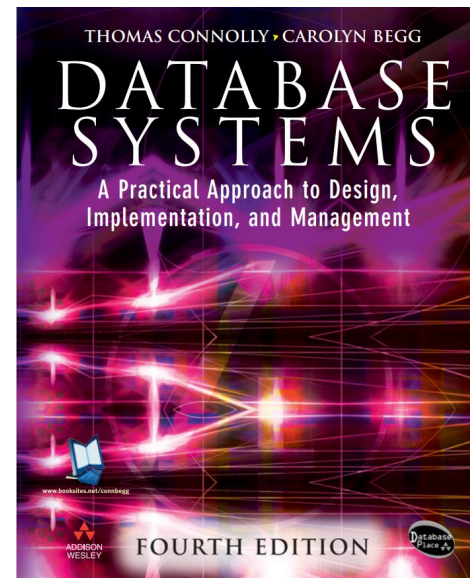# Fundamentals of Database

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References

- Database Systems A Practical Approach to Design, Implementation and Management 4th Edition
- Rod Stephens , Beginning Database Design Solutions
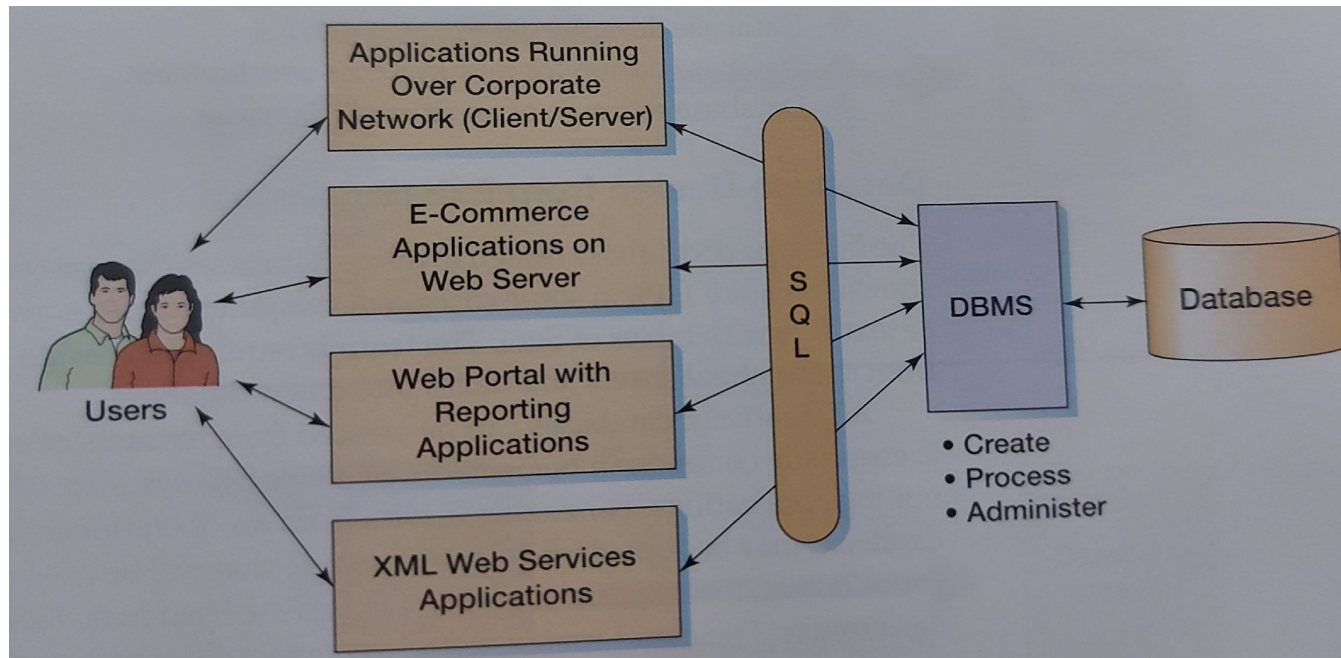- http://www.w3schools.com/sql/default.asp
- http://functionx.com

Course info

- Prerequisite –
- Post requisite - Database programming, Data mining, web programming, Visual programming

- Final Examination – 40
- Mid Exam – 15
- Laboratory Work – 45

Contents

○ Database

○ Database Management system

Source: "Database processing" book

Terminology

Data (Юмс үзэгдлийг илэрхийлсэн баримт, ажиглалтыг өгөгдөл гэнэ)

- **Information** (Боловсруулагдсан өгөгдөл)
- **Knowledge** (Мэдлэг)
- **Table** (Хоорондоо холбоо бүхий өгөгдлүүдийг мөр баганы дагуу эмхлэн байгуулсан объект)
- **Attribute || Field** (хүснэгтийн багана)
- **Record or tuple** – хүснэгтийн мөр

Data type

Text

Numeric

AutoNumber

Currency

Date

Memo

Yes/No

Hyperlink

Object

Attachment

Chapter 1

Database system Transparencies

Database system objectives

o **Common uses of database systems.**

o **Meaning of the term database.**

o **Meaning of the term Database Management System (DBMS).**

o **Components of the DBMS environment.**

o **Typical functions of a DBMS.**

o **Advantages/disadvantages of DBMSs.**

o **Types of database applications**

Examples of Database Systems

- Purchases from the supermarket
- Purchases using your credit card
- Booking a holiday at the travel agents
- Using the local library
- Renting a video
- Using the Internet

Database

○ **Shared collection of logically related data (and a description of this data), designed to meet the information needs of an organization.**

Өгөгдлийн сан

Өгөгдлийн сан гэдэг нь мэдээллийг хадгалахад зориулагдан дизайн хийгдсэн, логик уялдаа холбоо бүхий өгөгдлийн хамтран ашиглаж болох цуглуулга, мөн тэдгээр өгөгдлийн тодорхойлолт юм.

Database Systems A Practical approach to Design, Implementation and Management (1996) Thomas M Connolly, Carolyn E Begg, Anne D Strachan

Өгөгдлийн сан

1. Системд хамааралтай өгөгдлүүдийг хадгалж байдаг.
2. Мөн эдгээр өгөгдлүүдийн тодорхойлолтуудыг агуулж байдаг.

Relational Database Systems (1998) Colin Ritchie (course text)

Өгөгдлийн сан

Өөрөө өөрийгөө тайлбарлаж чадах өгөгдлийн цогц цуглуулга

SQL for Dummies (3rd Ed) (1998) Allen G Taylor

Database

- Shared collection - can be used simultaneously by many departments and users.

- Logically related - comprises the important objects and the relationships between these objects.

- Description of the data - the system catalog (meta-data) provides description of data to enable data independence.

DBMS

- **A software system that enables users to define, create, and maintain the database and that provides controlled access to this database.**

Өгөгдлийн санг үүсгэх, устгах, өөрчлөх боломжийг тодорхой хяналт, хандалттайгаар олгодог програм хангамжийг өгөгдлийн санг удирдах систем гэнэ.

ӨСУС буюу Database Management System = "Програм хангамж"

ӨСУС нь хэрэглэгчдийг ӨСХэл ашиглах боломжоор хангаж байдаг.
- DDL буюу өгөгдлийн санг тодорхойлох хэлийг ашиглан өгөгдлийн санг үүсгэх
- DML буюу өгөгдлийн санг удирдах хэлийг ашиглан өгөгдлийн санг удирдах
- DCL Өгөгдлийн санд тодорхой хяналттайгаар хандах

Database Management Systems

Popular Database Management Systems

Database	Manufacturer	Computer Type
Access	Microsoft Corporation	Personal computer, server, mobile devices
Adabas	Software AG	Server, mainframe
D^3	Raining Data	Personal computer, server
DB2	IBM Corporation	Personal computer, server, mainframe
Essbase	Oracle Corporation	Personal computer, server, mobile devices
FastObjects	Versant Corporation	Personal computer, server
FileMaker	FileMaker, Inc.	Personal computer, server
GemFire	GemStone Systems	Server
Informix	IBM Corporation	Personal computer, server, mainframe
Ingres	Ingres Corporation	Personal computer, server, mainframe
InterBaseSMP	Embarcadero Technologies	Personal computer, server
KE Texpress	KE Software, Inc.	Personal computer, server
MySQL	Oracle Corporation	Personal computer, server
ObjectStore	Progress Software Corporation	Personal computer, server
Oracle Database	Oracle Corporation	Personal computer, server, mainframe, mobile devices
SQL Server	Microsoft Corporation	Server, personal computer
SQL Server Compact Edition	Microsoft Corporation	Mobile devices
Sybase	Sybase Inc.	Personal computer, server, mobile devices
Teradata Database	Teradata	Server
Versant	Versant Corporation	Personal computer, server
Visual FoxPro	Microsoft Corporation	Personal computer, server

Database application program

○ A software program that interacts with the database by issuing an appropriate request (typically an SQL statement) to the DBMS.
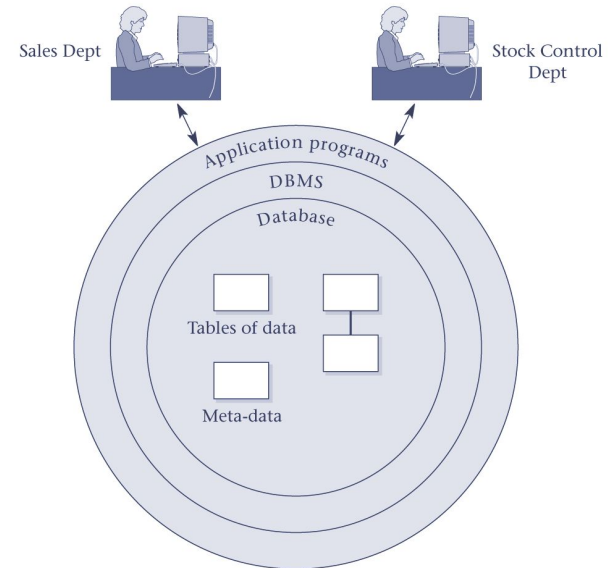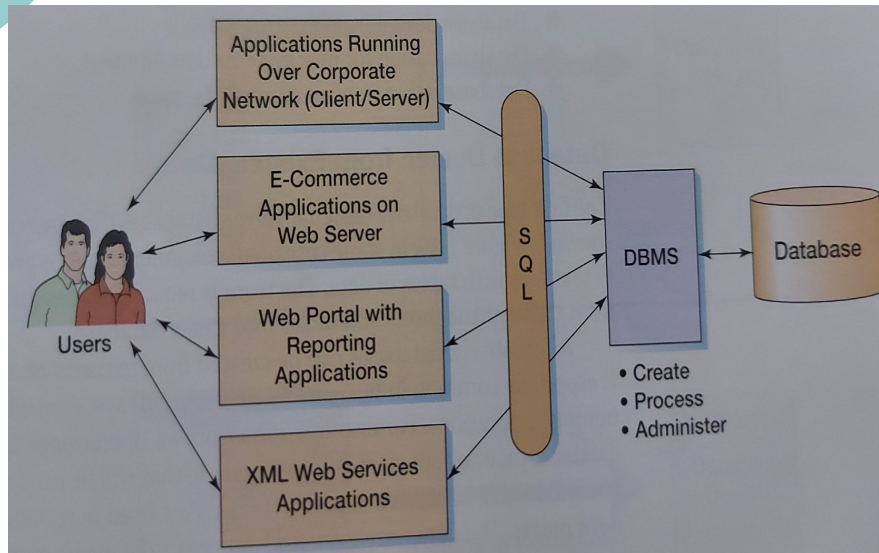
Views

- Allows each user to have his or her own view of the database.

- A view is essentially some subset of the database.

Views

- Benefits include:
  - Provide a level of security;
  - Provide a mechanism to customize the appearance of the database;
  - Present a consistent, unchanging picture of the structure of the database, even if the underlying database is changed.

DBMS

Sales Dept

Stock Control Dept

Application programs

DBMS

Database

Tables of data

Meta-data
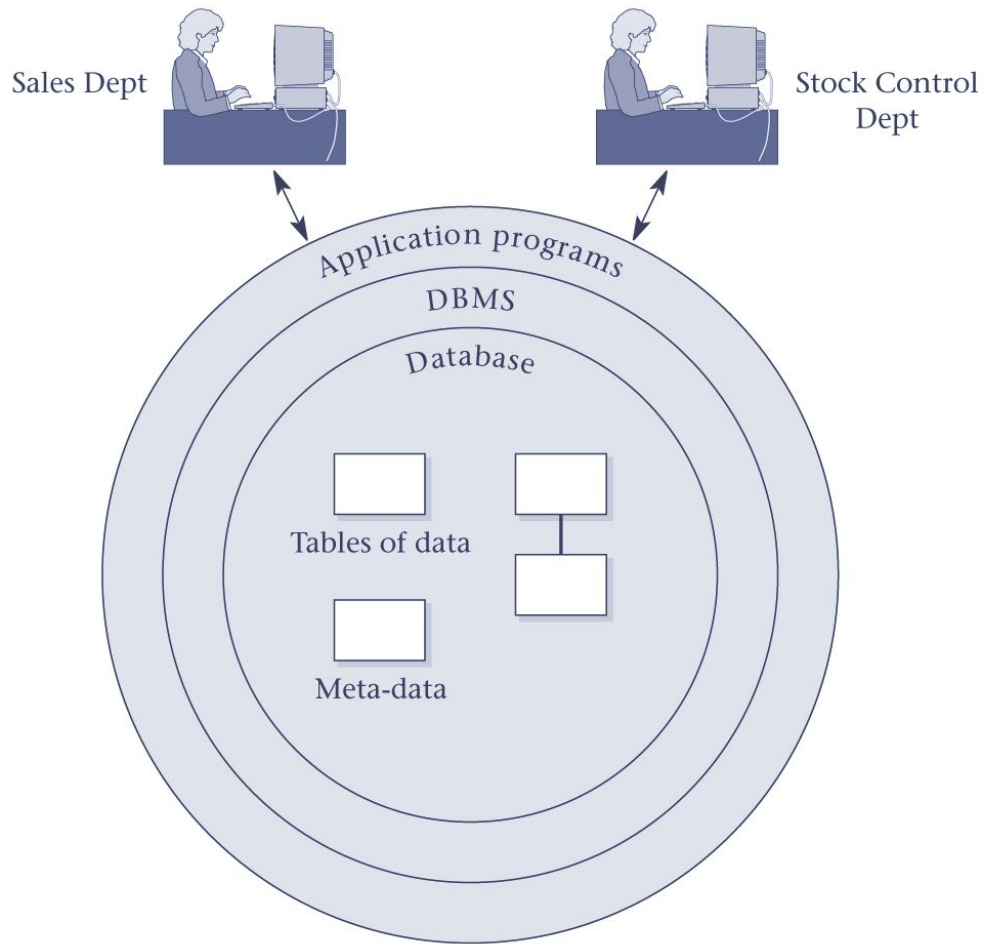
Components of DBMS Environment

- Hardware
  - Can range from a PC to a network of computers.
- Software
  - DBMS, operating system, network software (if necessary) and also the application programs.
- Data
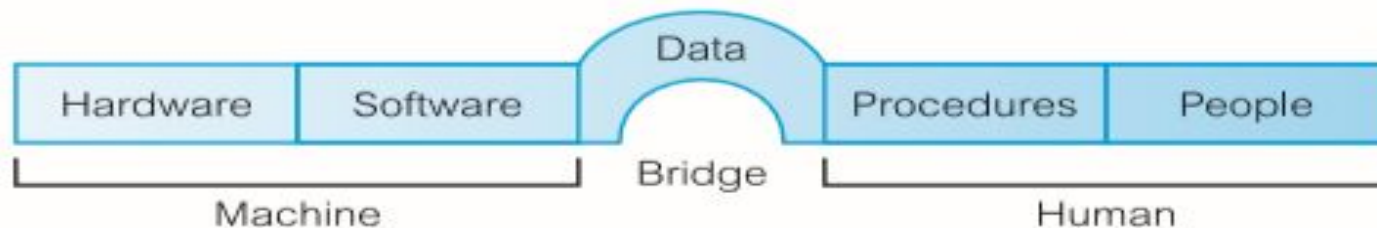 - Used by the organization and a description of this data called the schema.

Components of DBMS Environment

○ **Procedures**
  - **Instructions and rules that should be applied to the design and use of the database and DBMS.**

○ **People**
  - **Includes database designers, DBAs, application programmers, and end-users.**

Hardware	Software	Data	Procedures	People
Machine		Bridge	Human	

Components of DBMS Environment

Өгөгдлийн сангийн удирдлагын системийн орчин

File system

Functions of a DBMS

- Data Storage, Retrieval, and Update.

- A User-Accessible Catalog.

- Transaction Support.

- Concurrency Control Services.

- Recovery Services.

Functions of a DBMS

- Authorization Services.

- Support for Data Communication.

- Integrity Services.

- Services to Promote Data Independence.

- Utility Services.

Advantages of DBMSs

- Control of data redundancy
- Data consistency
- Sharing of data
- Improved data integrity
- Improved maintenance through data independence.

Disadvantages of DBMSs

- Complexity
- Cost of DBMS
- Cost of conversion
- Performance
- Higher impact of a failure

Relational, Object-Oriented, and Multidimensional Databases

A **data model** consists of rules and standards that define how the database organizes data

Data Models for Popular DBMSs

Data Model	Popular DBMSs		Data Model	Popular DBMSs	
Relational	Access Adabas FileMaker Informix Ingres InterBase MySQL	SQL Server Sybase Teradata	Object-relational	DB2 Oracle Polyhedra PostgreSQL Visual FoxPro Teradata	
Object-oriented	FastObjects GemFire KE Texpress	ObjectStore Versant	Multi-dimensional	D^3 Essbase	Oracle Express Edition

Relational databases

A **relational database** stores data in **tables** that consist of rows and columns

- Each **row** has a primary key
- Each **column** has a unique name

○ A **relationship** is a link within the data
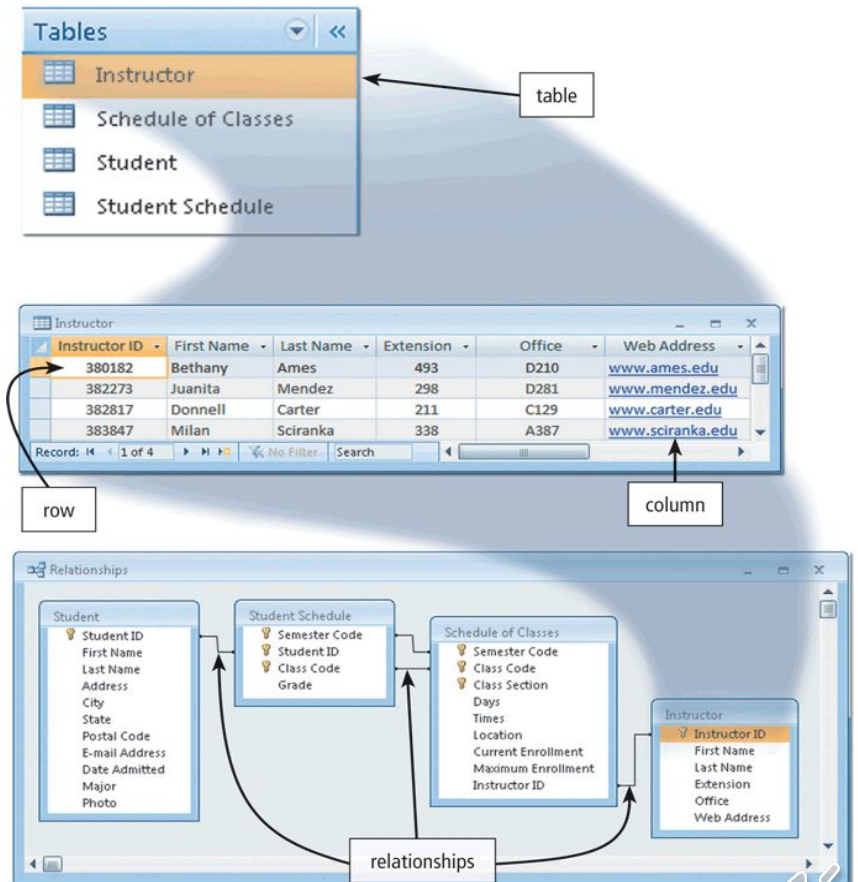
Relational, Object-Oriented, and Multidimensional Databases

Structured Query Language (**SQL**) is a query language that allows users to manage, update, and retrieve data

```
SELECT CLASS_TITLE, CLASS_CODE, MAXIMUM_ENROLLMENT -
  CURRENT_ENROLLMENT AS SEATS_REMAINING
FROM SCHEDULE_OF_CLASSES, CLASS_CATALOG
WHERE SCHEDULE_OF_CLASSES.CLASS_CODE =
  CLASS_CATALOG.CLASS_CODE
ORDER BY CLASS_TITLE
```

Class Title	Class Section	Seats Remaining
Algebra 1	51	14
Art Appreciation	52	19
English Composition 1	02	5
Introduction to Sociology	01	14

Relational, Object-Oriented, and Multidimensional Databases

An **object-oriented database** (**OODB**) stores data in **objects**

○ Examples of applications appropriate for an object-oriented database include:

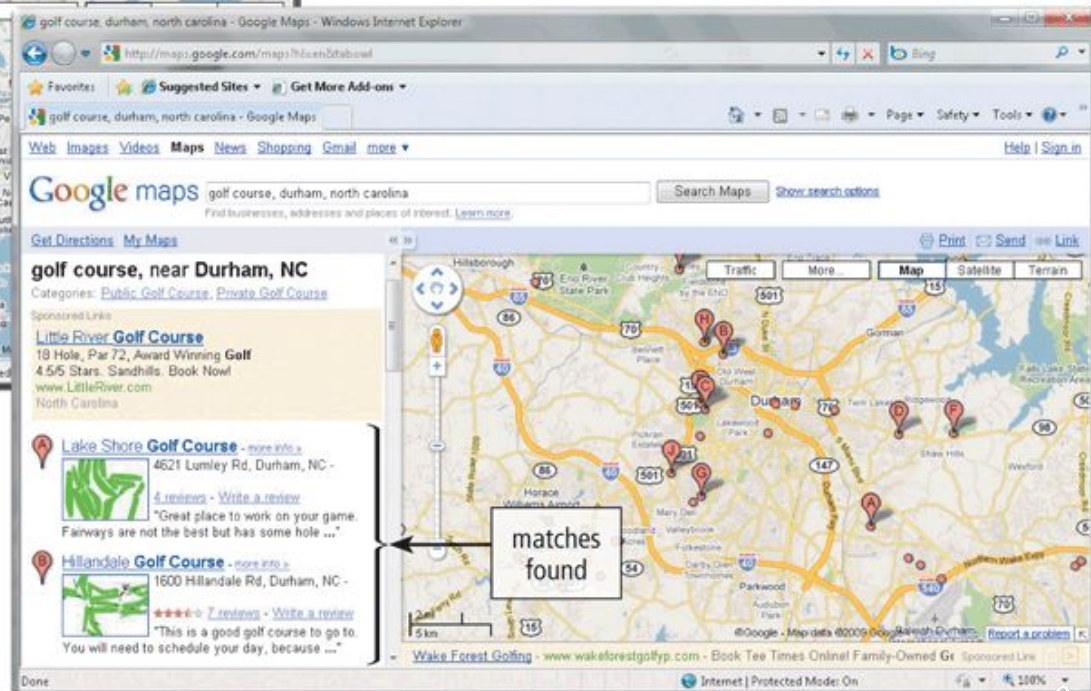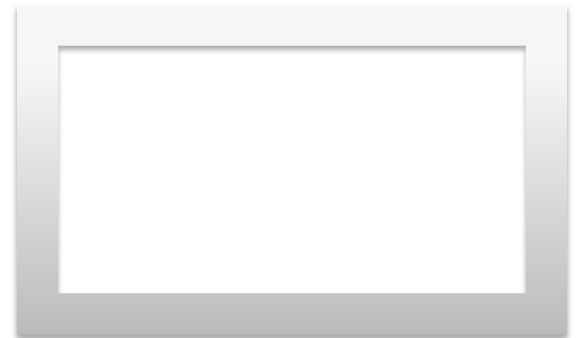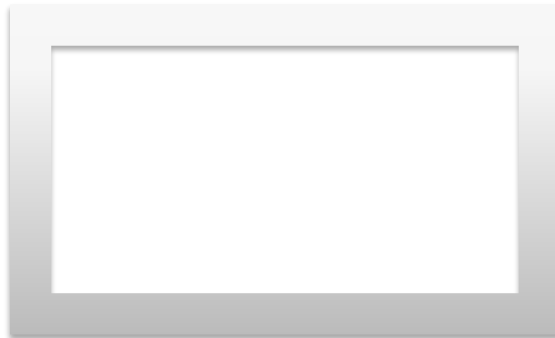| Multimedia database	Groupware database
Computer-aided design database	Hypertext database

Relational, Object-Oriented, and Multidimensional Databases
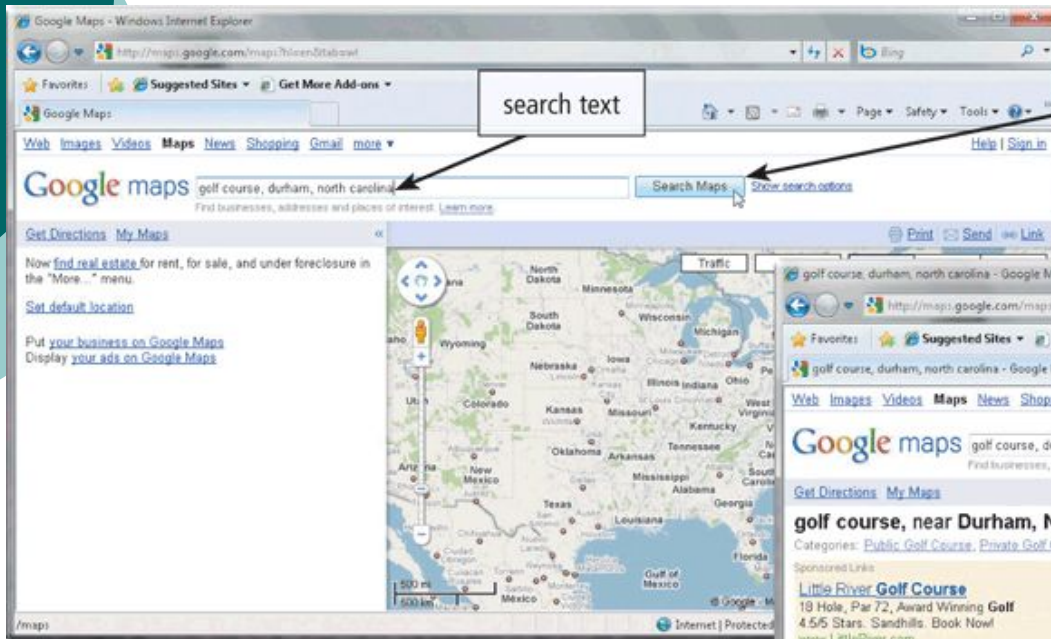
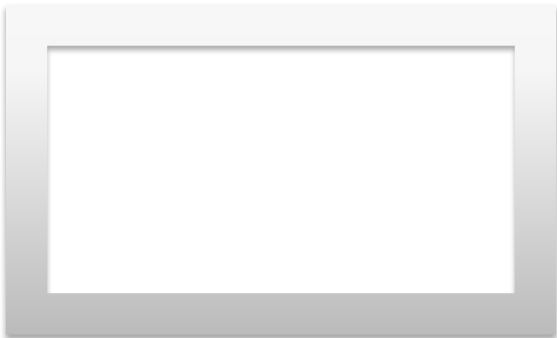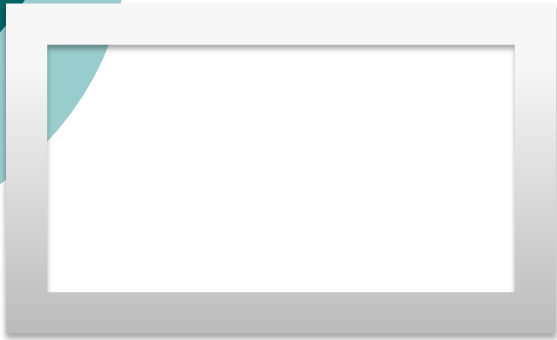# Web Databases

Databases on the Web allow you to:

Thanks for attention!