

# Database Structure

## The Database File

A Microsoft Access database is a single file with the file extension \*.mdb and is often referred to as a database *application* since, unlike other Microsoft Office files it can contain many different objects and work as if it were a program in its own right. Usually you need a copy of Microsoft Access to run an Access database, although Access developers (programmers) can create and distribute Access databases that will work completely independently of the Microsoft Access program so that the user does not need a separate copy of Access to run the database. These are known as *run-time* databases.

Access database files are also different from other Microsoft Office files (such as Excel Workbooks) in that they permit more than one user to work with the file simultaneously. An Access database can have up to 255 concurrent users.

## Database Objects

An Access database can consist of many different components. These are called the *database objects*. They are organised into groups according to type and are listed in the Access *database window* (Fig. 1) which is normally displayed when the database opens.

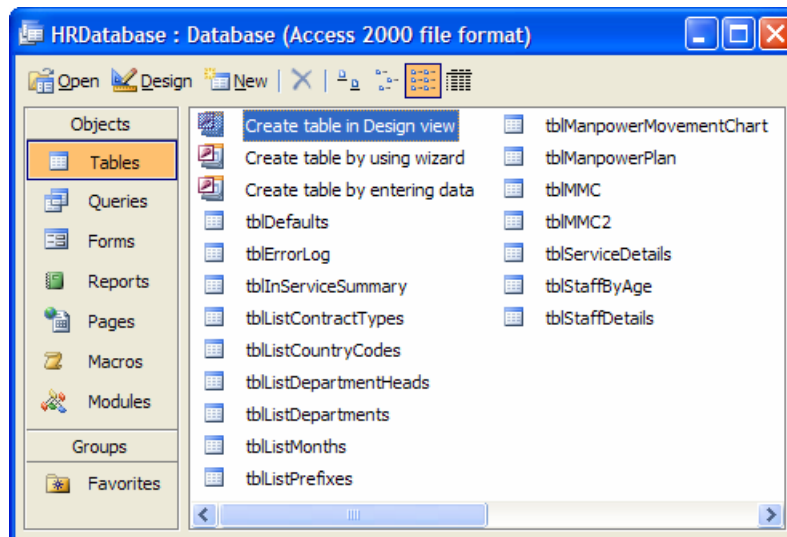


Fig. 1 The Access Database Window

Some database developers prefer to hide the database window from their users. You can find this setting by choosing **Startup** from the **Tools** menu. If the database window is not visible, either because it has been hidden or because it is behind other object windows, you can display it by pressing the **[F11]** key.

View lists of the various objects in a database by clicking the buttons on the left-hand side of the database window. Double-click an object's name to open it or right-click on the name to see a menu of options.

The database window allows you to open or modify (design) existing database objects, or to create new ones either manually (in *Design view*) or with the help of wizards.

## Tables

Tables are the most important part of a database. They contain the data. Tables present the data as a *datasheet* with the data arranged in rows (*records*) and columns (*fields*) (Fig. 2). You can edit data directly in a table and add or delete records. The data can also be sorted and filtered in this view. Data in a table can be selected, copied and pasted into another application or exported as a file. An Access table can have up to 255 fields and can contain up to 2 million records.

tblStaff : Table							
	StaffID	FirstName	LastName	BirthDate	HireDate	Gender	JobTitle
▶	1	Martin	Green	27/09/1950	01/01/1995	M	Chairman
	2	Debbie	Collett	13/07/1957	01/01/1995	F	Regional IT Ma
	3	Luke	Willis	29/01/1978	04/01/1995	M	Senior IT Engin
	4	Samuel	Pienaar	29/04/1950	04/01/1995	M	Production As
	5	Clare	James	10/07/1969	05/01/1995	F	Secretary
	6	James	Ruane	11/10/1971	06/01/1995	M	Research Assi
	7	Tamsin	Graef	24/01/1959	07/01/1995	F	Head of Admin

Fig. 2 A table of data in datasheet view.

Tables can be joined by linking common fields, thereby setting up relationships between them. This ability to relate data in different tables makes Access a very powerful data storage tool setting it apart from alternative data stores such as Excel and is the reason Access is called a *relational database*.

## Queries

A query can be thought of as a stored question about the data. They are used to filter, sort and summarise data. Special queries called *action queries* are used to manipulate data and database structure. They can create, delete or modify records and create new tables. Access provides a user-friendly graphical tool for building queries, although in the background the query commands are stored in SQL (structured query language). The query tool allows you to work directly with SQL if you prefer, or when you need to create commands that can not be represented graphically.

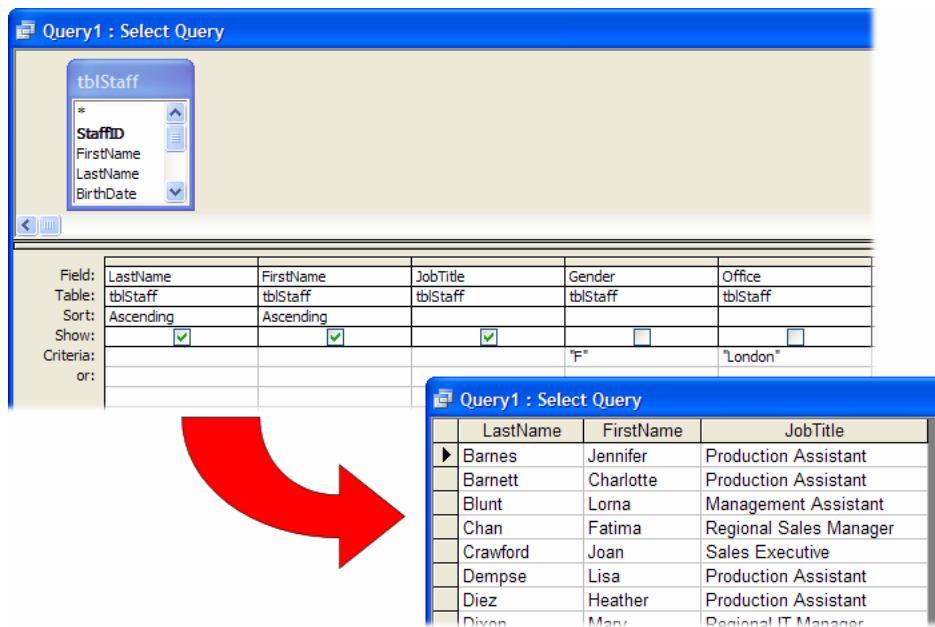


Fig. 3 A simple Select query shown in design and datasheet views.

When you open or *run* a query it carries out the stored SQL commands. Most queries simply display a sorted or filtered view of a table, so it is important to remember that any change you make to the data displayed is a change to the data in the underlying table.

## Forms

Forms are used to create a user-friendly interface for the database. They are often used to display records and for data entry and retrieval but they can also take the form of custom dialog boxes and switchboards (Fig. 4). The Access forms design tool can be used to create a powerful, professional looking *front-end* for your database application.

Forms are a very important part of the database and can do much to improve the user experience. The functionality of forms can be enhanced with the help of Access Macros or VBA programming.

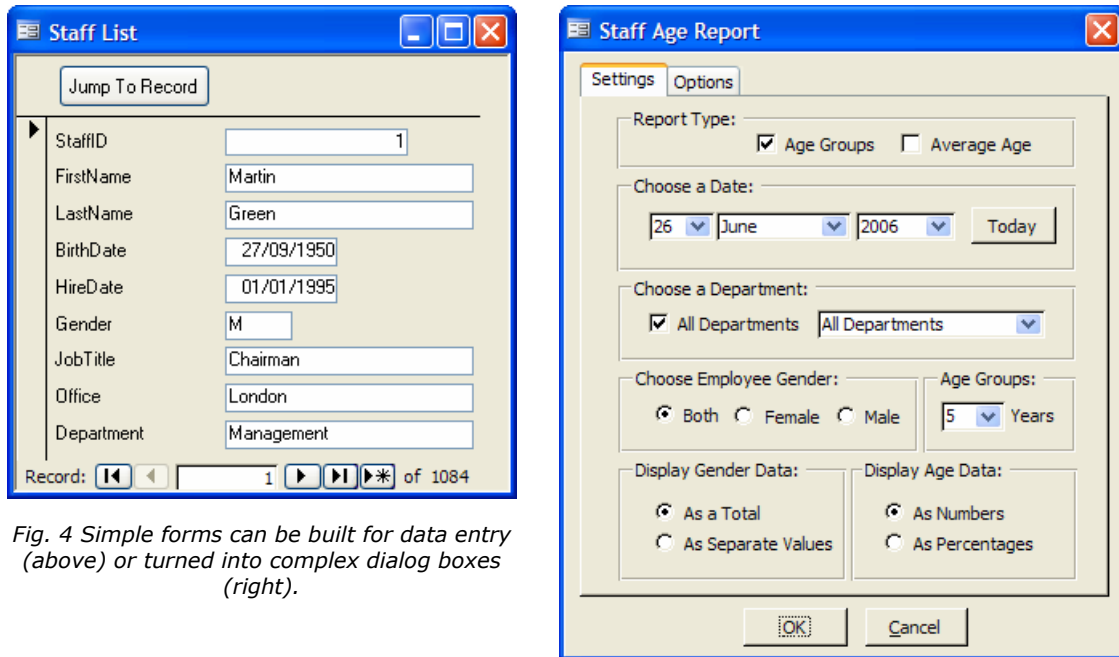


Fig. 4 Simple forms can be built for data entry (above) or turned into complex dialog boxes (right).

## Reports

The Access report is used to present your data, usually for printing. Reports are designed in a similar way to forms and can get their data either directly from a table or filtered by a query. In addition to text Access reports can display data in the form of charts and pivot tables.

The report tool is ideal for creating a wide range of documents based on the data in your database such as invoices, statements or shipping documents and even envelopes or lists of mailing labels.

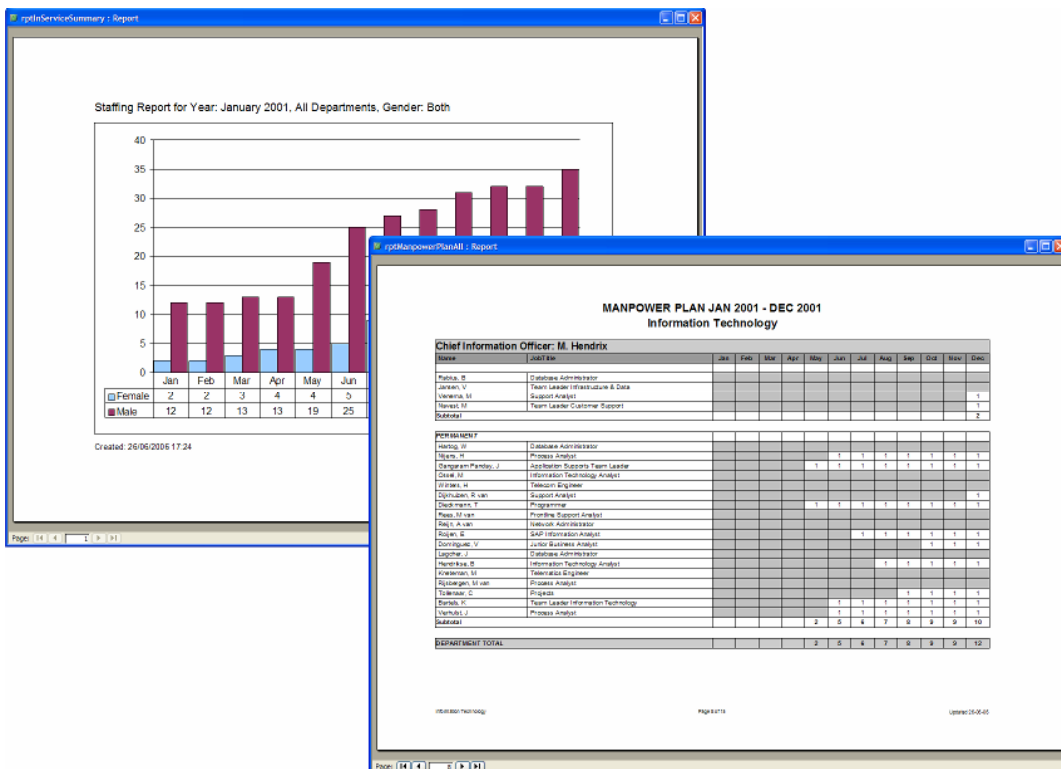


Fig. 5 Reports can be used to present data in many different ways.

Tables, queries and forms can be printed in Access, and it is easy to export data from an Access database into other programs such as Microsoft Word and Microsoft Excel if you prefer to make use of their layout and printing options.

## Pages

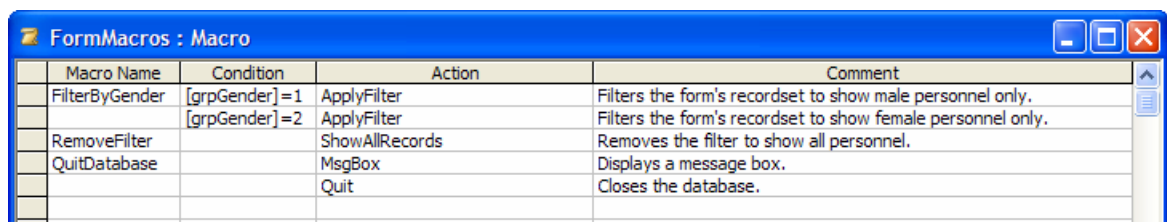
Access includes a tool to help you create and edit *Data Access Pages*. These are web pages that display data from the database. They are not stored in the database but reside on an Internet or Intranet web site. Links to existing data access pages are shown in the Pages section of the Database Window.

## Automating Access

Database applications usually involve a high degree of interaction with the user. To facilitate this and to enhance the scope of the application Access provides two powerful tools for automating the database: Macros and VBA Programming. These allow you to add useful and time-saving tools to database so that complex operations can often be achieved at the click of a button.

### Macros

The Macro tool provides an easy way to automate actions in the database. It requires no programming knowledge. A macro is a set of commands that you create by choosing options from a list and specifying various criteria to determine exactly how you want the commands to work (Fig. 6). Whilst not offering as many options as VBA programming, macros can be used to help automate most common database tasks.



Macro Name	Condition	Action	Comment
FilterByGender	[grpGender]=1	ApplyFilter	Filters the form's recordset to show male personnel only.
	[grpGender]=2	ApplyFilter	Filters the form's recordset to show female personnel only.
RemoveFilter		ShowAllRecords	Removes the filter to show all personnel.
QuitDatabase		MsgBox	Displays a message box.
		Quit	Closes the database.

Fig. 6 The macro tool provides an easy way of automating database processes.

## Modules and VBA Programming

Access modules store VBA (Visual Basic for Applications) programming code. General code is stored in the modules listed in the Modules section of the Database Window. Forms and reports can also contain code. This code is stored in special *class modules* attached to the form or report. Class modules are not listed in the Modules section of the Database Window but can be viewed by selecting the object's name and choosing **Code** from the **View** menu, or from the design view of the object, or by using the Visual Basic Editor (**Tools > Macro > Visual Basic Editor**).

VBA is a very powerful programming language and is used throughout Microsoft Office. It can automate almost any database process in addition to much that can not be achieved from the usual Access user interface.

## Other Features

**External Data.** In addition to its own data an Access database can contain links to *external data sources* such as data in Excel workbooks, text files, other Access databases and server databases like Microsoft SQL Server and Oracle.

**Networking.** When an Access database has multiple users in a networked environment it is usually split into a *back-end* containing the tables and a *front-end* containing everything else. Each user can then have their own copy of the front-end which can be tailored to their personal needs.

**Security.** Access databases provide various tools for securing a database where that is an important consideration. Security can be as simple as a database password or can involve creating user and group accounts, each with their own set of permissions.

**Upsizing.** Access can be used to build a front-end to a server database such as Microsoft SQL Server. By creating an *Access Data Project* you can create a new link to an existing server database or upsize an existing Access database to be hosted on a server database when the server's extra processing power is required to handle large volumes of data or many concurrent users.