

BTEC First in IT

Second Edition

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Mark Fishpool and
Bernadette Fishpool

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Dummy text

Unit 9

Database Software

Introduction

In many organisations, databases have already replaced manual record systems with computerised ones. Databases are used to store information that the organisation needs to operate.

Database software can be purchased or, in some circumstances, programmers may be asked to create database applications from scratch. Common commercial examples include Microsoft® Access, Oracle, IBM Lotus® Approach.

In this unit you will learn the basic concepts of databases and database design. You will understand database objects and how these are manipulated to create efficient working systems that provide up-to-date and timely information for managers to use in decision-making.

Learning outcomes

By the end of this unit you should be able to:

1. understand the structure and principles of databases
2. be able to create a simple database to meet user needs
3. be able to create database queries, forms and reports
4. be able to document a database.



Recording Your Progress

In order to achieve each unit, you will complete a series of coursework activities. Each time you hand in work, your tutor will return this to you with a record of your achievement.

This particular unit has 8 criteria to meet: 5 Pass, 2 Merit and 1 Distinction.

- **For a Pass:** you must achieve all 5 Pass criteria.
- **For a Merit:** you must achieve all 5 Pass and both Merit criteria.
- **For a Distinction:** you must achieve all 5 Pass, both Merit and the single Distinction criterion

To achieve a pass grade the evidence must show that the you are able to:	To achieve a merit grade you must be able to:	To achieve a distinction grade you must be able to:
P1 using examples, describe the advantages and disadvantages of computerised databases	M1 explain the choice of fields, data types and primary key in database	D1 justify the choices of datum, work-holding equipment and measurement techniques used to mark out the three different applications
P2 design, create and check a single table database that meets a defined user need, using at least three different data types	M2 explain the importance of data integrity and how it can be maintained with reference to a particular database	
P3 produce reports based on database queries to meet a defined need		
P4 create and use data entry forms		
P5 produce technical documentation for a database		

So that you can monitor your own progress and achievement in each unit, a recording grid has been provided (see the Progress check section at the end of this unit).

Learning Outcome 1: Understand the structure and principles of databases

P1

M2

Database basics

Uses of databases

Databases are everywhere: schools and colleges, libraries, doctors' and dentists' surgeries, supermarkets, garages, florists, grocers, music and DVD stores, clothes shops, gyms, hotels, kennels, banks, building societies, hospitals, fast food outlets – and many more.

Within each of these organisations the following information could be stored: customers, sales, products, suppliers, purchases, stock, manufacturing, accounts, VAT.

These databases are organised in such a way that data can be easily entered and stored, edited, deleted and manipulated to support the activities of the organisation.

The advantages and disadvantages of computerised databases are as follows:

Scorecard

- + Easy to use
- + Records are easy to access and retrieve
- + Data can be manipulated easily in many different ways (e.g. trends can be established, data can be viewed from different perspectives)
- + Data can be validated to ensure that it is accurate
- + Easy to store
- Database structures must be carefully developed to ensure that they work as efficiently as possible
- There are laws that control the use of databases
- Many people feel that simply too much information is stored about us
- The costs of technology can be prohibitive

An example of a database in use

To be able to fully appreciate why databases are an improvement on manual alternatives, consider the following: Animal boarding kennels book cats and dogs in for short stays when their owners are on holiday or moving house. Most kennels have a rule that animals must be inoculated prior to the start of their stay. As such, when the staff are making bookings, they need to ensure that the animal's inoculations are valid. Often this is 21 days prior to the start of the animal's stay.

A user form has been created where the user will key in the booking information. An animal code is generated automatically by the system and the user has keyed in the animal's name and type (e.g. Labrador, Cat or Golden Retriever). The next piece of data that is requested is the inoculation date. After this is input, the user tabs (moves using the tab key) into the next box to input the booking date.

In the example shown in Figure 9.1 the booking start date has been keyed in after the inoculation date. An acceptable booking start date can not be prior to 27 January 06 (6 January plus 21 days). Here the user has input 22 January 06 and an error message has been activated.

Once a valid date has been entered, the input will be accepted and the user will be able to complete the booking.

In a manual system where this functionality would not have existed, the user would have had to use a calendar (or mental maths) to calculate whether the booking should be made or not.

Database objects

One of the most frustrating issues with computing is the new terminology that you have to learn and understand. Database technology is no different in requiring you to learn new terminology:

Key terms

Object is an independent item that can be designed, selected and manipulated. Tables, queries, forms and reports are all examples of objects.

Database tables consist of rows and columns of information, where the row contains a record and the column becomes a record field (this will be explored later).

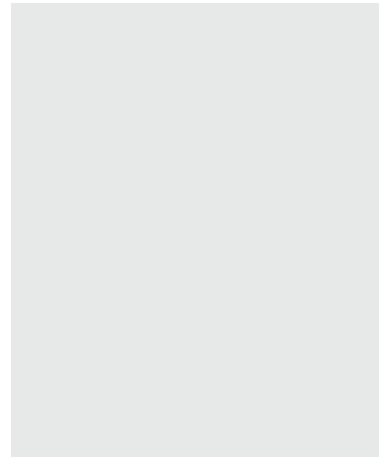


Figure 9.1 Validation on a date

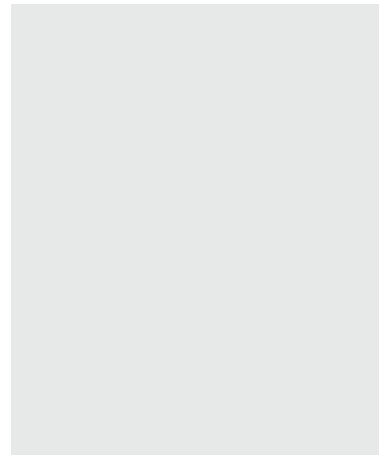


Figure 9.2 Accepted input

Data types

Just as with computer programming, understanding data types is an important aspect of working successfully with databases.

- Text: this particular data type will allow you to hold any alphanumeric data. It can hold numbers, characters, combinations of numbers and characters (e.g. E101ITP), or symbols. The default (manufacturer preset) number of characters that is set to be stored in a text field is 50, although this number can be adjusted to any number between 1 and 255.
- Number: you can use number fields to store both whole numbers (e.g. 6 or 492) or numbers with a decimal part (e.g. 134.87). If the number is likely to require a decimal part, you should select how many numbers will display after the decimal point (this will ensure that when numbers are displayed they will be consistent).
- Currency: setting a field as currency will automatically add a £ to the value that has been keyed in. As with number above, you will need to specify how many numbers you wish to display after the decimal point.
- Date/Time:– this field allows you to key in a date in most recognised formats and stores it in a specific way. The main options within this data type are:
 - General date 08/04/2005 13:23:41
 - Long date 8 April 2005
 - Medium date 8-Apr-05
 - Short date 08/04/2005
 - Long time 13:23:41
 - Medium time 01:23 PM
 - Short time 13:23
- AutoNumber: an AutoNumber is a number that is computer-generated sequentially. If you use an AutoNumber in a field, each time a record is created the number will increase by 1.
- Lookup Wizard: this is a very useful data type because you will be able to specify the values that will be stored in advance and the user will simply be presented with a list from which he or she can choose (e.g. Mr, Mrs, Ms, Miss, Dr, Rev would all be potential titles for a customer).

One of the key issues with good database design and construction is the correct choice of data type.

Activity 1

As described in the case studies in Unit 1, Steve Hodder's business has two distinct areas. He sells skateboards and components to the general public and he organises competitions. For the purposes of this case study, you are being asked to create a data table for the competition part of his business. You should consider what data you would recommend that Steve should hold on competitors and on the competition itself. Complete the data table to include information in all relevant columns. Then create the database tables and input forms with two queries and two reports that would provide Steve with useful information.

Managing resources

Case Study

Steve Hodder runs a small skateboard shop (SHS). As the business has grown, so have their computer systems. At first there was only one PC, which was used for everything, particularly:

- writing letters
- accounting
- producing price lists
- calculating the cost of products.

Then a second PC was used to run the till. It had a barcode scanner attached so they could scan products to help keep track of sales.

The third PC was purchased to run a bespoke program that was commissioned so that customers could enter details of a custom-built skateboard to find out how much it would cost.

These computers made working a lot more productive, but there were disadvantages, especially when data needed to be transferred from one computer to another:

- Records of sales had to be copied to a USB flash drive so they could do the accounts on the office PC.
- Details of custom-built skateboards had to be copied, using the USB flash drive, to the office PC so the orders could be built.
- Work done on the till PC during quiet times in the shop had to be copied to the office PC later.
- The shop consulted with an ICT professional, who recommended they purchase a small network to link the PCs together. Their consultant ICT professional installed the network for them, trained them how to use it and set up a backup routine, so if a disaster happened to their systems the data would be safe.

The network has been a great success, saving the shop time and improving their response to customers.

Estimating the size of a database

Depending on the database software you use, you may well be able estimate the size of your database. This example calculates how big the database will be, dependent on known factors:

Animal_Code	AutoCounter (4 bytes)
Animal_Name	Text of 20 characters (20 bytes)
Animal_Type	Text of 20 characters (20 bytes)
Inoculation_Date	Date (stored as text – dd/mm/yy is 8 bytes)
Booking_Start_Date	Date (stored as text – dd/mm/yy is 8 bytes)
Number_of_Nights	Integer (4 bytes)
Maximum record size	64 bytes

If we used all the available space in each field (keyed in the maximum number of bytes possible), each record would take up 64 bytes of memory. Taking this a little further, if we knew that we were going to store, say, 1000 records, we would be able to calculate that our database would have a size of 64,000 bytes, and if the database grew to 10,000 records, we would effectively be storing 640,000 bytes.

However, whether this calculation is appropriate or not will depend on which software you are using. For example, some databases are made up of records with a fixed record length. This is where the software will always store 4 bytes for Animal_Code, 20 bytes for Animal_Name, 20 bytes for Animal_Type, and so on, as set up in the table structure, regardless of how many bytes have actually been used. (If you key Rex into Animal_Name, you will only be using 3 of the 20 characters allowed.) The alternative to this would be the database supporting records with a variable record length, where if you are only storing 3 characters, as in Rex, the computer will not store the unused character space also. Let us see this in practice, using the following record structure:

1	4 bytes
Rex	3 bytes
Golden Retriever	16 bytes
06/01/06	8 bytes
30/01/06	8 bytes
5	4 bytes
Total	43 bytes

The above record would only need 43 bytes to store it in its entirety

1	Rex	Golden Retriever	06/01/06	30/01/06	5
2	Jack	Cat	17/01/06	21/03/06	10
3	Pickles	Cat	17/01/06	21/03/06	10
4	Spot	1,000	12/12/05	15/02/06	3

Learning Outcome 4: Be able to document a database

P2

Technical documentation

The most common technique for supporting technical documentation is the data table. (This technique was discussed in Unit 3: ICT Project.) Although this version of the data table contains an extra column (the primary key column, where it is noted whether or not a field is the primary key in the table), other than that it is identical to the data table in Unit 3.

Field Name	Primary Key	Description	Type	Length	Format	Validation/ Input Mask
Animal_ Code	Yes	Unique identifier	Auto Counter			
Animal_ Name		Name of animal	Text	20		Is not FULL
Inoculation_ Date		The date of the animal's most recent inoculation	Date		dd/mm/yy	
Booking_ Start_ Date		The start of the animal's stay at the kennels. This is validated (see Validation column)	Date		dd/mm/yy	Must be more than 21 days after inoculation date

Table 9.1 Data table

Data tables are very flexible and are also used extensively in computer programming to record details of variables used in program design. (For further information, see Unit 7: Software Design and Development.)

The last part of the technical documentation will be a full written description of each of the forms, queries and reports, explaining the purpose of each. Typically, the forms, queries and reports are printed (or screen-dumped) and are annotated to fully explain what each part of the document is for.

Quiz

9

1. Name three advantages and three disadvantages of using databases.
2. Name two of the four database objects.
3. Name the four primary data types.
4. What does validation do?
5. Which view does the user use to input data into a table (if there is no input form)?
6. What is the default field size for text?
7. What is an input mask?
8. Give the most common example where input masks are used.
9. What does a list box do and why are they used?
10. What does a Wizard do?
11. What is a caption?
12. What does a query do?
13. What is a footer? Give an example of something you might find in a footer.
14. What is landscape view?
15. What is portrait view?

Coursework Guidance

This unit is largely practical in that you need to demonstrate that you can use the basic functionality of a database. You will be asked to design a database, create database objects such as tables, forms and reports, and produce technical documentation.

For this unit, the Merit and Distinction criteria are awarded for demonstrating your ability to justify your choices, explain why data integrity is important in database design and stating how integrity can be maintained, and finally through recommending further improvements that could be made to your database. At this level you will be expected to be using shortcuts (Wizards, list boxes, etc.).

Unit links

Unit 1 Using ICT to Present Information

Unit 3 ICT Project

Unit 7 Software Design and Development

Unit 8 Customising Applications Software

Unit 10 Spreadsheet software

Further reading

Heathcote, F., Basic Access 2000–2003 (Payne Gallway Publishers, 2004)
ISBN: 1904467784

Heathcote, P. and Heathcote, F., Further Access 2000–2003 (Payne-Gallway Publishers, 2004)
ISBN: 1904467741

Heathcote, R., ICT Projects for GCSE (Payne-Gallway Publishers, 2002) ISBN: 1903112699

Progress check

So that you can monitor your own progress and achievement, a recording grid has been provided.

	Assignments in this Unit			
Assignment	U9.01	U9.02	U9.03	U9.04
Referral				
Pass				
1				
2				
3				
4				
5				
6				
7				
Merit				
1				
2				
3				
4				
Distinction				
1				
2				
3				

Quiz Answers

a

- 1. Any three advantages from the following:**
Easy to use
Records are easy to access and retrieve
-Data can easily be manipulated in many different ways (e.g. trends can be established, data can be viewed from different perspectives)
Data can be validated to ensure that it is accurate
-Easy to store
Any three disadvantages from the following:
-Database structures must be carefully developed to ensure that they work as efficiently as possible
There are laws that control the use of databases
Many people feel that simply too much information is stored about us
The costs of technology can be prohibitive
- 2. Table, form, query, report**
- 3. Text, number, currency, date/time**
- 4. Validation is a process whereby the computer has been set up to check user inputs are of a particular data type, are within a given range or have a specified format.**
- 5. Datasheet view**
- 6. 50**
- 7. An input mask reorganises the visual display of data to be in a specific format. For example, the input mask can automatically insert the brackets around an STD code in a telephone number. The user only needs to key in the number and the formatting appears automatically.**
- 8. Postal codes**
- 9. A list box offers a user a list of options he or she can choose from as a valid input. It reduces the potential for incorrect inputs.**
- 10. A Wizard is a series of programmed steps that a user will go through to create an output (e.g. a table, a query or a report).**
- 11. A caption is a title (it could be a form, table, report or query title) that names an object on the visual interface, but which does not change the actual name of the object within the database.**
- 12. A query interrogates a database using criteria.**
- 13. A footer is detail that is displayed at the bottom**

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