



Università degli Studi di Brescia
PhD Course 2016

An Introduction to database design and implementation

Michele Melchiori
DII – UniBS

Databases are incredibly prevalent. They underlie technology used by most people every day if not every hour. Databases reside behind a huge fraction of websites; they are a crucial component of telecommunications systems, banking systems, video games, and just about any other software system or electronic device that maintains some amount of persistent information.

In addition to persistence, database systems provide a number of other properties that make them exceptionally useful and convenient: reliability, efficiency, scalability, concurrency control, data abstractions, and high-level query languages.



Motivations

For your research probably you need to deal with (possibly complex) data ...

Activities on the data:

- representing
- managing
- storing
- processing
- aggregating, summarizing...



Targets

- Presenting the basic concepts of database (*DB*) design and use
- Describing a methodology/diagrams for designing simple databases
- From the design to the implementation: Tools
- How to exploit the data: some querying and exporting



Course Outline

- Definitions
- UML class diagram
- Relational data model
- Implementation of relational databases
- Presentation and use of software tools
- Examples/Laboratories



Database design

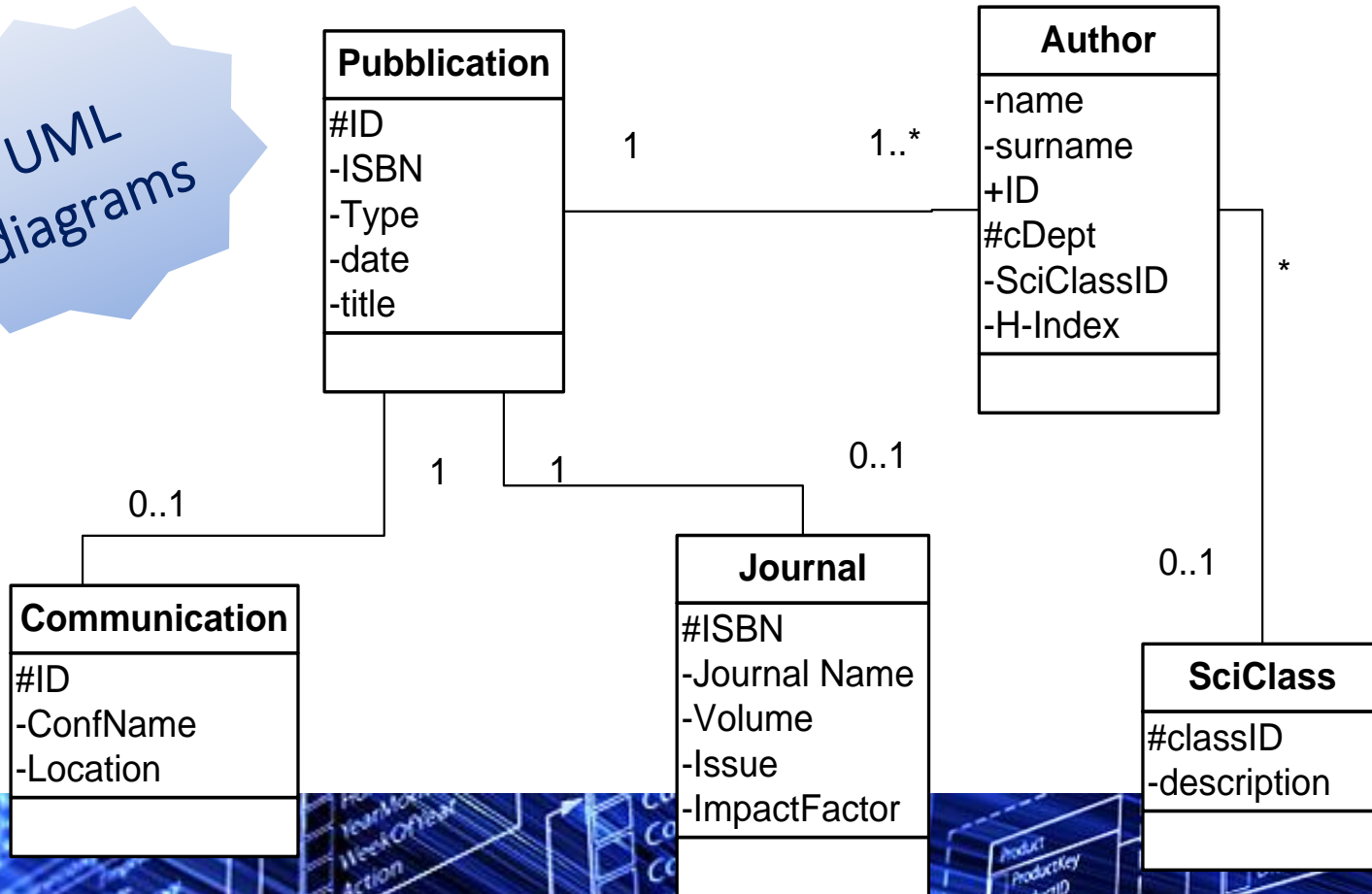
Three main phases:

- **Definition of requirements on the data:** *What data we need in the DB? What is the purpose and the expected size? How we want to use and to query it?*
- **Conceptual design:** *How we representing the information requirements? A graphical and complete description (**conceptual schema**). The schema answers to: *What concepts, detailed infos and association among concepts we need in the DB?**
- **Logical design:** *How we implement the DB? By translating the conceptual schema into the data model used by the DBMS; the result is a **logical schema**.*



Conceptual schema, “Scientific Publications”

UML diagrams



Relational data model

- It is based on (a version of) the mathematical notion of **relation**
- Relations are naturally represented by means of **tables**. Each row is called **tuple** and the headings, **attributes**.

PATIENT

Code	Surname	FirstName
A102	Harris	Lucy
B372	Rossini	Peter
B543	Johnson	Nadia
B444	Johnson	Luigi
S555	Rose	Jean

DOCTOR

Number	Surname	FirstName	Ward
203	Black	Peter	A
574	Bisi	Mavis	B
461	Boyne	Steve	B
530	Clark	Nicola	C
405	Mizzi	Nicola	A
501	Mount	Mavis	A

ADMISSION

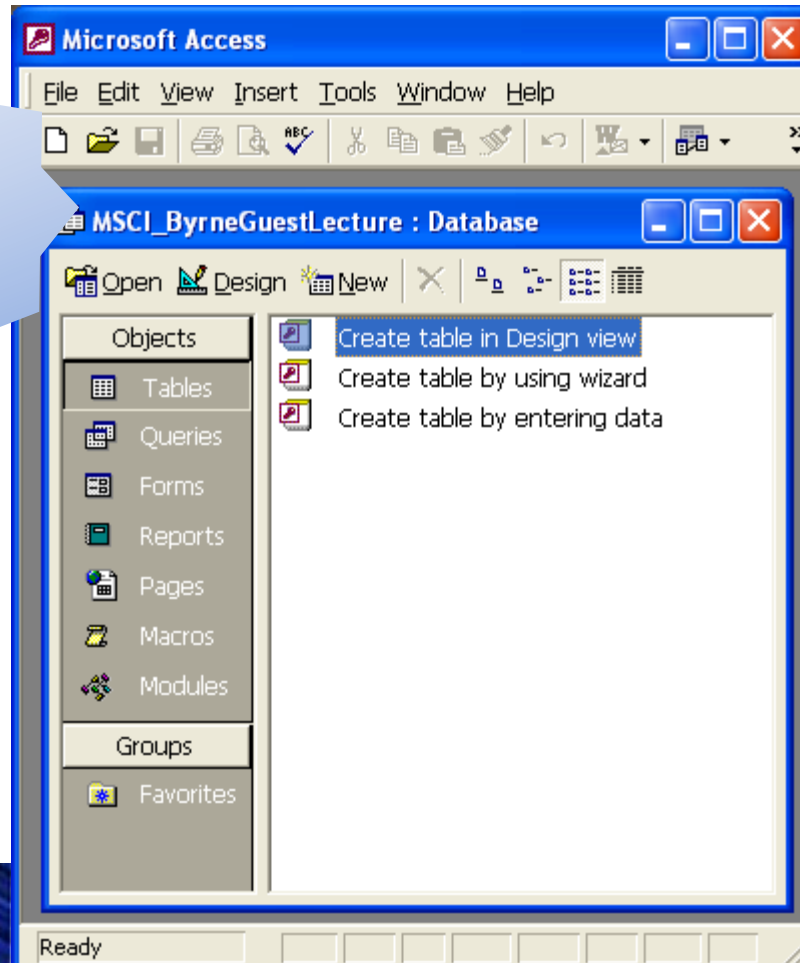
Patient	Admitted	Discharged	Ward
A102	2/05/04	9/05/04	A
A102	2/12/04	2/01/05	A
S555	5/10/04	3/11/04	B
B444	1/12/04	1/01/05	B
S555	5/11/04	10/11/04	A

WARD

Code	Name	Consultant
A	Chirurgia	203
B	Pediatria	574
C	Medicina	530

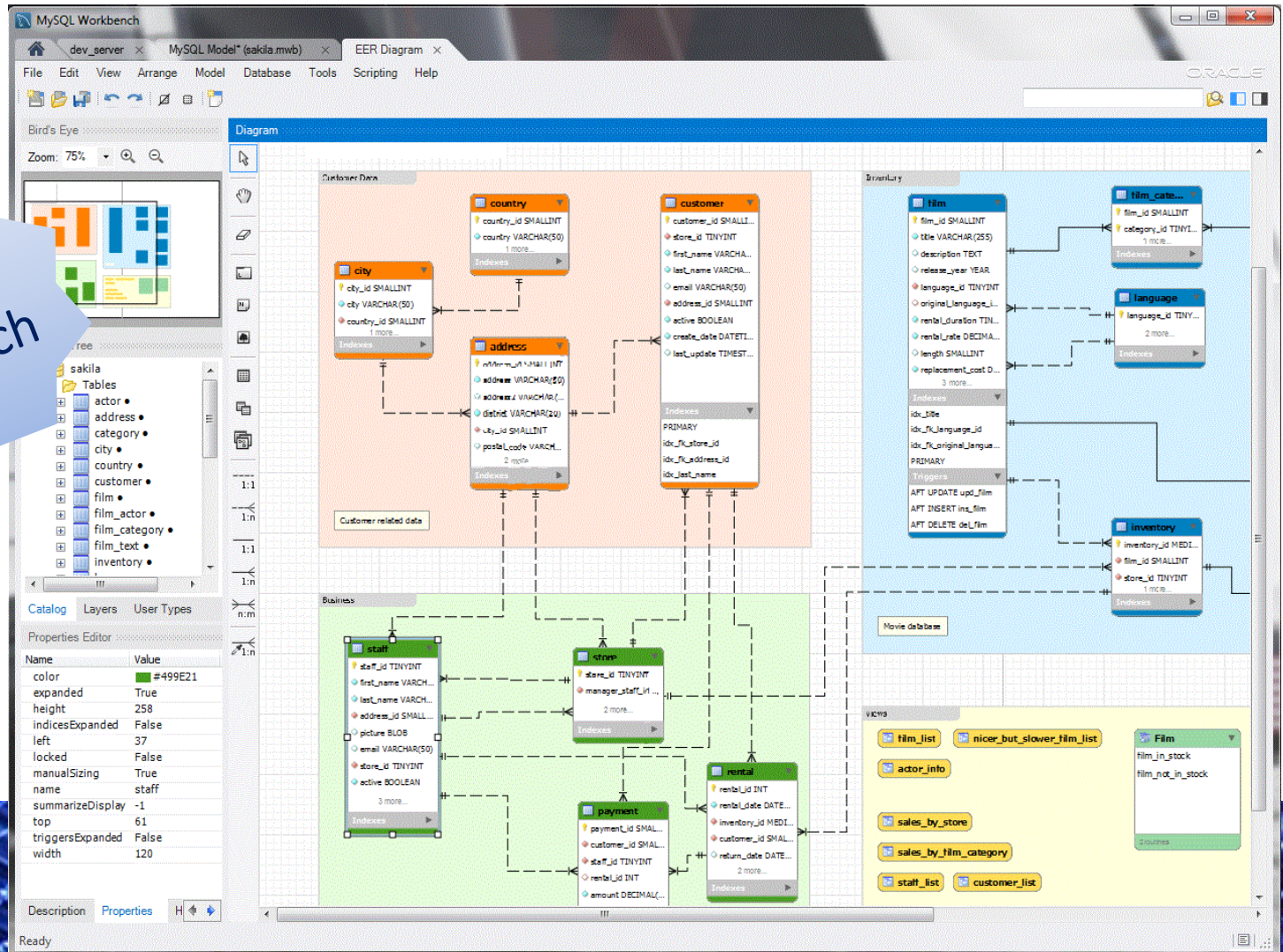
Database Implementation & Tools (1)

MS
Access



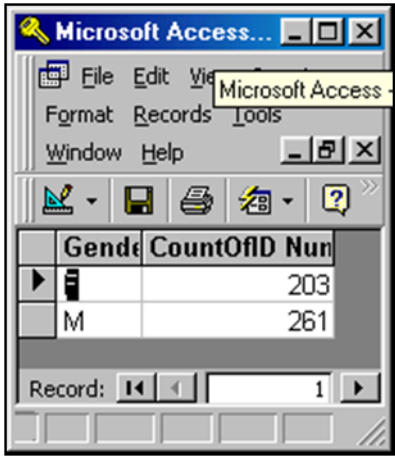
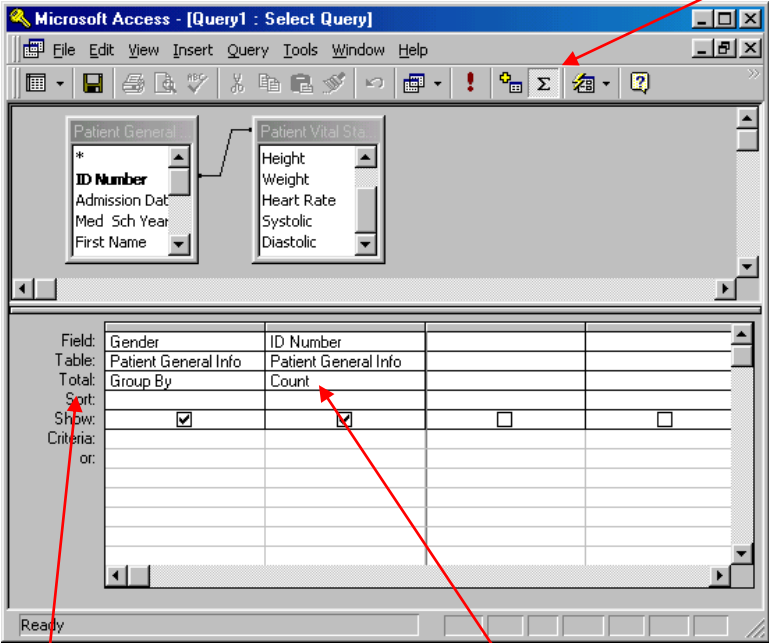
Database Implementation & Tools (2)

MySQL Workbench



Querying a Database with visual tools

1) The Totals button enables **Grouping, Counting and Statistical Options**



4) Running this Query indicates there are 203 Females and 261 Males in the database.

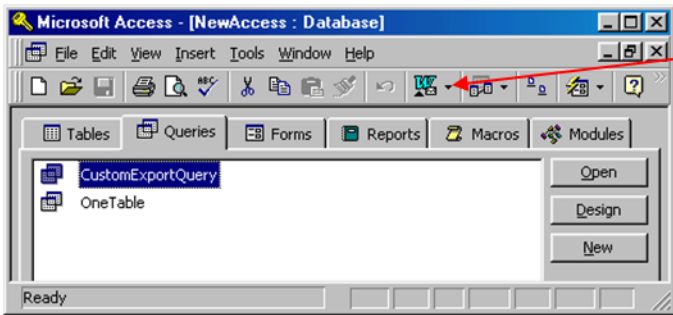
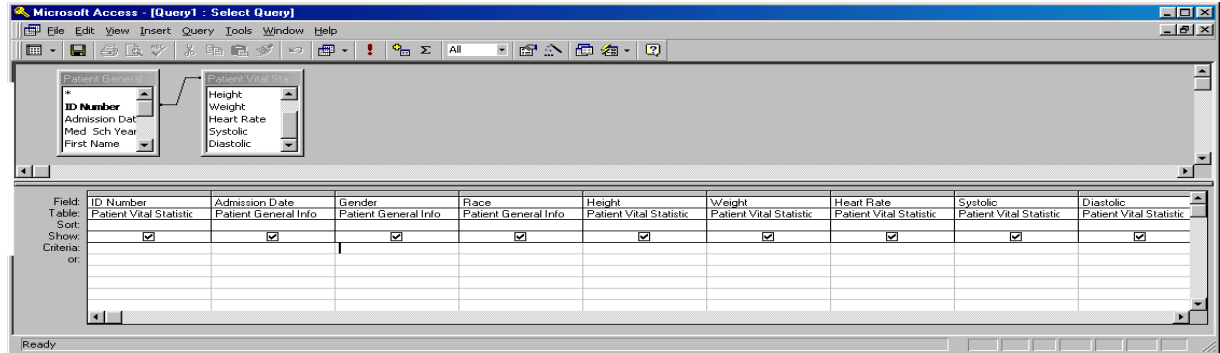
3) "Count the patients grouped based on their Gender"

2) Note the new "Total" row. Each field (column) can be set.

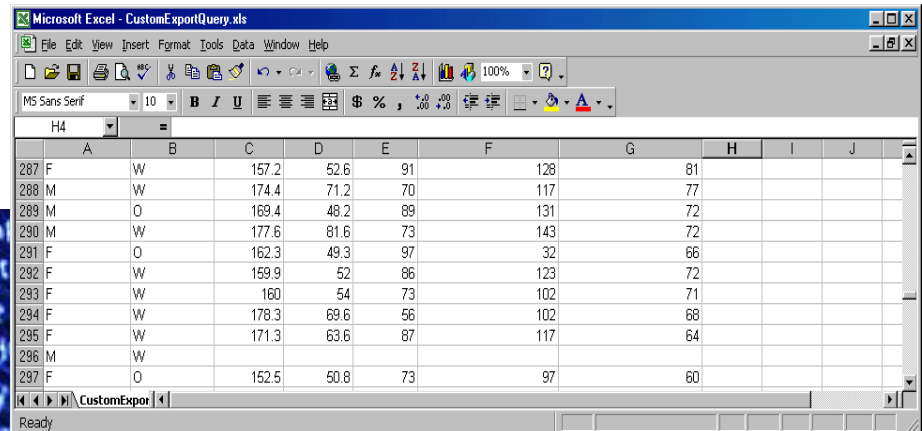


Exporting data towards various file formats...

1) Create and Save Query



2) Use OfficeLinks (Excel Toggle Option) to "Analyze it with Excel"



3) Data Automatically Exported to Excel

When?

December, 6 th,7th,13th, 2016

14.30-17.30

