Database

Database

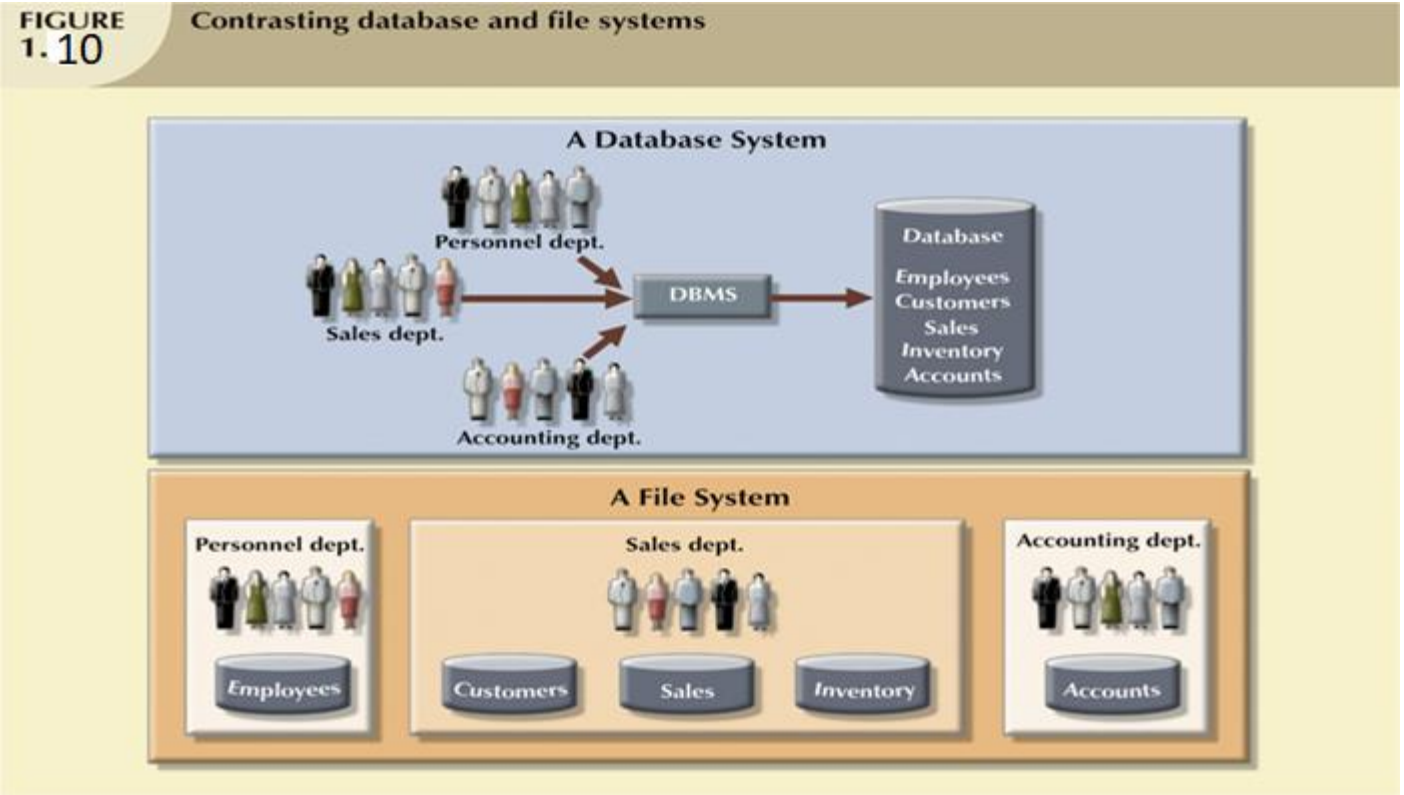
- A shared, integrated computer structure that houses a collection of related data. A database contains two types of data:
  - end-user data (raw facts) and
  - Metadata (data about data).

Advantage of (Modern) Database System

- Keep lists that involve multiple themes/concepts, e.g., student grades, emails from students, office visits etc.
  - For example, Griffith students' database
    - Check if issues with spreadsheet are now solved!

- **Advantages over spreadsheet**
  - Minimised data redundancy
  - Minimised data anomaly/inconsistency
  - Provides security/privacy hierarchy
  - Data/file can be shared to multiple users
  - The data is no longer related by application programs, but by the structure defined in the database

Database vs File systems

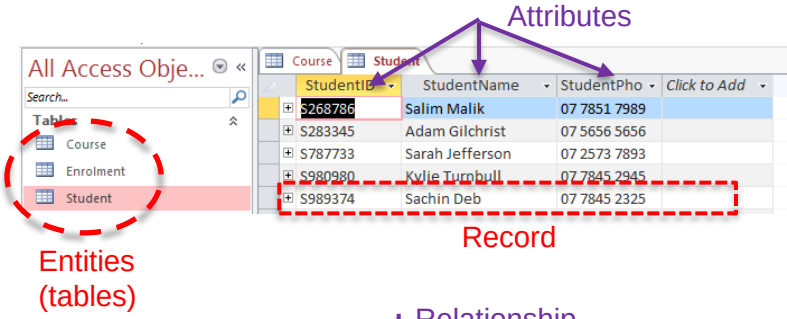


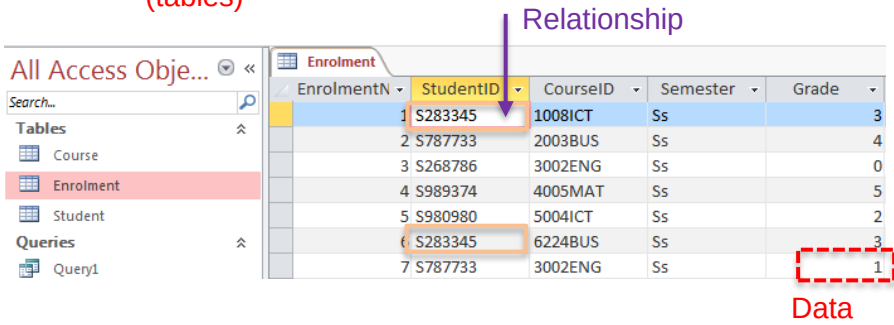
Database Terms

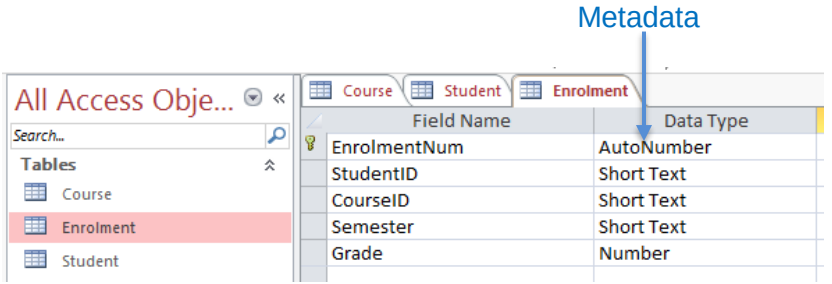
- Some important database terms:

3 main components of ERD (taught in Week 2)

- **Entities / Tables** - Entities represent items that we want to store data about (e.g., a student)
- **Attributes / Fields / Columns headings** - attributes are the pieces of data that we want to store (e.g., the students name)
- **Relationships** - relationships are used to show how entities within the database are related (e.g., a student may be enrolled in a course, so keep student ID in Enrolment table).
- **Metadata** – data about data that provides description of data to enable program–data independence, e.g., type of data (number or text)
- **Records / Rows** – a logically connected one or more fields, e.g., a student record consisting of name, student number & phone
- **Data / Data item** – raw fact, e.g., student grade or phone number.







Database management system (DBMS)

DBMS

- A software system that enables users to define, create, maintain, and control access to the database.
- Examples: Oracle, MySQL, MS SQL, IBM DB2, PostgreSQL
- (Database) application program: a computer program that interacts with database by issuing an appropriate request (SQL statement) to the DBMS. E.g.,
  - Facebook is a web-based application program;
  - Some DBMS also have application programs: e.g., MySQL etc.

DBMS functions

System catalog management

- System catalog: Stores definitions of the data elements and their relationships, i.e., metadata

Data storage management

- **Performance tuning**: Ensures efficient performance of the database in terms of storage and access speed

Data transformation and presentation

- Transforms entered data to conform to required data structures

Security management

- Enforces user security and data privacy

DBMS functions

Transaction support

- Ensures either all the updates in a transaction is made or that none of them is made

Concurrency control

- Ensures the database is updated correctly when multiple users are updating the database concurrently

Backup and recovery management

- Enables recovery of the database after a failure

Data integrity management

- Minimizes redundancy and maximizes consistency

Database access languages and application programming interfaces

- **Query language**: Lets the user specify what must be done without having to specify how
- **Structured Query Language (SQL)**: De facto query language and data access standard supported by the majority of DBMS vendors

Database communication interfaces

- Accept end-user requests via multiple, different network environments

Disadvantages of database

- Complexity
- Cost of DBMS
- Additional hardware costs
- Performance
- Higher impact of a failure

Thank you