

# CHAPTER 5: DATABASE

## **Introduction to Databases**

A **database** is an organized collection of data. It is the collection of tables, queries, reports, views, and other objects. The data are typically organized to model aspects of reality in a way that supports processes requiring information, such as modelling the availability of rooms in hotels in a way that supports finding a hotel with vacancies.

A **database management system (DBMS)** is a computer software application that interacts with the user, other applications, and the database itself to capture and analyze data. A general-purpose DBMS is designed to allow the definition, creation, querying, update, and administration of databases. Well-known DBMSs include MySQL, Oracle and MS Access

## **Traditional File Organization**

Traditional file organization refers to an approach to organizing computer-based or electronic files. Prior to computer databases, many businesses simply organized files by creating folder structures and placed documents and files into folders based on category or type. This method has given way to database systems in many cases. However, traditional filing is sometimes advantageous if you have a relatively small number of files.

### **Simple to Use**

The traditional filing system is very simple to set up and use, assuming the number of files you maintain is small. If you have five basic categories of documents and a limited number of files in each, for instance, you don't need a database system to easily store, maintain and retrieve your files. You also don't have to worry about learning a software system and training employees to use it.

### **Minimal Investment**

If you're using a traditional filing system, you also don't have to make an investment in a software database that may include an upfront purchase and ongoing licensing fees. Naturally, you need a computer, which is fairly commonplace in business whether you store files or not. Your basic file structure is maintained right in your computer's hard drive. Alternatively, you can purchase a very inexpensive external hard drive that allows you to transport files from one computer to another.

### **Poor Data Integration**

A major deficiency of the traditional filing system is that it doesn't enable cross-file data integration or data sharing. With a software-based filing system, you can maintain various folders but you can cross-match searches to retrieve documents in multiple files. Additionally, you can enable multiple employees to search through shared data files. This integration reduces time to search through all individual files, a benefit that's especially important if you maintain a large amount of files or have a large client base.

## **Duplication and Lack of Security**

You also risk duplication of data if you don't integrate your files through a database. In a traditional system, your computer doesn't recognize that you create similar documents and store them in different file locations. Additionally, your traditional filing system doesn't offer nearly the level of security that a carefully crafted database filing system does. Encrypted data and current security are key features as company's regularly develop enhanced database systems.

## **What are Data Models? Type of Data Models.**

A model is a representation of reality, 'real world' objects and events, associations. It is an abstraction that concentrates on the essential, inherent aspects an organization and ignores the accidental properties. A data model represents the organization itself. It should provide the basic concepts and notations that will allow database designers and end users unambiguously and accurately to communicate their understanding of the organizational data.

Data Model can be defined as an integrated collection of concepts for describing and manipulating data, relationships between data, and constraints on the data in an organization.

### **A data model comprises of three components:**

- ✓ A structural part, consisting of a set of rules according to which databases can be constructed.
- ✓ A manipulative part, defining the types of operation that are allowed on the data (this includes the operations that are used for updating or retrieving data from the database and for changing the structure of the database).
- ✓ Possibly a set of integrity rules, which ensures that the data is accurate.

The purpose of a data model is to represent data and to make the data understandable. There have been many data models proposed in the literature. They fall into three broad categories:

- Object Based Data Models
- Physical Data Models
- Record Based Data Models

The object based and record based data models are used to describe data at the conceptual and external levels, the physical data model is used to describe data at the internal level.

## **Object Based Data Models**

Object based data models use concepts such as entities, attributes, and relationships. An entity is a distinct object (a person, place, concept, and event) in the organization that is to be represented in the database. An attribute is a property that describes some aspect of the object that we wish to record, and a relationship is an association between entities.

Some of the more common types of object based data model are:

- Entity-Relationship
- Object Oriented
- Semantic
- Functional

The Entity-Relationship model has emerged as one of the main techniques for modeling database design and forms the basis for the database design methodology. The object oriented data model extends the definition of an entity to include, not only the attributes that describe the state of the object but also the actions that are associated with the object, that is, its behavior. The object is said to encapsulate both state and behavior. Entities in semantic systems represent the equivalent of a record in a relational system or an object in an OO system but they do not include behaviour (methods). They are abstractions 'used to represent real world (e.g. customer) or conceptual (e.g. bank account) objects. The functional data model is now almost twenty years old. The original idea was to view the database as a collection of extensionally defined functions and to use a functional language for querying the database.

### Physical Data Models

Physical data models describe how data is stored in the computer, representing information such as record structures, record ordering, and access paths. There are not as many physical data models as logical data models, the most common one being the Unifying Model.

### Record Based Logical Models

Record based logical models are used in describing data at the logical and view levels. In contrast to object based data models, they are used to specify the overall logical structure of the database and to provide a higher-level description of the implementation. Record based models are so named because the database is structured in fixed format records of several types. Each record type defines a fixed number of fields, or attributes, and each field is usually of a fixed length.

The three most widely accepted record based data models are:

- Hierarchical Model
- Network Model
- Relational Model

The relational model has gained favor over the other two in recent years. The network and hierarchical models are still used in a large number of older databases.

### **Introduction to Microsoft Access**

MS Access is a database management tool that enables one to have good command of data collected. The programme enables one to retrieve, sort, summarize and report results speedily and effectively. It can combine data from various files through creating relationships, and can make data entry more efficient and accurate.

Microsoft Access (MS Access) enables one to manage all important information from a single database file. Within the file, one can use:

- ✓ Tables to store your data.
- ✓ Queries to find and retrieve specific data of interest.
- ✓ Forms to view, add, and update data in tables.
- ✓ Reports to analyze or print data in a specific layout.
- ✓ Data access pages to view or update, the data.

In MS Access, data is stored once in one table, but can be viewed from multiple locations. When the data is updated in a Table, Query or Form, it is automatically updated everywhere it appears

**Microsoft Access** is a relational database management system for windows. Using this package, following tasks can be performed.

- Organize data into manageable related units Enter, modify and locate data
- Extract subsets of data based on specific criteria Create custom forms and reports
- Automate common database tasks Graph database relationships
- Add clipart to forms and reports
- Create macros for automating various functions
- Create database applications, consisting of modules linked through menus, dialog boxes, and command buttons.
- In Access, the term Database refers to a single file that contains a collection of information. Each Access Database consists of tables, queries ,forms reports, macros and modules

## **Database Concepts**

### ***Field Names***

These should be meaningful, without spaces or punctuation, such as SNAME (surname), FNAME (first name), DOB (date of birth), ADDRESS1 (first line of address), TOWN, PCODE, PHONE etc. You cannot have two fields with the same name.

### ***Field Types***

- Text for text and whole numbers that aren't going to be used in calculations(e.g., age, phone number)
- Date/Time for dates and time
- Numbers for decimals and numbers that are going to be used in calculations, e.g. sales figures
- Currency for money
- Yes/No for true/false logical values, e.g. a "married" field, field could be logical.

### ***Field length***

This has to be fixed, so you need to plan your database structure beforehand (although you can alter the length later).

### ***Required Fields***

This box is for when you want to force the user to enter data in a field

### **Primary keys**

These are used to sort the records to allow fast access. Access encourages you choose one field as the primary key field, and then sorts the records on this field. However, only one record with

the same value is allowed in the primary key field, for example if you choose surname for the primary key, you can only have one Smith, Jones etc. For this reason, you should always choose a numeric or a counter field for the primary key: do not use surname as the primary key field.

## ***Introduction to Access 2007***

Microsoft Office Access is enabling information workers to perform data-tracking tasks that otherwise would require the time and expertise of professional programmers and database administrators. Even professional developers have found that Office Access can save time and meet business requirements for many applications. In addition to this, Microsoft has made significant changes and has redesigned the user interface and design tools to make them even more approachable to entry level Access users.

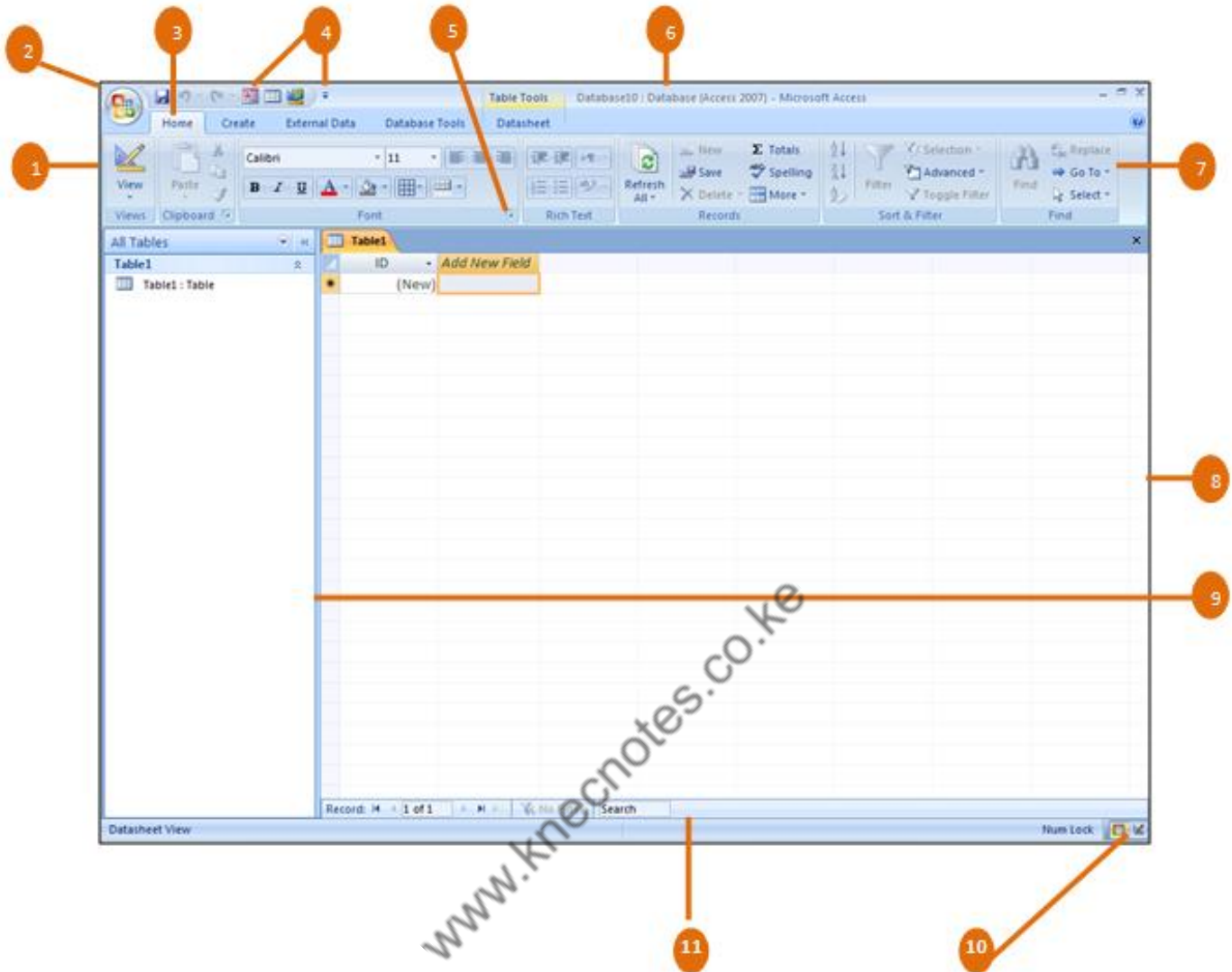
## **What's New in Microsoft Access 2007**

Access 2007 has gone through an extensive redesign which becomes apparent as soon as you start the program. The program opens up to the Getting Started Page where you can either open an existing or a new database or even down-load a professionally built data-base. And that is not the only change you will notice, the top bar has a completely new look called the Ribbon and some great new features have also been added. All of which we will cover in further detail in this document.

## **Help and How To in Access 2007**

Access 2007 looks very different from the previous versions of Access, and many of the common features have been re-categorized. Therefore, it is strongly suggested that you use the Help Files within Access if challenges arise. The Help Files are assessable by clicking the question mark in the blue circle at the end of the Ribbon. The blue question mark replaces the Office Assistant in previous versions. Help also offers a Super Tooltips, which are screen tips or pop-ups to learn more information about the commands function in just a few lines. To activate, rest your mouse over a command. Diagrams and pictures may also appear if they apply.

If you are unable to find your question in the Help Files, search the Microsoft Knowledge Base at [www.support.microsoft.com](http://www.support.microsoft.com) or contact your local Help Desk.



1 **Ribbon:** An area across the top of the screen that makes almost all the capabilities of Excel available in a single area. The Ribbon replaces the menus and toolbars in previous versions. The Ribbon exposes most of the features that were hidden in the drop-down Menus. The Ribbon makes it easier to see and find commands to format your document.

2 **Microsoft Office Button:** A button that provides access to menu commands in Excel. The Microsoft Office Button replaces the File menu in previous versions. Here is where you will find commonly known features such as New, Open, Save, Print and Recent Documents.

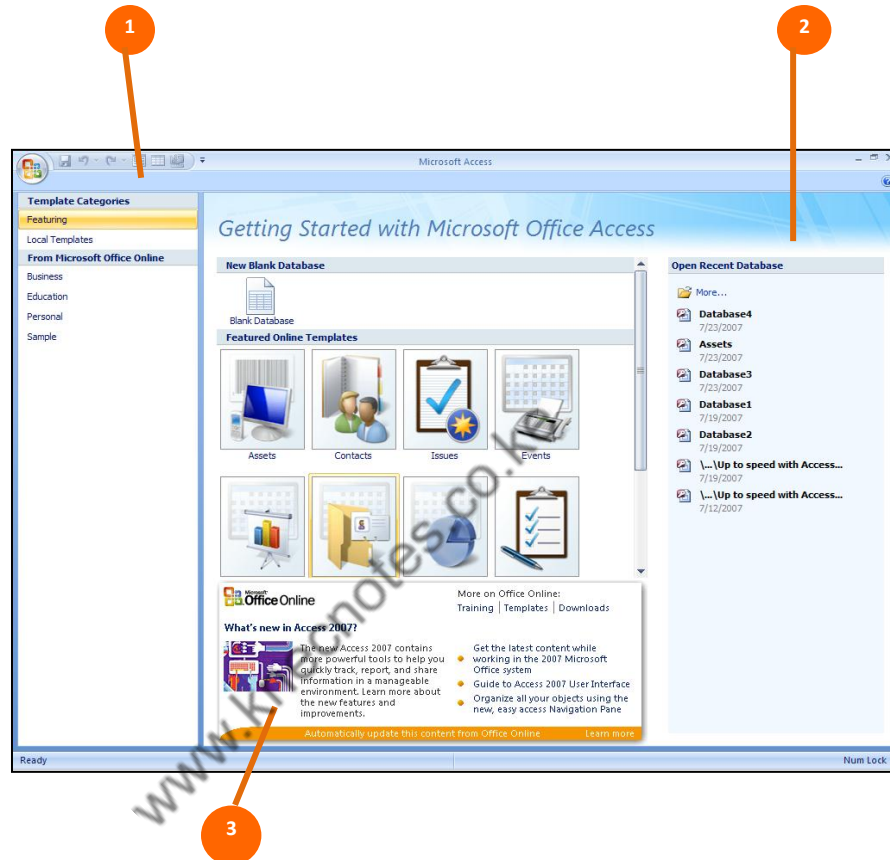
- 3 **Tab:** An area on the Ribbon that contains commands organized in groups. The default tabs are Home, Create, External Data, and Database Tools.
- 4 **Quick Access Tool Bar:** A customizable toolbar located right above the default tabs. By default the Quick Access Tool Bar displays the Save, Undo, and Repeat buttons and is used for easy access to frequently used commands.
- 5 **Dialog Box Launcher:** A button that launches a dialog box containing options for refining a command.
- 6 **Title Bar:** A horizontal bar at the top of an active document. This bar displays the name of the document and application. At the right end of the Title Bar, as in previous versions is the Minimize, Restore and Close buttons.
- 7 **Groups Categories:** A Group of buttons on a tab that are exposed and easily accessible. These buttons were formally embedded in menus on the Menu Bar in the previous versions.
- 8 **Database Window:** Workspace for creating, editing and formatting objects in your database.
- 9 **Navigation Pane:** From this pane you can create tables, forms, reports and queries. Easy access to any object within your database.
- 10 **View Toolbar:** A toolbar that enables, adjusts, and displays different views of a database.
- 11 **Status Bar:** A horizontal bar at the bottom of an active window that gives details about the active document.

## **Exploring Access 2007**

### **Starting Up Access 2007**

1. **Click Start** button, located in the lower left corner of the Windows task bar.
2. **Point to All programs, click Microsoft Office.**
3. **Click Microsoft Office Access 2007.**

4. Access 2007 will open displaying an empty database. This will happen for the first time you open Access. (After that, Access has set the Getting Started Page as the default page.) **Click the Microsoft Office Button** and then **click Close Database**. The **Getting Started Page** will now display.



## The Getting Started Page


- 1 Professionally designed database templates grouped by category. Here you can choose a template category; your options under that category are displayed in the center of the screen. From there you can choose to create a blank database or download a pre-built database.
- 2 Access to your most recently opened databases.
- 3 Direct link to Microsoft Office Online Help.

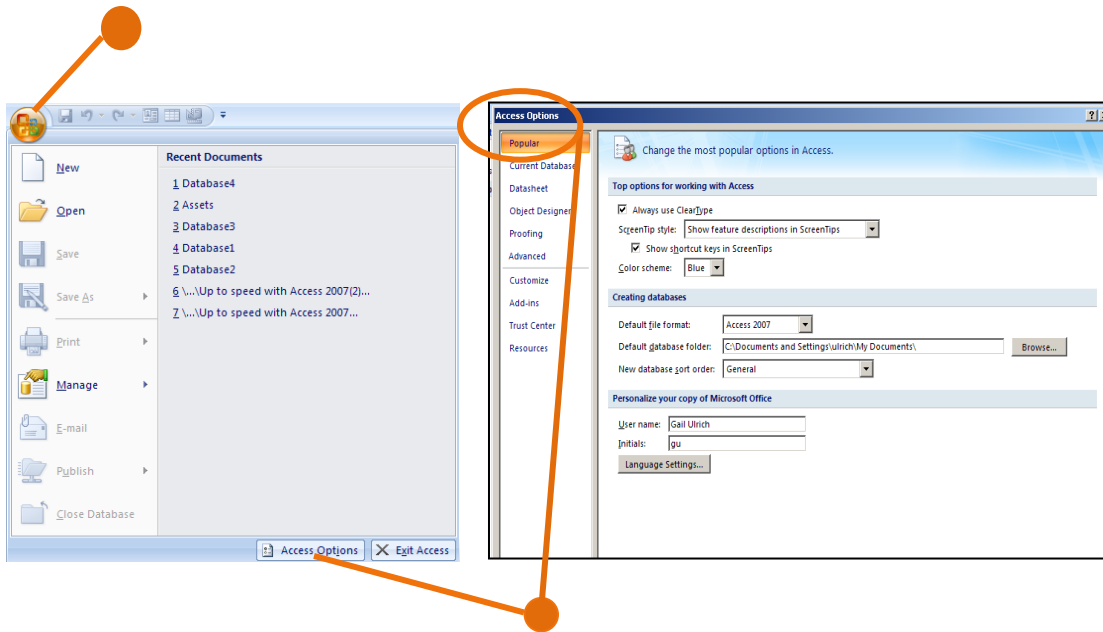


## The New Access Environment

The new Access environment has been designed so that its powerful features are easier to find when you need them. This design reflects the way in which people generally work within the program. In previous versions, commands were primarily located in a Menu list. In Access 2007 the commands are displayed on the Ribbon for easy access.

- **Commands** are arranged on tabs, grouped according to the task you want to accomplish. Commands are arranged on background tabs that become visible only when they are needed.
- **Tabs** are designed to be task-oriented.
- **Contextual Tabs** are designed to appear on the Ribbon when certain objects or commands are selected. These tabs provide easy access to options specific to the selected object or command.
- **Groups** within each tab break a task into subtasks.
- When you point to certain types of formatting options on a **tab**, the text of that command changes to show a **Live Preview** of the effects of that option. This means you can do a trial run without actually applying changes that you might later need to undo.

Microsoft Office Button  is located in the upper-left corner of the window. This button manages the following Access commands: Open, Save, Print, Recent Documents, and replaces the File menu in previous versions. At the bottom of the menu are buttons for changing Access Options and Exiting Access. Many of the options available in the Access Options menu are located in the Tools menu in previous Versions

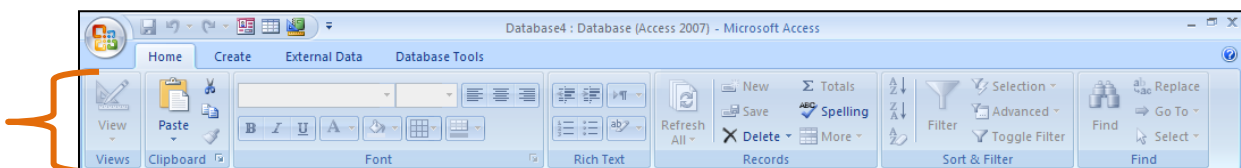


**Tip:** Press the escape key or click away from menu to close.

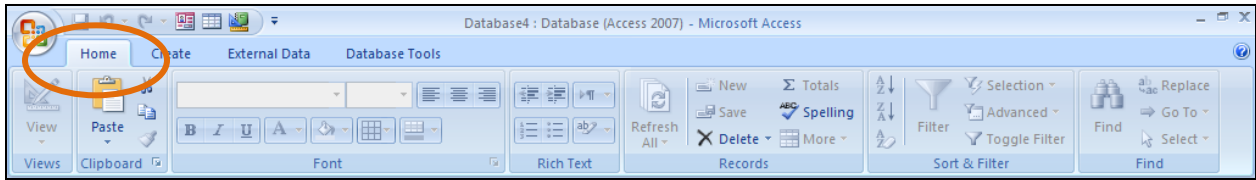
The **Quick Access Toolbar** is located to the right of the Microsoft Office Button and was designed for **easy access to frequently used commands**. The Quick Access Toolbar **can be customized** to add such commands as Print and Spell Check.



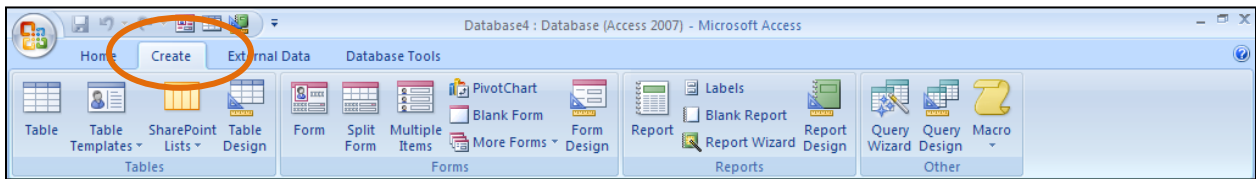
The **Ribbon** is the area across the top of the screen and **exposes most of the features that use to be hidden in file menus**. The Ribbon makes it easier to see and find the commands to format your document. The Ribbon can be reduced to a single line of tabs by pressing CTRL + F1.



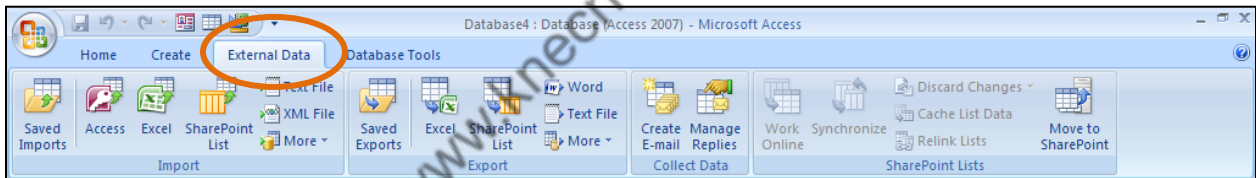
The **Home tab** is organized into seven groups related to working with data: **Views, Clipboard, Font, Rich Text, Records, Sort & Filter, and Find**.



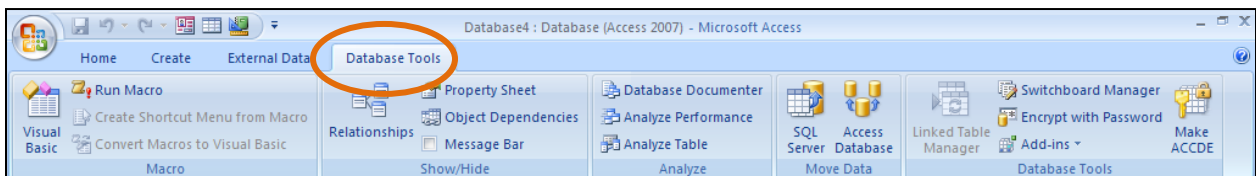
The **Create Tab** is organized in four groups: **Tables, Forms, Reports, Other**. Here you will find **quick create commands to help build forms and reports with the click of a button**. These enhanced commands create new data entry forms and reports complete with controls and graphics.



The **External Data tab** is organized in four groups: **Imports, Export, Collect Data, and SharePoint Lists**. Here you will find the commands to import data from other programs or even through e-mail.



The **Database Tools tab** is organized in five groups: **Macro, Show/Hide, Analyze, Move Data, and Database Tools**. Here you find the commands to build relationships between the many tables/queries in a database. Build macros, Launch Visual Basic Editor and so on.



**Contextual Tabs** appear on the Ribbon **when certain objects or commands are selected**.

These tabs provide easy access to options specific to the selected object or command.

## Creating a New Database

1. Click the Microsoft Office Button, and then click New.
2. Click on Blank Database or Click on a Pre-built Database located in the center of the screen
3. Your choice will appear in the download field, there you will click on Create

## Opening an Existing Database

1. Click the Microsoft Office Button, and then click Open.
2. In the Open dialogue box, navigate to the folder that contains the file you want to open, and then double-click the file.

## Navigating in a Database

This table list ways to navigate in a database using your Keyboard to move the insertion point in an active database

**To do this:**

**Press.....**

Select the active tab of the ribbon and Activate the access keys	Alt or F10. Press either of these keys again to move back to the document and cancel the access keys.
Move to another tab of the ribbon	Alt or F10 to select the active tab, and then Left arrow or Right Arrow.
Minimize or Restore the Ribbon	Ctrl +F1
Display the shortcut menu for the selected Command	Shift + F10
Move the focus to select each of the following areas of the window <ul style="list-style-type: none"> <li>● Active tab of the Ribbon</li> <li>● View status bar at the bottom of the window</li> <li>● Your document</li> </ul>	F6
Move the focus to each command in the Ribbon forward or backward	Alt or F10 and then Tab or Shift-Tab
Move down, up, left or right among the Items in the Ribbon	Down Arrow, Up Arrow, Left Arrow or Right Arrow
Activate the selected command or control in the Ribbon	the Ribbon

Open the selected menu or gallery in the Ribbon	Space Bar or Enter
Activate a command or control in the Ribbon so you can modify a value	Enter
Finish modifying a value in a control in the Ribbon, and move focus back to the document	Enter

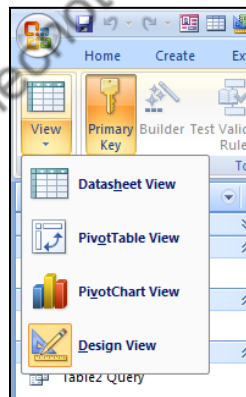
## Displaying Different Views

**Note** - Access offers different View Options depending on the object you are working with, see View Options by Object Below. Access allows different functions and commands to be performed while in the different view formats.

### **Table: View Options**

The two views you will use most often when working with a Table will be:

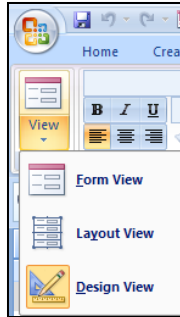
1. **Datasheet View:** this is your **data entry screen**
2. **Design View:** this is where you **define your data type**



### **Form: View Options**

The two views you will work in most often when working with a form will be:

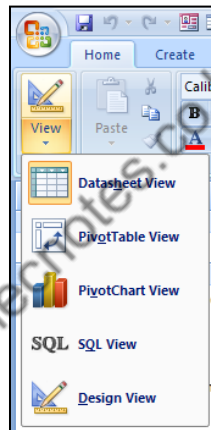
1. **Layout View:** here you **design forms** and see **changes as you apply them**
2. **Design View:** this is where you would **actually design your form**, although some changes can be done in layout view, many are more easily done here and some changes can only be made here.



### Query: View Options

The two views you will work in most often when working with Queries will be:

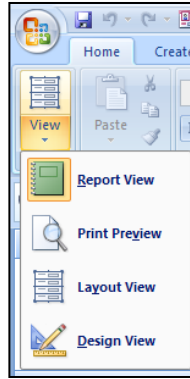
1. **Datasheet View:** here you would **filter data** in a Query
2. **Design View:** here you have **access to the tools** to make changes to your query



### Report: View Options

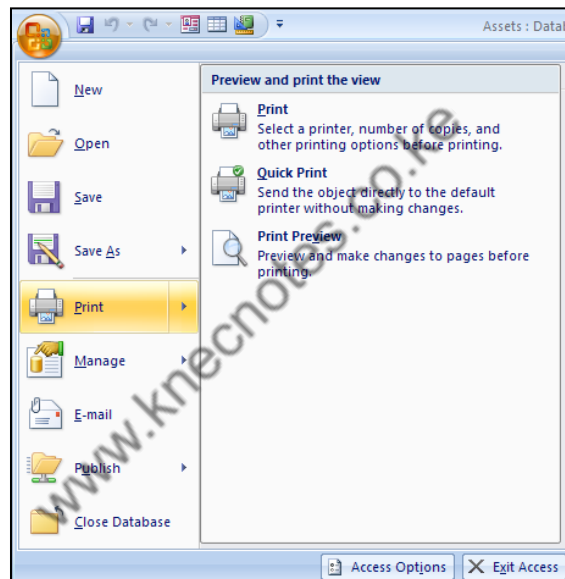
The three views you will work with most often when working with Reports will be:

1. **Report View:** here you can **filter the data** and **drilldown to print only what you need**.  
Just right-click inside a control and select a filtering option from a contextual shortcut menu
2. **Layout View:** here you **design reports and see changes as you apply them**
3. **Design View:** this is where you would actually **design your report**, although some changes can be done in layout view, many are more easily done here and some changes can only be made her



## Previewing and Printing an Object

Click the Microsoft Office Button, point to Print.



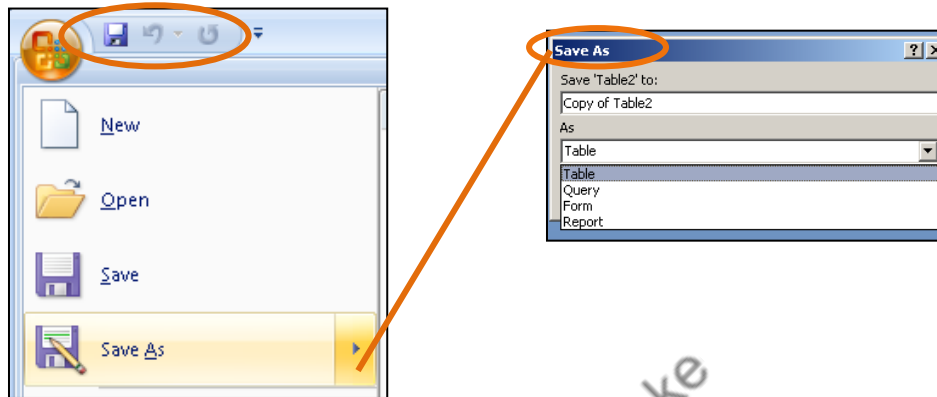
- **Print** allows you to **select a printer**, number of copies, and **other printing options** before printing.
- **Quick Print** allows you to **send** the object directly to the default printer **without making changes**.
- **Preview** allows you to **preview and make changes** to pages before printing.

## Saving and Closing a New Database

### Saving a New Database

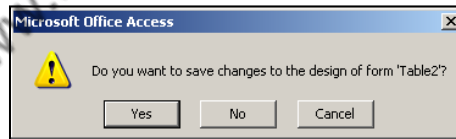
1. On the **Quick Access Toolbar**, click the **Save** button; or

2. Click the **Microsoft Office Button**, and then **click Save As**, the Save As dialog box will appear. In the **Save “Object Name “to field, type the name of the object.**
3. **Click on the drop down menu in the As field** choose **type of object** you want to convert to.
4. **Click Ok.**



### Closing a New Database

1. Click **the Microsoft Office Button**, **and then click Close.**
2. **A Microsoft Office Access dialogue box will appear displaying a “Do you want to save...?” Message**
3. **Click Yes to save, No to discard, or Cancel to close dialogue box.**



## **Converting and Compatibility Issues**

### Converting a Database to a different version of Access

1. **Click the Microsoft Office Button**, **point to Save As**, and then, **under Save the database in another format**, **click the file format to which you want to convert.** For example, you can click Current File Format to save the copy in the same file format as the original, or you can choose one of the other file formats.
2. **In the Save As dialog box, type a file name** for the copy of the database in the File name box, and then **click Save.** A copy of the database is created and opened; Access automatically closes the original database.



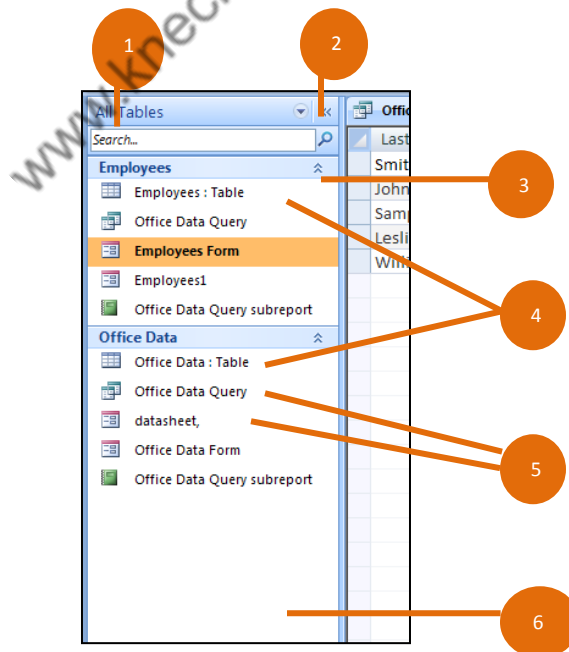
## Compatibility with different versions of Access

If you need to **share a database** with someone who has an **earlier version** of Access **you will need to create a copy of the database to an earlier format** (see instructions above for **Converting a Database**)

**Note** – if you use a feature in your database that requires a 2007 format you will not be able to convert this database to an earlier version. Features that will not convert to a previous file format include attachments, multi-valued fields, offline data or links to external files that are not supported by earlier versions of Access.

## Exploring the Navigation Pane

The **Navigation Pane** is located on the left hand side of your screen. If the pane is not open, click F11. Otherwise go to the top of the open pane, and click the downward facing triangle. A drop down list of available views will appear. **Here you will find all the objects in your open database.** Use the navigation pane to **organize your objects**. This pane replaces the Database Window used in earlier versions of Access. From **here you can create tables, forms, reports, and queries.**



## Navigation Pane features and controls

1

**Menu:** Sets or changes the categories by which the pane groups database objects.

Click the menu to see the category in use. Right-click the menu to perform other tasks, such as starting the Navigation Options dialog box.

2

**Shutter Bar:** Expands or collapses the Navigation Pane.

3

**Search box:** Find objects in large databases quickly by entering part or all of an object name. As you type, the pane hides any groups that do not contain objects that match your search text.

4

**Groups:** By default, the pane displays visible groups as sets of bars. To expand or close a group, click the up or down arrows. Remember that group names changes as you change categories.

5

**Database objects:** The tables, forms, reports, queries, and other objects in a database. The objects that appear in a given group depend on the logic behind the parent category. For example, if you use the Object Type category, the pane creates separate groups for tables, forms, reports, and so on. In turn, each group displays those objects that logically belong there — the tables group displays only the tables, and so on.

6

**Blank space:** Right-click the blank space at the bottom of the Navigation Pane to perform a variety of tasks. You can change categories, sort the items in the pane, and show or hide the details for the objects in each group.

## Exploring an Access Database

The create tab is where you will find the tools to create all the objects that make up a database.

