

Chapter 9

The Database and Database Management System

- **Data Management**
- **DBMS Functions and Concepts**
- **The Data Base Administrator**

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Data Organization

- **Data Value**
 - Contents of a field contained in a record
- **Data Field**
 - Smallest unit of data
- **Record**
 - Collection of related fields
- **File**
 - Collection of related records

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Spreadsheet as a Simple Database

- Rows and columns of a spreadsheet can be regarded as a simple database
- Flat files
 - Does not have repeating columns
 - Spreadsheet table is a file and column is a field
- Key fields
 - Contains a value to uniquely identify each record in a table

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Data Structure vs. Spreadsheet Terminology

Spreadsheet Term	Data Structure Term
Table	File
Column	Field
Row	Record

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Database Terms

- **Database**
 - All data stored on computer-based resources of the organization
- **Database Management System (DBMS)**
 - Software application that stores the structure of the database, the data itself, relationships among the data in the database, as well as forms and reports pertaining to the database

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Hierarchical Structures

- **Hierarchical structure**
 - Implicit relationships
 - Uses the 'parent / children' concept
 - Limitation: Cannot handle ad hoc requests
 - First DBMS was IDS by GE in 1964
- **Network structure**
 - Implicit relationships
 - Allow given record to point back to any other record in the database
 - Specification released by CODASYL in 1971
 - Solves problem of having to backtrack through data but chaotic structure as database grows

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Relational Structures

- **Relational structure**
 - **Implicit Relationships**
 - **Frees designers from need to specify every relationships prior to building the database as with Hierarchical Database structures**
 - **Does not rely on physical (explicit) relationships**
 - **Easy to modify**

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The Database Concept

- **Database concept**
 - **Logical integration of records in multiple tables**
- **Minimize Data redundancy**
 - **Duplication of data**
- **Data Inconsistency**
- **Data Independence**
 - **Keep data specifications separate from programs, in tables and indexes**

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Data Items and Fields

- **A phone book contains **fields****
- **In each field, there are **data items****

Last	First	Address	Phone
Capron	H.	123 Digit	555-1001
Laurie	Robert	233 First	253-5321

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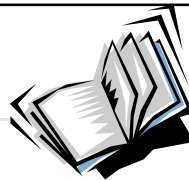
Records

- **Using the phone book analogy, each individual is a **record**. The larger the city, the more records it contains.**

Capron	H.	123 Digit	555-1001
Noyes	D.	341 Market	555-0101
Fell	C.	2467 Buyer	555-0110

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Files



- **Continuing with the phone book analogy, the book is the collection of records.**
- **In a database, this collection of records is the database file or table.**

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Database File = Table

- **Columns are the fields**
- **Rows are the records.**

Table

Record


Addresses : Table				
First Name	Last Name	Address	City	
Janet	Leverling	722 Moss Bay I	Kirkland	
Margaret	Peacock	4110 Old Redn	Redmon	
Nancy	Davolio	507 20th Ave.	Seattle	
Andrew	Fuller	908 W. Capital	Tacoma	
Steven	Buchanan	14 Garrett Hill	London	

Data Items

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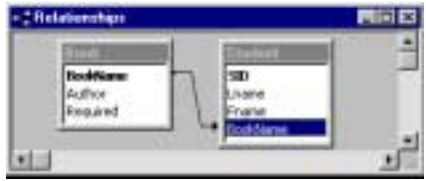
Relational Databases

- Used with personal computers
- Data organized in a table format.
- Data stored in one Table (File) can be tied to (Related) to data in another Table (File).
- MS Access is a Relation Database Management System



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Table Relationships



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Database Power

- Connection** = Relating Data in One Table (File) to Data in Another
- Key Fields** = Establishes connection between two tables of data
- Equivalent Field Names (Key Fields) must exist between different Tables to relate the data
- Queries** allow you to provide sorted searches of all relevant data in the database and display appropriate records.

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SALES REPRESENTATIVE FILE						
REP-ID	LN-NAME	FN-NAME	REGION	HD-DATE	PHONE	
114	Able	Lois	SW	10-15-86	(802)	634-8384
159	Higgins	Heatherly	SE	12-16-91	(604)	724-6472
230	Sullivan	Pat	SE	2-21-88	(305)	734-2887
386	Spaid	Kristan	NW	6-14-90	(708)	822-8222
349	Demaree	Donn	NW	7-10-93	(906)	634-1955

CUSTOMER FILE			
CUST-NO	CN-NAME	CITY	REP-ID
2924	Bullard Computer	Seattle	349
3007	Computer City	Miami	230
4987	Laser Systems	Atlanta	159
8987	Vanner Lab Systems	Naperville	386
9185	CCI Computers	Spokane	349
9876	Computing Solutions	Tucson	114

ORDER FILE			
CUST-NO	DATE	ITEM-NO	QTY
3007	8-12-99	7639	11
4987	8-12-99	6720	15
8987	8-13-99	2378	14
9185	8-10-99	608	10
9876	8-14-99	2720	20

INVENTORY FILE		
ITEM-NO	DESCR	QOH
1628	Hard scanner	181
3378	Printer	453
3403	Hard drive	294
5647	Printer pack	676
6720	3 1/2" disk holder	982
6399	CD-ROM drive	817
7639	Sound card	0
8870	Mouse	796
9037	Monitor	152

CREATING A DATABASE

- Two Step Process**
 - Design Database Field Structure**
 - Field Names
 - Field Types (Character, Numbers, Logical)
 - Field Widths (Max Characters for Entry)
 - Key Fields (Used for Query)
 - Entering Data**
 - Using Tables
 - Using Forms


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Begin With a Sketch

- Careful planning will include a paper sketch of the file structure and the kind of data that will be put into each field.

Four-rid Description Cost Hours Food Waste Stairs

14 San Juan Islands 25 35 Y N N



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Field Name and Type

- Each **field** must have a unique name.


Last First Address Phone

There are four commonly used types of fields:

- Character = descriptive data (text).
- Numeric = numbers used for calculation
- Date = Month Day Year and/or time
- Logic = T/F, Y/N, Checked/Unchecked

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Field Widths

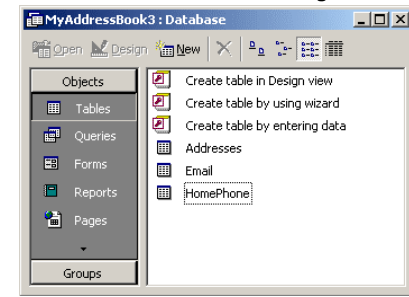


- Field width determines the maximum number of characters or digits to be contained in the field.

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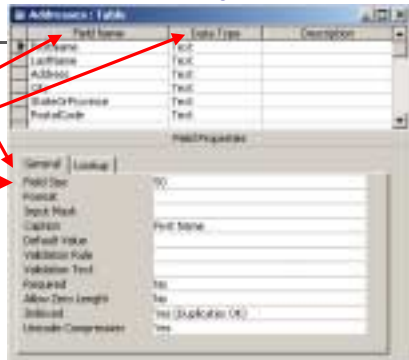
MS Access Navigation

The Tables, Queries, Forms, and Reports are accessed on the Database Dialog Box



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MS Access Table Layout View



Field Name

Field Types

Field Width

Design Field Structure

Enter & Display Data Using Table

Record data items are entered into each field of the Table.

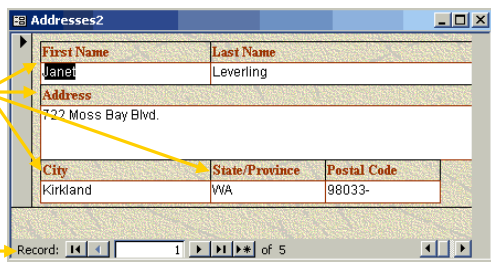
Field	First Name	Last Name	Address	City	State/Province	Postal Code
Record	Janet	Leverling	722 Moss Bay I	Kirkland	WA	98033
	Margaret	Peacock	4110 Old Redn	Redmond	WA	98052
	Nancy	Davolio	507 20th Ave.	Seattle	WA	98122
	Andrew	Fuller	908 W. Capital	Tacoma	WA	98401
	Steven	Buchanan	14 Garret Hill	London		SW1 8JR

Data Items

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Enter & Display Data Using Form

A Form allows you to enter or view data fields for one record at a time.



Fields

Record Select

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REPORTS: Information Output

Addresses2

Reports are used to display the data records.

You can not do data entry or modification using tables.

First Name	Last Name	
Andrew	Fuller	
Address		
908 W. Capital Way		
City	State/Province	Postal Code
Tacoma	WA	98401-

First Name	Last Name	
Janet	Leverling	
Address		
722 Moss Bay Blvd.		
City	State/Province	Postal Code
Kirkland	WA	98033-

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QUERY: What If?

Queries can be used to answer "What If?" type questions by selecting records which match a relational expression.

Relational Operators are described below:

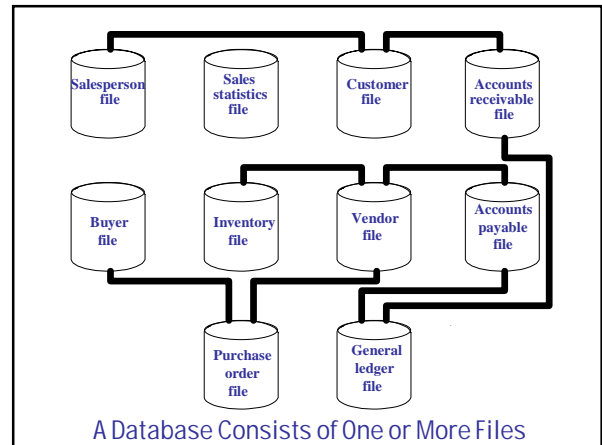
- < Less Than
- > Greater Than
- = Equal To
- <= Less Than or Equal To
- >= Greater Than or Equal To
- <> Not Equal To

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Structured Query Language

- **SEQUEL from IBM**
 - Continuation of IMS
- **Renamed SQL**
 - Structured Query language
 - Embedded within traditional language
 - Standalone Program for Database access
 - Became an ANSI Standard 1992

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Describing the Database Contents

Step 1: Data dictionary → Enter dictionary data

Step 2: Enter dictionary data → Data description language (DDL) → Schema

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Schema

- Data field name
- Aliases (other names used for same data field)
- Type of data (numeric alphabetic)
- Number of positions
- Number of decimal positions
- Various integrity rules

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Rule for Required Field

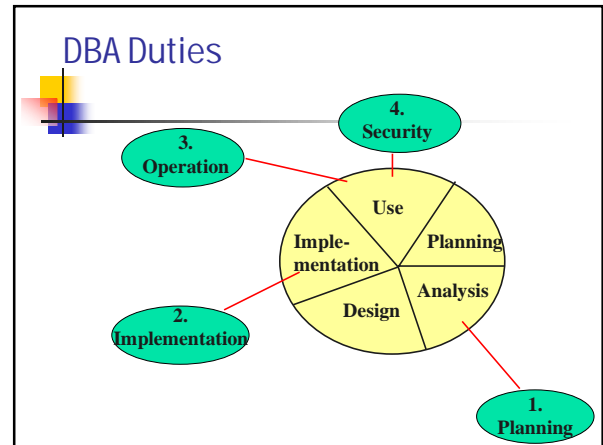
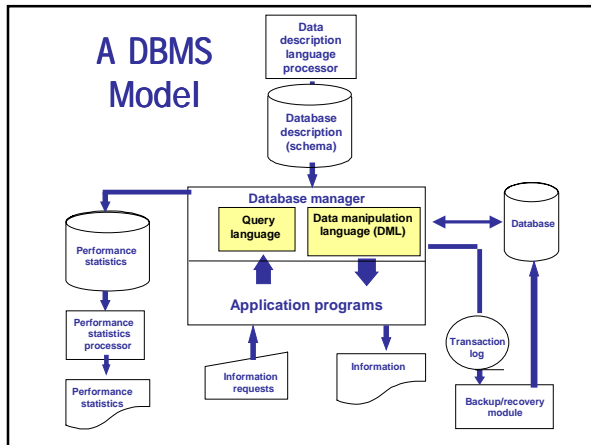
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The Database Administrator (DBA)

DBA Duties

- Database planning; work with users and others, define schema, etc.
- Database implementation; creating the database and enforcing policies and procedures
- Database operations
- Database security

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Putting it all Together

- The ideal situation
 - Enterprise planning (Executives)
 - Enterprise Data Modeling (Executives, Users, DBA)
 - Entity-relationship diagram (DBA, Systems Analysts)
 - Data dictionary (DBA, Systems Analysts)
 - Select DBMS (DBA, MIS Steering committee)
 - Specify schema, subschema (DBA, Users)
 - Store in DASD (DBA, Computer operations)

DBMS Advantages

- Reduce data redundancy
- Achieve data independence
- Enable integration of data from multiple files
- Retrieve data and information quickly
- Improve security

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