

Unit 5: Data Modelling

Level: **3**

Unit type: **Internal**

Guided learning hours: **60**

Unit in brief

Learners study how data modelling can be used to solve problems. They will design and implement a data model to meet client requirements.

Unit introduction

In all aspects of life, individuals are constantly faced with situations where they must weigh up the available information in order to produce alternatives and make decisions. In the working environment, effective decision making can ensure the successful development of organisations. Poor decision making can have significant negative consequences and can even lead to the demise of an organisation.

In this unit, you will investigate the fundamentals of the decision-making process. You will find out how using data modelling provides the computational ability to compare consequences, and determine a preferred course of action. You will develop the skills and techniques necessary to create complex spreadsheets in order to produce accurate information that informs decision making. You will examine a scenario and then design, develop and test a spreadsheet; you will review your spreadsheet and make refinements based on user feedback, providing an evaluation of the effectiveness of the alternatives produced.

The skills developed in this unit are useful for progression to computing or business-related higher education courses and for use in decision making in the workplace.

Learning aims

In this unit you will:

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

Summary of unit

Learning aim	Key content areas	Recommended assessment approach
A Investigate data modelling and how it can be used in the decision-making process	A1 Stages in the decision-making process A2 Spreadsheet features used to support data modelling A3 Using data modelling to consider alternatives A4 Evaluating models A5 Documenting and justifying decisions	A presentation or report evaluating the role of data modelling in the decision-making process.
B Design a data model to meet client requirements	B1 Functional specification B2 Spreadsheet model design B3 Reviewing and refining data model designs	A practical activity, involving the design and development of a data model to fulfil identified client requirements.
C Develop a data model to meet client requirements	C1 Developing a data model solution C2 Testing the data model solution C3 Reviewing and refining the data model solution C4 Skills, knowledge and behaviours	A functional specification, design documentation, spreadsheet development and testing logs. A report that evaluates the effectiveness of the alternatives considered, and suggests ways in which the alternatives could be improved if the task were to be repeated.

Content

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

A1 Stages in the decision-making process

- Understanding the scenario.
- Identifying information and sources:
 - information required
 - information that is already available
 - additional information needed
 - sources of additional information
 - requirements for verifying the information sources.
- Factors affecting the quality of information:
 - currency of data
 - accuracy of data
 - external factors.
- Analysing the information.
- Identifying alternatives.
- Identifying consequences of implementing the alternatives.
- Making a decision.
- Justifying the decision.
- Communicating decision(s) to others (e.g. client, supervisor, project sponsor), as appropriate.

A2 Spreadsheet features used to support data modelling

- Entering and editing data.
- Formatting data.
- Using formulae and functions.
- Validation (and verification) of data.
- Analysing and interpreting data.
- Presenting data.

A3 Using data modelling to consider alternatives

- Identifying the inputs required for the model.
- The range of outputs that can be produced.
- Benefits and limitations of alternative solutions.
- Impact/consequences of alternative solutions.
- Identifying the alternative solution(s) that produce the best decision or compromise.

A4 Evaluating models

Factors to consider in the evaluation of the model:

- how well the model reflects the scenario being modelled
- the decisions that can be made, using the model
- whether the model can be improved
- whether or not there are other factors that could be used to extend the model.

A5 Documenting and justifying decisions

Requirements for documenting and justifying the model:

- summarising the situation
- identifying information sources used
- indicating the factors considered
- indicating method used to reach a decision
- justifying the choice of information sources, factors considered and methods used.

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

B1 Functional specification

Designing a functional specification to meet requirements:

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

B2 Spreadsheet model design

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

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

B3 Reviewing and refining data model designs

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

- Gathering feedback from client(s) and potential users on the extent to which the design meets requirements.
- Communicating with clients, e.g. email, verbal communication.
- Scheduling and documenting meetings.
- Agreeing and adjusting timescales.
- Refining ideas and solutions.
- Updating design specification documentation, based on review and feedback.

Learning aim C: Develop a data model to meet client requirements

C1 Developing a data model solution

- Processing features and requirements:
 - formulae, e.g. add, subtract, divide, multiply
 - functions e.g. SUM, AVERAGE, COUNT, COUNTIF, LOOKUP, INDEX, GOAL SEEK
 - logical functions e.g. IF, NOT, AND, OR, WHATIF
 - nested IF functions
 - data manipulation, e.g. sorting, grouping, filtering, pivoting data
 - importing and exporting data
 - autofill
 - replication
 - relative and absolute cell referencing
 - using macros and buttons to initiate procedures.

- Data entry and validation requirements and methods:
 - use of data entry forms
 - restricting data input to acceptable values
 - protecting cells by hiding, locking and password protecting
 - ease of use techniques, e.g. list boxes and drop-down menus
 - automated data transfer between sheets or applications
 - adding user prompts and messages.
- Layout and presentation considerations:
 - font size and style
 - merging cells
 - colours, borders, shading
 - conditional formatting
 - headers and footers
 - graphics.
- Output requirements:
 - worksheet layout
 - graphics
 - colours, borders and shading
 - charts and graphs.

C2 Testing the data model solution

Using formative and summative testing to test data models, including functionality and acceptance.

- Testing to establish whether:
 - the solution meets all of the requirements of the functional specification
 - the underlying logic of the model is correct
 - all the functions and formulae work correctly.
- Other factors to consider:
 - selection and use of appropriate test data, e.g. valid, invalid, erroneous, extreme
 - selecting suitable users for solution testing
 - gathering feedback from users, e.g. effectiveness, presentation, performance and purpose
 - designing and completing test documentation.

C3 Reviewing and refining the data model solution

Making improvements and/or refinements to the model in order to meet client requirements.

- Refining the model to take account of issues raised during testing.
- Refining the model to take account of the feedback and client requirements.
- Factors that could be used to extend the model.

C4 Skills, knowledge and behaviours

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

- Media and communication skills, including:
 - the ability to convey intended meaning, e.g. written (email, design documentation, recording documentation, reports, visual aids for presentation use); verbal communication requirements (one to one and group informal and formal situations)
 - use of tone and language for verbal and written communications, to convey intended meaning and make a positive and constructive impact on audience, e.g. positive and engaging tone, technical/vocational language suitable for intended audience, avoidance of jargon
 - responding constructively to the contributions of others, e.g. supportive, managing contributions so all have the opportunity to contribute, responding to objections, managing expectations, resolving conflict.

Assessment criteria

Pass	Merit	Distinction
Learning aim A: Investigate data modelling and how it can be used in the decision-making process		A.D1 Evaluate how the features of spreadsheet software contribute to the decision-making process.
A.P1 Explain the stages involved in the decision-making process for data modelling. A.P2 Explain how the features of spreadsheet software are used to support the decision-making process.	A.M1 Analyse how the features of spreadsheet software contribute to the decision-making process.	
Learning aim B: Design a data model to meet client requirements		BC.D2 Evaluate the design and optimised data model against client requirements. BC.D3 Demonstrate individual responsibility, creativity, and effective self-management in the design, development and review of a data model.
B.P3 Produce designs for a data model which meet client requirements. B.P4 Review the designs with others, to identify and inform improvements.	B.M2 Justify decisions made, showing how the design will fulfil its purpose and client requirements.	
Learning aim C: Develop a data model to meet client requirements		
C.P5 Develop a data model to meet client requirements. C.P6 Test the data model for correctness, functionality and acceptance. C.P7 Review the extent to which the data model meets client requirements.	C.M3 Optimise the data model to meet client requirements.	

Essential information for assignments

The recommended structure of assessment is shown in the unit summary along with suitable forms of evidence. *Section 6* gives information on setting assignments and there is further information on our website.

There is a maximum number of two summative assignments for this unit. The relationship of the learning aims and criteria is:

Learning aim: A (A.P1, A.P2, A.M1, A.D1)

Learning aims: B and C (B.P3, B.P4, C.P5, C.P6, C.P7, B.M2, C.M3, BC.D2, BC.D3)

Further information for teachers and assessors

Resource requirements

For this unit, learners must have access to hardware and software resources that will allow them to use the features and functions of spreadsheet software, as given in the unit content, to design and develop data models.

Essential information for assessment decisions

Learning aim A

For distinction standard, learners will produce a comprehensive, detailed explanation of the stages involved in the decision-making process, considering how a systematic approach using valid information leads to informed decisions that can be justified. Learners will evaluate the use of advanced features and functions of a spreadsheet in data modelling, and clearly show how this contributes to the decision-making process.

Learners' evidence will demonstrate high-quality written/oral communication, through use of accurate and fluent technical vocabulary to support a well-structured and considered response that clearly connects chains of reasoning.

For merit standard, learners will produce a detailed explanation of the stages involved in the decision-making process and show clear understanding of how a systematic approach using valid information leads to informed decisions. Learners will analyse how advanced features and functions of spreadsheet software in data modelling can contribute to the decision-making process.

The evidence will be technically accurate and demonstrate good-quality written/oral communication.

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

Learning aims B and C

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

Learners must produce detailed designs for a data model, which will include a range of alternative solutions. Learners will evaluate the alternatives and their impact and consequences, selecting, and justifying the selection of the alternative(s) that produce the best decision or compromise. Learners will develop their final design using a range of appropriate, advanced spreadsheet features and functions. They will carry out comprehensive testing and seek user feedback which will be used to refine and improve their data model. They will evaluate the final design and produce well-considered, justifiable suggestions for future improvements to the data model.

Learners will produce an evaluation that is a systematic and accurate review of their own skills and performance and the impact that this had on the effectiveness of the solutions. Learners will take individual responsibility for their own work, for example identifying potential issues and resolving them, reviewing their work and making improvements, keeping their work safe and secure and showing responsible use of quoted materials. Creativity will be shown, for example, by evidence of taking innovative approaches to problem solving, and the originality of their solution.

For merit standard, learners will provide evidence of designing and developing a data model for a specified scenario that meets client requirements. They will justify how the decisions made and processes applied throughout the design, development and testing stages impact on the effectiveness of the final solution.

Learners will produce detailed designs for a data model that will include a range of alternative solutions. Learners will analyse the alternatives and their impact, selecting the alternative(s) that produce the best solution. Learners must develop their final design using a range of advanced spreadsheet features and functions. They will carry out testing and seek user feedback, which will be used to refine and improve their data model. Learners will analyse the final design and provide reasoned justification of how it fulfils its purpose and meets client requirements.

For pass standard, learners will provide evidence of designing and developing a data model for a specified scenario that meets client requirements, although some small issues may persist. They will explain how the decisions made and processes applied throughout the design, development and testing stages impact on the effectiveness of the final solution.

Learners will produce designs for a data model that will include a range of alternative solutions. Learners will consider the alternatives and their impact, selecting the alternative(s) that produce the best solution. Learners must develop their final design using a range of spreadsheet functions, carry out testing and seek user feedback. The results of testing and user feedback can be used to refine and improve their data model. Learners must review the extent to which the final design meets client requirements, although the review may be unbalanced.

Links to other units

This unit links to *Unit 1: Information Technology Systems*.

Employer involvement

This unit would benefit from employer involvement in the form of:

- guest speakers
- technical workshops involving staff from local organisations/businesses
- contribution of design/ideas to unit assignment/scenario/case study/project materials, including own organisation/business materials as exemplars where appropriate
- feedback from staff from local organisations/businesses on plans/designs/items developed
- opportunities for observation of organisational/business application during work experience
- support from local organisation/business staff as mentors.