each unit.

Assessment guidance can be found within the Unit document available from www.ocr.org.uk.

The latest version of this Delivery Guide can be downloaded from the OCR website.

UNIT AIM

This unit will enable you to develop the skills and knowledge required to actively use data analysis techniques to provide evidence and interpretation for decision making for a range of organisational needs. Organisations and individuals collect both quantitative and qualitative data and store it for current or future use. The data analyst examines, cleanses, transforms and models data in order to support decision making and understanding.

This unit is mandatory to the Data Analyst specialist pathway in the Level 3 Diploma suite of qualifications due to its relevance in conducting data analysis and design solutions to meet business requirements. The unit supports the development of skills, knowledge and understanding relevant to the role of a data analyst and the techniques required.

Unit 7 Data analysis and design	
LO1	Understand the purpose and stages of data analysis and design
LO2	Be able to investigate client requirements for data analysis
LO3	Be able to develop data design solutions to meet business requirements
LO4	Be able to present data analysis and design solutions to stakeholders

To find out more about this qualification please go to: http://www.ocr.org.uk/qualifications/cambridge-technicals-it-level-3-certificate-extended-certificate-introductory-diploma-foundation-diploma-diploma-05838-05842-2016-suite

The activities within this teaching and learning resource must not be used for summative assessment purposes. As part of our teaching we expect support to be given to your learners; such support is not permissible for summative assessment and is likely to be considered malpractice.

Cambridge TECHNICALS 2016

2016 Suite

- **New suite for first teaching September 2016**
- **Externally assessed content**
- **Eligible for Key Stage 5 performance points from 2018**
- **Designed to meet the DfE technical guidance**

RELATED ACTIVITIES

The Suggested Activities in this Delivery Guide listed below have also been related to other Cambridge Technicals in IT units/Learning Outcomes (LOs). This could help with delivery planning and enable learners to cover multiple parts of units.

This unit (Unit 7)	Title of suggested activity	Other units/LOs	
LO1	Data types	Unit 2 Global information	LO5 Understand the process flow of information
	Stages of data analysis	Unit 1 Fundamentals of IT	LO4 Understand employability and communication skills used in an IT environment
		Unit 2 Global information	LO3 Understand the use of global information and the benefits to individuals and organisations
	Investigate information requirements	Unit 10 Business computing	LO2 Be able to capture and store data for analysis
	Data collection	Unit 10 Business computing	LO2 Be able to capture and store data for analysis
		Unit 11 Systems analysis and design	LO2 Be able to use investigative techniques to establish requirements for business systems
	Data organisation	Unit 10 Business computing	LO2 Be able to capture and store data for analysis
	Data storage	Unit 3 Cyber security	LO3 Understand measures used to protect against cyber security incidents
		Unit 10 Business computing	LO2 Be able to capture and store data for analysis
	Data cleansing	Unit 22 Big data analytics	LO2 Be able to process Big Data for business purposes
LO2	Investigate information requirements	Unit 2 Global information	LO3 Understand the use of global information and the benefits to individuals and organisations
		Unit 9 Product development	LO2 Be able to design products that meet identified client requirements
		Unit 10 Business computing	LO1 Know the attributes required for data analyst job roles
		Unit 22 Big data analytics	LO2 Be able to process Big Data for business purposes
	Investigate quantitative data collection techniques	Unit 2 Global information	LO3 Understand the use of global information and the benefits to individuals and organisations
	Investigate qualitative data collection techniques	Unit 2 Global information	LO3 Understand the use of global information and the benefits to individuals and organisations
LO3	Phases of creating a logical data model (LDM)	Unit 3 Cyber security	LO3 Understand measures used to protect against cyber security incidents
LO4	Data flow diagrams (DFDs)	Unit 2 Global information	LO5 Understand the process flow of information
		Unit 11 Systems analysis and design	LO3 Be able to develop and document models for business systems
	Information flow charts	Unit 11 Systems analysis and design	LO3 Be able to develop and document models for business systems
	Entity relationship diagrams (ERD)	Unit 11 Systems analysis and design	LO3 Be able to develop and document models for business systems
	Entity life history (ELH)	Unit 11 Systems analysis and design	LO3 Be able to develop and document models for business systems
	Evaluation of design solution	Unit 11 Systems analysis and design	LO3 Be able to develop and document models for business systems
		Unit 22 Big data analytics	LO2 Be able to process Big Data for business purposes

KEY TERMS

Explanations of the key terms used within this unit, in the context of this unit	
Key term	**Explanation**
Data mining	The process of trying to find useful information in large sets of data (e.g. *looking for trends* - finding the difference between a typical customer this month and last).
Digitalisation	Converting information into a digital format (e.g. scanning in a hand-drawn diagram).
Event analysis	A way of analysing a system by studying what happens over time (e.g. event trees, fault trees, analysis of time-stamped data).
Focus group	A form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs and attitudes towards a product, service, concept, idea or packaging e.g. to find out the needs of a group of staff.
Interview	One-to-one question and answer session (e.g. used to find out business information requirements from the organisation's data manager).
Logical analysis	An abstract way of analysing a system to show how it is organised (e.g. flow charts, flow diagrams).
Mean	This is the total (by addition) of all the numbers, divided by the number of numbers.
Median	The median is the middle number of a set of numbers, once they have been set out in order.
Observation	Notes made whilst observing an event or process.
Qualitative data	This is data that describes, rather than defines things. It provides context and meaning, not measuring an attribute or property (e.g. the colour of a car, the condition of a second-hand book).
Qualitative data collection techniques	These are the techniques used to collect the qualitative data that provides additional context and meaning for the data analysis. Common qualitative data collection techniques are: focus groups, observations and interviews. These are usually time consuming, so need to be carefully planned.
Quantitative data collection techniques	These are the techniques used to collect the quantitative data for data analysis. Common quantitative data collection techniques are: questionnaires and surveys; review of existing data and web data capture forms. These can often be automated to provide structured data in a digital format, such as a spreadsheet data table.
Quantitative data	Data that can be measured, quantified and verified. It can be manipulated using statistical techniques (e.g. the value of houses in a neighbourhood).
Range	The range is the difference between the smallest and largest numbers in a set of numbers.
Standard deviation	The standard deviation is a measure of how spread out the numbers in a set of data are. Standard deviation is the average of the distances of each value in a data set from the mean of the data. Hence, the smaller the standard deviation, the more closely clustered the values are around the mean; the larger the standard deviation, the more spread-out the values are around the mean.
Structured data	Data that can be stored in a data table with rows and columns (e.g. a group register, showing attendance and assignment grades).
Transcription	Writing up the speech in an audio or video recording, or from a face-to-face conversation.
Typology	A way of analysing a system by looking at the different types of object and how they are interrelated (e.g. activities, actions, relationships).
Unstructured data	Data that does not lend itself to being stored in a table (e.g. word processed documents, audio and video files).

MISCONCEPTIONS

Some common misconceptions and guidance on how they could be overcome		
What is the misconception?	**How can this be overcome?**	**Resources which could help**
The difference between information and data	Data is unorganised; the raw facts before they have been analysed. Data may appear to be random and without meaning. Information is created by analysing data, to give it structure and meaning within a given context.	Organisation: Benedictine University Resource Title: Data vs. Information vs. Insight Website Link: http://online.ben.edu/blog/business/data-information-insight Description: An explanation of the differences between data and information.
All data design requires complex levels of modelling	Highly complex data models are not needed in many situations. Quite often, all that is needed is a simple data design solution that will meet the business requirements.	
Confusion about qualitative and quantitative data types	Learners could write their own definition of qualitative data and quantitative data, together with a range of examples of each.	Organisation: PACE mySPH Resource Title: Quantitative vs. Qualitative Data Website Link: https://www.youtube.com/watch?v=EcKrT_legoU Description: A good introduction to qualitative and quantitative data in a health care context.
Confusion about qualitative or quantitative methods of data collection and which one to use when	Learners could record examples of each data collection method, together with the advantages and drawbacks of each.	Organisation: Best Essay Services Resource Title: When to use Qualitative or Quantitative Methods of Data Collection Website Link: https://www.youtube.com/watch?v=p0TKJlnMSN4 Description: A comparison of qualitative and quantitative methods of data collection, including the characteristics of each.

SUGGESTED ACTIVITIES

LO No:	1		
LO Title:	Understand the purpose and stages of data analysis and design		
Title of suggested activity	**Suggested activities**	**Suggested timings**	**Also related to**
Data types	Tutors could introduce this topic with a discussion on data types; linking this to the Information sources and data types section in Unit 2. Tutors could explain that this Learning Outcome is focussed on gaining knowledge and understanding of data analysis and design and that the remaining three Learning Outcomes are based on practical data analysis and data design. Learners could then carry out individual research on the four data types used in this Unit: qualitative, quantitative, structured and unstructured. Each learner could write their own definition of each data type. Learners could then record two appropriate uses of each of the data types, with a justification of why each use is appropriate. Learners could share their research finding in small groups. Finally, as a whole group, there could be a plenary session led by the tutor, where areas of misunderstanding or ambiguity could be clarified. Learners could demonstrate how the four different types of data impact on data analysis: which data types are easiest to analyse and why? The resources below could be used either by learners as a starting point for their research, or by tutors as part of a plenary session at the end of the activity. Organisation: Content Writer Resource Title: Types of information Website Link: http://www.contentedwriter.com/types-of-information-qualitative-quantitative-primary-and-secondary/ Description: This web page contains explanations of qualitative and quantitative data. Organisation: Robert Primmer Resource Title: Structured vs Unstructured Website Link: https://www.youtube.com/watch?v=WBU7sW1jy2o Description: A video explaining the differences between structured and unstructured data, plus the implications for data analysis.	2 hours	Unit 2 LO5

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Stages of data analysis	Tutors could start by emphasising that all of the stages of data analysis have a clear purpose and relevance to the following stage and the quality of data produced. Tutors should stress that the aim of data analysis should be to produce useful and cost effective data. Over the next seven activities, learners, working individually, could produce a presentation or visualisation that can be shared with colleagues (covering the seven stages of data analysis; each of the stages should be clearly summarised). Learners could include the purpose of each stage, together with the relevance of each stage to the production of useful and cost effective data. This could be based on knowledge and understanding developed through the individual and group work carried out in activities three to nine below.	30 minutes	Unit 1 LO4 Unit 2 LO3
Investigate information requirements	To start with, tutors could stress that this, the first stage of data analysis, is very important, as any weaknesses in this stage could have a large impact on the effectiveness of the overall data analysis. Tutors could provide learners with a few simple data analysis scenarios which include poorly thought-out lists of information requirements (e.g. when analysing the number of motor accidents on a stretch of motorway, the list of information requirements provided could omit 'speed of vehicles', 'weather conditions', 'blood alcohol of drivers' etc). Learners, working in pairs, could draw up a list, in order of importance, of the information requirements provided for each scenario. Learners could then insert additional information requirements into their ordered list for each scenario. Tutors could monitor this activity, check for misunderstandings and facilitate the sharing of good work. Other scenarios could be based on: market share; particulates in the air; testing of new pharmaceutical drugs etc.	1 hour	Unit 10 LO2

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data collection	Learners, working in pairs, could select 10 of the data collection techniques listed below and then suggest a few possible uses of each (e.g. audio recordings could be used to: record answers to questions, capture the number of words spoken by a child in a lesson at school, to help monitor noise pollution caused by building work). Some qualitative data collection techniques: • observation • interview • focus group. Some quantitative data collection techniques: • review of existing data • preparing and distributing questionnaires and surveys to stakeholders • web data capture forms • video recording • audio recording • sensors and data logs • website visitor tracking • mobile and wearable technology • image and document scanning • machine-readable media and codes • legacy data import. Organisation: Teach-ICT Resource Title: Input Devices Website Link: http://www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/312_software_hardware/input_devices/home_input.html Description: This mini site covers theory and news articles on data capture input devices.	1 hour	Unit 10 LO2 Unit 11 LO2

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data organisation	Learners could research these four data organisation techniques: • digitalisation • transcription • sorting • data mining. These resources below could be used as a starting point for this research: Organisation: University of Leicester Resource Title: Organise data Website Link: http://www2.le.ac.uk/services/research-data/organise-data Description: Shows the relevance of well-organised data to data analysis with an example. Organisation: Change Factory Resource Title: The Benefits of Digitisation Website Link: http://www.changefactory.com.au/our-thinking/articles/benefits-digitisation/ Description: This explains a wide range of benefits of digitalisation for data organisation. Organisation: University of Huddersfield Resource Title: Doing a transcription for qualitative research Website Link: https://www.youtube.com/watch?v=KfdrtpQDtBk Description: The first four minutes of this video introduces the process of transcription and discusses benefits and disadvantages. N.B. The last 12 minutes of the video are not relevant to this activity. Organisation: Studytonight Resource Title: Introduction to Sorting Website Link: http://www.studytonight.com/data-structures/introduction-to-sorting Description: An introduction to sorting of data, with further links that describe different sort methods. Organisation: Teach-ICT Resource Title: Data Mining Website Link: http://www.teach-ict.com/glossary/D/data_mining.htm# Description: A brief introduction to data mining, with a link to Google, allowing learners to research further themselves. Learners could then carry out a whole group discussion of the purpose of each data organisation technique and how it can affect the usefulness and cost effectiveness of data. Learners could discuss the advantages and disadvantages of each type of data organisation. Tutors could monitor this activity, checking for misunderstandings and expanding on relevant points regarding usefulness and cost effectiveness of the data produced.	1 hour	Unit 10 LO2

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data storage	Learners could identify a few in-house (i.e. storage owned and managed by the organisation itself) and external (i.e. storage owned and managed by a third party) data storage options that could be used as part of data analysis in a multinational retail organisation. Learners, working in small groups, could then discuss the advantages and disadvantages to the organisation of all the data storage options identified. Tutors could follow this by explaining the need for data security, plus the implications of current legislation with regard to data storage. Organisation: Big Data Made Simple Resource Title: 5 advantages and disadvantages of Cloud Storage Website Link: http://bigdata-madesimple.com/5-advantages-and-disadvantages-of-cloud-storage/ Description: Clear and succinct set of advantages and disadvantages of Cloud storage. Organisation: Digistor Resource Title: Pros and Cons of Data Storage Devices Website Link: http://blog.digistor.com/pros-and-cons-of-data-storage-devices/ Description: Introduction to the common data storage devices.	1 hour	Unit 3 LO3 Unit 10 LO2

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data cleansing	Tutors could provide learners with a set of data in a spreadsheet table; the data set provided should contain errors, missing elements and duplicates. Tutors could task learners with reviewing the data and highlighting all errors, missing elements and duplicates they find. Learners could then be asked to manually change the data where appropriate. Tutors could select sets of data from the Office for National Statistics (ONS) online 'datasets and reference tables' resource: Organisation: Office for National Statistics (ONS) Resource Title: Time Series - searchable set of data series Website Link: http://www.ons.gov.uk/timeseriestool Description: This resource includes over 20,000 tables of data and is searchable. It covers a bewildering range of topics, including: health, crime, tourism, education, earnings and employment. Tutors could show the group the first few minutes of the video shown below: Organisation: Trump Excel Resource Title: 10 Super Neat Ways to Clean Data in Excel Website Link: https://www.youtube.com/watch?v=e0TfIbZXPeA Description: A simple set of solutions to real world data cleaning problems. Learners only need to watch the first few minutes to gain an understanding of how easy it can be to cleanse large data sets. As a plenary activity, tutors could facilitate a group discussion comparing and contrasting the automated and manual approaches to removing the errors, missing elements and duplicates. Tutors could remind learners that tables of data could contain thousands or even millions of rows.	1 hour	Unit 22 LO2

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data manipulation	Tutors could begin the activity by explaining, with examples, a wide range of ways of manipulating data to create useful information: e.g. arranging, collating, aggregating, interpreting and correlation. Tutors could explain how the usefulness and cost effectiveness are affected by the data manipulation techniques selected. Learners could take notes during this explanation. Tutors could answer any questions raised by learners. Next, tutors could ask learners the following questions: 1. Does it matter if you do not cleanse the data, before you manipulate it? 2. What sort of problems could be caused if the data still contains errors, missing elements and duplicates when it is manipulated? Learners could view the 'LATCH – Methods of Organization' resource below and identify all of the data manipulation techniques used in the 'organising dogs' example. Tutors could hold a plenary session and highlight all the data manipulation techniques used in this example: • Arranging in alphabetic order • Collating by group • Correlating the 15 most popular breeds with the corresponding health characteristics (eyes, skin etc). Tutors could use the second part of the 'organising dogs' example as an introduction to the next activity. Organisation: Parsons Design Resource Title: LATCH – Methods of Organization Website Link: https://parsonsdesign4.wordpress.com/resources/latch-methods-of-organization/ Description: An outline of the LATCH method of arranging information, using the range of dog breeds as an example. Some of the presentation techniques shown here lead in to the activity below.	1 hour	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Presentation of findings	Learners could watch the following video and evaluate the usefulness of the visualisation techniques used: Organisation: TED Talks Resource Title: The beauty of data visualization - David McCandless Website Link: https://www.youtube.com/watch?v=5Zg-C8AAlGg Description: A light-hearted introduction to visualisation of data (e.g. tables, charts, graphs, dashboard, reports, visualisation). Tutors could follow this up by a short, whole group discussion of all other, more traditional data presentation methods that learners can suggest. Learners could produce a list of all of these methods. Learners could then carry out research, in pairs, to extend their knowledge and understanding, perhaps using the two resources below as a starting point. Organisation: University of Leicester Resource Title: Presenting numerical data Website Link: http://www2.le.ac.uk/offices/ld/resources/numerical-data/numerical-data Description: This explains (with clear examples) the most common methods of presenting quantitative data. Organisation: National Foundation for Educational Research (NFER) Resource Title: How to present your results Website Link: http://www.nfer.ac.uk/schools/developing-young-researchers/how-to-present-your-results.cfm Description: This web page explains some techniques for presenting qualitative findings.	2 hours	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Importance of accurately defining information requirements	This activity builds the knowledge and understanding developed in the Investigate information requirements activity above and the examples from that activity could be incorporated into the report detailed below. Tutors could emphasise that learners should focus on the importance of accurately identifying information requirements, before starting any data collection; rather than simply explaining the issues arising from poor information requirements planning. Learners could discuss their own experience of data collection. Learners, working individually, could use a scenario they have been given, to highlight the importance of accurately defining the information requirements of a specific business need prior to data collection. Learners could produce a visualisation explaining how accurately identifying the information requirements should help with the planning of: data collection; data organisation and storage; cleaning and manipulation; and presentation of results. This could include supporting notes and comments.	1 hour	

SUGGESTED ACTIVITIES

LO No:	2
LO Title:	**Be able to investigate client requirements for data analysis**

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Investigate information requirements	Learners could provide evidence from either a scenario provided solely for this Unit (see following paragraph) or from a current project for another Unit. Tutors could emphasise that learners should focus on 'a specified business requirement' when defining the information requirements, collecting data and considering data analysis techniques to be used. Learners could be given a scenario that will enable them to investigate the information requirements for a clearly specified business need. The scenario given could also provide learners with scope to use a range of quantitative and qualitative techniques on data from sources that they can identify themselves. Tutors could emphasise that learners should include the business need, the qualitative and quantitative data to be gathered and their potential sources of data in their evidence. Learners could show their evidence as a report or presentation with speaker notes. Tutors could use the Office for National Statistics (ONS) online 'datasets and reference tables' resource to generate ideas for scenarios to give to learners. This resource includes over 20,000 tables of data and is searchable. Learners could be made aware of this resource, even if the scenario given was not inspired by any data from the ONS. Tutors could also consider any of these areas, when drawing up their own scenarios: • retail sales data analysis • school/college performance data analysis • banking reference data analysis • business data analysis • financial data analysis • human resources data analysis • health data analysis • voice data analysis • gaming data analysis. Organisation: Office for National Statistics (ONS) Resource Title: Time Series - searchable set of data series Website Link: http://www.ons.gov.uk/timeseriestool Description: This resource includes over 20,000 tables of data and is searchable. It covers a bewildering range of topics, including: health, crime, tourism, education, earnings and employment.	2 hours	Unit 2 LO3 Unit 9 LO2 Unit 10 LO1 Unit 22 LO2

16

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Investigate quantitative data collection techniques	Tutors could introduce this and the next activity together. To start this activity tutors could emphasise that this activity is focussed on the selection of appropriate quantitative data collection techniques and then using these techniques to collect quantitative data for a specified business requirement. Learners could select three different quantitative data collection techniques that could be used to collect the data needed to meet the information requirements for a specified business need given in the scenario. Learners could then add details of their selection of quantitative data to be collected to their report or presentation. Learners could also include a rationale for each selection of quantitative data. Some quantitative data collection techniques: • review of existing data • preparing and distributing questionnaires and surveys to stakeholders • web data capture form • video recording • audio recording • sensors and data logs • website visitor tracking • mobile and wearable technology • image and document scanning • machine-readable media and codes • legacy data import.	2 hours	Unit 2 LO3
How to be an effective interviewer	Tutors could show the first 3 minutes 20 seconds of the resource below to the group. This could be followed up by learners viewing the rest of the video in small groups; making joint notes on what to do and what not do when acting as an interviewer and how to collect quantitative and qualitative data as an interviewer, without bias. Organisation: University of Huddersfield Resource Title: How to do a research interview Website Link: https://www.youtube.com/watch?v=9t-_hYjAKww Description: This explains the skills and attitudes needed by an effective research interviewer. It includes good and bad interviews, including an analysis of each.	1 hour	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Use quantitative data analysis methods	Tutors could explain to learners that during this activity they will be using different methods to analyse the quantitative data that will be provided to them. Tutors could provide data sets and associated information requirements that learners can use to practice using quantitative data analysis methods on. Tutors could provide these in a range of formats (e.g. CSV files, printed data tables, completed questionnaires). Learners, working in pairs, could discuss and agree the most appropriate quantitative data analysis method to be used in each case. Learners could then use these methods to produce the data required. Quantitative data analysis methods: • mean (e.g. =average(data-range) in Excel 2007) • median (e.g. =median(data-range) in Excel 2007) • standard deviation (e.g. =stdev(data-range) in Excel 2007) • range (e.g. =max(data-range) – min(data-range) in Excel 2007) Learners could use the following two resources to gain understanding of how to use the quantitative data analysis methods listed above. Organisation: Jeremy Jones Resource Title: Standard Deviation - Explained and Visualized Website Link: https://www.youtube.com/watch?v=MRqtXL2WX2M Description: A simple explanation of standard deviation and its use. Organisation: National College of Ireland Resource Title: How To... Calculate Mean and Standard Deviation in Excel 2010 Website Link: https://www.youtube.com/watch?v=62i1fqKhNhg Description: This starts with a definition of mean and standard deviation and then goes on to show how to calculate these in Excel 2010.	2 hours	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Investigate qualitative data collection techniques	To start this activity tutors could emphasise that it is focussed on the selection of appropriate qualitative data collection techniques to collect qualitative data for a specified business requirement. Some qualitative data collection techniques: • observations • interviewing stakeholders • shadowing workers • focus groups. To support this, tutors could provide learners with a scenario (providing scope for interviews and focus groups) or a real business problem could be studied, with support from a local employer (this could also provide an opportunity to use observations and to shadow workers). In addition, the scenario could be based on either a school/college or a work placement context. Learners, working in pairs, could write a set of interview questions that could be used to obtain the necessary information for the specified business needs given in the scenario. Learners could then share and pilot their questions with the whole group and the tutor could record all of these questions and then distribute these to the group. Learners, in small groups, could then select the three best questions and also the worst two questions and explain their reasons for these choices to the whole group. Tutors could facilitate this task and highlight any misunderstandings. Tutors could take on the role of a stakeholder if learners select to use an interview. Learners could then take turns in asking a few questions from their list and also adding their own follow-up questions if appropriate. These interviews could be recorded as video or audio for later use as teaching resources. Similarly, small groups of learners could take on the role of stakeholders to form a focus group, with the tutor asking questions. In both cases a scenario and/or briefing notes will be needed. Finally, learners could carry out a review of their questions, to evaluate how effective the questions were in collecting the data required, suggesting improvements if necessary.	2 hours	Unit 2 LO3

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Use qualitative data analysis methods	Learners, working in small groups, could be given one category of qualitative data analysis method to research from this list: • typology (e.g. activities, actions, relationships) • event analysis (e.g. event trees, fault trees, use of time-stamped data) • logical analysis (e.g. flow charts, data flow diagrams). Each small group could produce a 'how to' guide, showing examples of their given category. Learners could then present their findings to the whole group. Tutors could explain to learners that during this activity they will be using different methods to analyse the qualitative data that will be provided to them. Tutors could provide qualitative data that learners can use to practice using qualitative data analysis methods on. Tutors could provide this in different formats: • interview (e.g. learners could interview tutors to find out how a given task is done, such as making a cup of tea) • observations (e.g. learners could observe other learners whilst they carry out a task, such as sending an email). Learners could then use qualitative data analysis methods to record the process or activity (e.g. create a flow chart showing how to send an email).	1 hour	

SUGGESTED ACTIVITIES

LO No:	3		
LO Title:	Be able to develop data design solutions to meet business requirements		
Title of suggested activity	**Suggested activities**	**Suggested timings**	**Also related to**
Levels of data model design	Tutors could explain that the following four activities will develop learners' understanding of the four levels of data model design: 1. informal conceptual level (enterprise/business requirements) 2. formal conceptual level 3. logical level 4. physical level. Tutors could show the following video to the whole group as an introduction to relational databases and data modelling in a business context. Tutors could pause the video at key points to take questions and to check learners' understanding. Organisation: University of Delaware Title: Video 0: An Introduction to Relational Databases Website link: https://www.youtube.com/watch?v=Jk0r7vbzzL0 Description: A clear introduction to relational databases within a business context.	1 hour	
Informal conceptual level (enterprise/business requirements)	Tutors could begin by stating that this level defines, informally, the unique business requirements of the data model. This level will describe entities and the relationship between them, but in a non-technical way. Tutors could provide learners with a scenario with a brief written summary (no diagrams) of the data analysis needs of a business (e.g. a car hire business, a college library). This scenario should also include any business rules (e.g. many students can loan the same book from a library, assuming there are multiple copies of that book in the library) Learners could read the written summary and draw a diagram (in any format they like) that describes the entities and their relationships.	1 hour	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Formal conceptual level	Tutors could begin by stating that the formal conceptual level only shows the relationship between entities. It does not go into any more detail than this, but is formal because an entity relationship diagram (ERD) should be produced. Learners could now carry out the Learning Outcome 4 Entity attribute relationship diagrams (EARD) activity. Learners could produce an entity relationship diagram for the business in the scenario in the Levels of data model design activity above. Learners, in small groups, could then compare their entity relationship diagrams. Tutors could check for any misunderstandings or inaccuracies of style. Organisation: University of Delaware Title: Video 1: An Introduction to Entity-Relationship Modeling Website link: https://www.youtube.com/watch?v=hXI5q3fIfwQ Description: A clear introduction to entity relationship diagrams within a business context. Organisation: University of New Orleans Resource Title: Conceptual Data Modeling with Entity Relationship Diagrams Website Link: https://www.youtube.com/watch?v=wo-Wyul8CDQ Description: This is a good introduction to conceptual data modelling. Organisation: BA-Experts Resource Title: Business Data Modeling: Getting Informational Requirements for IT Website Link: https://www.youtube.com/watch?v=0ZAP2y5PFNc Description: This introduces the concept of entities, relationships and cardinality within a business context.	1.5 hours	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Logical level	Tutors could begin by stating that the logical level has attributes and keys (primary and foreign) added to describe the entities and the relationships between entities. Tutors could use this table to help explain the differences between the conceptual and logical levels: | Item	Conceptual level	Logical level
---	---	---
Entity names	X	X
Entity relationships	X	X
Attribute names		X
Primary keys		X

Foreign keys		X |
		
		Learners, working in pairs, could draw up lists of attributes for each entity. Learners could discuss these as a whole group, with tutors monitoring and clarifying any areas, as needed.
		
		Learners, working in the same pairs, could investigate how to create a logical model:
		• an entity relationship diagram, expanded to show primary keys and attributes
		• an outline data dictionary detailing:
		  – the attributes for each entity
		  – primary keys
		  – the data type of each attribute (e.g. text, integer, Boolean)
		  – the range of acceptable values for each attribute.
		
		Organisation: Teach-ICT
		Resource Title: Data Dictionary
		Website Link: http://www.teach-ict.com/as_a2_ict_new/ocr/AS_G061/315_database_concepts/data_dictionary/miniweb/index.htm
		Description: Data dictionary mini site, including an example of an outline data dictionary.
		
		Organisation: University of Delaware
		Resource Title: Video 2: An Introduction to Logical Data Modeling (LDM)
		Website Link: https://www.youtube.com/watch?v=zX8BTZ9L06E
		Description: A clear introduction to creating an LDM.
			1 hour	

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Physical level	Tutors could use this table to help explain the differences between the conceptual, logical and physical levels:	2 hours	

Item	Conceptual level	Logical level	Physical level
Entity names	X	X	
Entity relationships	X	X	
Attribute names		X	
Primary keys		X	X
Foreign keys		X	X
Table names			X
Table relationships			X
Field names			X
Field properties			X

Learners could research physical data models (PDM), finding examples.

Learners, working in pairs, could then compare and contrast LDM's and PDM's, presenting their findings as a table. The resource below shows a wide range of examples of comparison tables. Learners could use this for ideas on layout and presentation of their comparison table.

Organisation: Web Design Dev
Rsource Title: 25 Clear And Beautiful Comparison Tables
Website Link: http://www.webdesigndev.com/25-clear-and-beautiful-comparison-tables/
Description: A wide range of clear and engaging comparison table designs.

A physical data model could consist of:
• an entity relationship diagram with all attributes and cardinality shown
• a more detailed data dictionary detailing:
  – the attributes for each entity
  – the data type of each attribute (e.g. text, integer, Boolean)
  – validation rules for attributes, if needed
  – input masks for attributes, if needed
  – primary keys
  – foreign keys
• queries
• reports.

Title of suggested activity	Suggested activities	Suggested timings	Also related to

Phases of creating a logical data model (LDM)	Tutors could begin by showing the resource shown below:
	
	Organisation: University of Delaware
	Title: Video 2: An Introduction to Logical Data Modeling (LDM)
	Website link: https://www.youtube.com/watch?v=zX8BTZ9L06E
	Description: A clear introduction to creating an LDM.
	
	Learners, working in pairs, could create a logical data model based on their entity relationship diagrams from the Formal conceptual level activity above.
	
	Tutors could explain the need for cyber security and that learners should identify vulnerable data and potential areas for data theft when creating the LDM.
	
	The LDM should include:
	• an entity relationship diagram, expanded to show primary keys and attributes
	• an outline data dictionary detailing:
	  – the attributes for each entity
	  – primary keys
	  – the data type of each attribute (e.g. text, integer, Boolean)
	  – the range of acceptable values for each attribute
	• potential cyber security risks associated with the data.
	
	The LDM created should be checked against the business needs and business rules set out in the scenario provided by tutors. These checks could cover:
	• structure – set of business rules (e.g. entities, attributes, relationships)
	• manipulating (e.g. updating, retrieving, editing or deletion of content)
	• integrity – validation of accuracy (e.g. the range of acceptable values for each attribute).
	
	Learners could check the LDMs of another pair and provide feedback.
		3 hours	Unit 3 LO3

SUGGESTED ACTIVITIES

LO No:	4
LO Title:	**Be able to present data analysis and design solutions to stakeholders**

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Data design documentation	Tutors could begin by explaining that data analysts need to be able to share their ideas with stakeholders; this can be achieved by use of different types of data design documentation, such as: • data flow diagrams (DFDs) • information flow charts • entity attribute relationship diagrams (EARD) • entity life history (ELH). The following four activities will allow learners to gain knowledge and understanding of the data design documentation that can be used to present design ideas to stakeholders (e.g. clients, colleagues). Learners could be tasked to produce an information booklet for other learners, explaining in detail each type of data design documentation. The explanations could include the purpose of each type, examples, any rules and drawing conventions used, advantages and disadvantages.	30 minutes	
Data flow diagrams (DFDs)	Working in pairs, learners could carry out research into data flow diagrams (DFDs). Learners could write a set of rules for creating a Level 1 DFD. Organisation: British Computer Society (BCS) Resource Title: *BCS Glossary of Computing and ICT,* 13th Edition, Page 248 Description: Explanation of data flow diagrams. Organisation: BA-Experts Resource Title: How to Draw a Data Flow Diagram Website Link: https://www.youtube.com/watch?v=KA4rRnihLlI Description: This video both explains the need for data flow diagrams and shows how they can be generated. N.B. As mentioned in the video commentary, there are many different symbols used for the four elements.	2 hours	Unit 2 LO5 Unit 11 LO3

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Information flow charts	Working in pairs, learners could carry out research into information flow charts. Organisation: British Computer Society (BCS) Resource Title: *BCS Glossary of Computing and ICT,* 13th Edition, Page 247 Description: Explanation of information flow diagrams, with a clear explanation of the relationship between information flow diagrams and data flow diagrams.	1 hour	Unit 11 LO3
Entity attribute relationship diagrams (EARD)	Tutors could start by explaining entities, attributes and relationships, in the context of data models in general. Tutors could build on the introduction given in the Data design documentation activity above, giving examples of entities, attributes and relationships, in the context of a given data model . Working in pairs, learners could carry out research into entities, attributes and relationships. Organisation: Seventh Morning LLC Resource Title: Entity-Relationship Diagrams Website Link: https://www.youtube.com/watch?v=c0_9Y8QAstg Description: A good introduction to entity diagrams, including attributes and relationships.	1 hour	Unit 11 LO3
Entity life history (ELH)	Working in pairs, learners could carry out research into entity life history (ELH) and entity life history diagrams. Organisation: theteacher.info Ltd Resource Title: Entity Life History (ELH) Website Link: http://theteacher.info/index.php/f453-advanced-theory/3-3-9-databases/notes/382-entity-life-history-elh-notes Description: Provides an introduction to entity life history (ELH) and entity life history diagrams.	1 hour	Unit 11 LO3

Title of suggested activity	Suggested activities	Suggested timings	Also related to
Evaluation of design solution	Learners could be presented with a scenario based on a fictitious organisation. The scenario should include the information requirements, details of the specific business requirements and also the data design documentation for a proposed design solution. Tutors could hold a whole group discussion on how the organisation could evaluate the data solution shown by the data design documentation. Tutors could record the outcome of the discussion as a list of success criteria for the design solution, such as: • meets the specific business requirements • follows the specific business rules • is achievable • is manageable • is extendable. Tutors could refer back to all of the other activities in this Learning Outcome, identifying the key points. In addition, tutors could discuss with learners the importance of the informal conceptual level of data model (the Informal conceptual level (enterprise/business requirements) activity in Learning Outcome 3) when evaluating a solution against the business requirements of the design solution.	2 hours	Unit 11 LO3 Unit 22 LO2

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