



The Context of Database Entity- Relationship Model

**College of Engineering and
Information Technology**

The Roles of Data and Database Administrators

DATA ADMINISTRATION (DA)

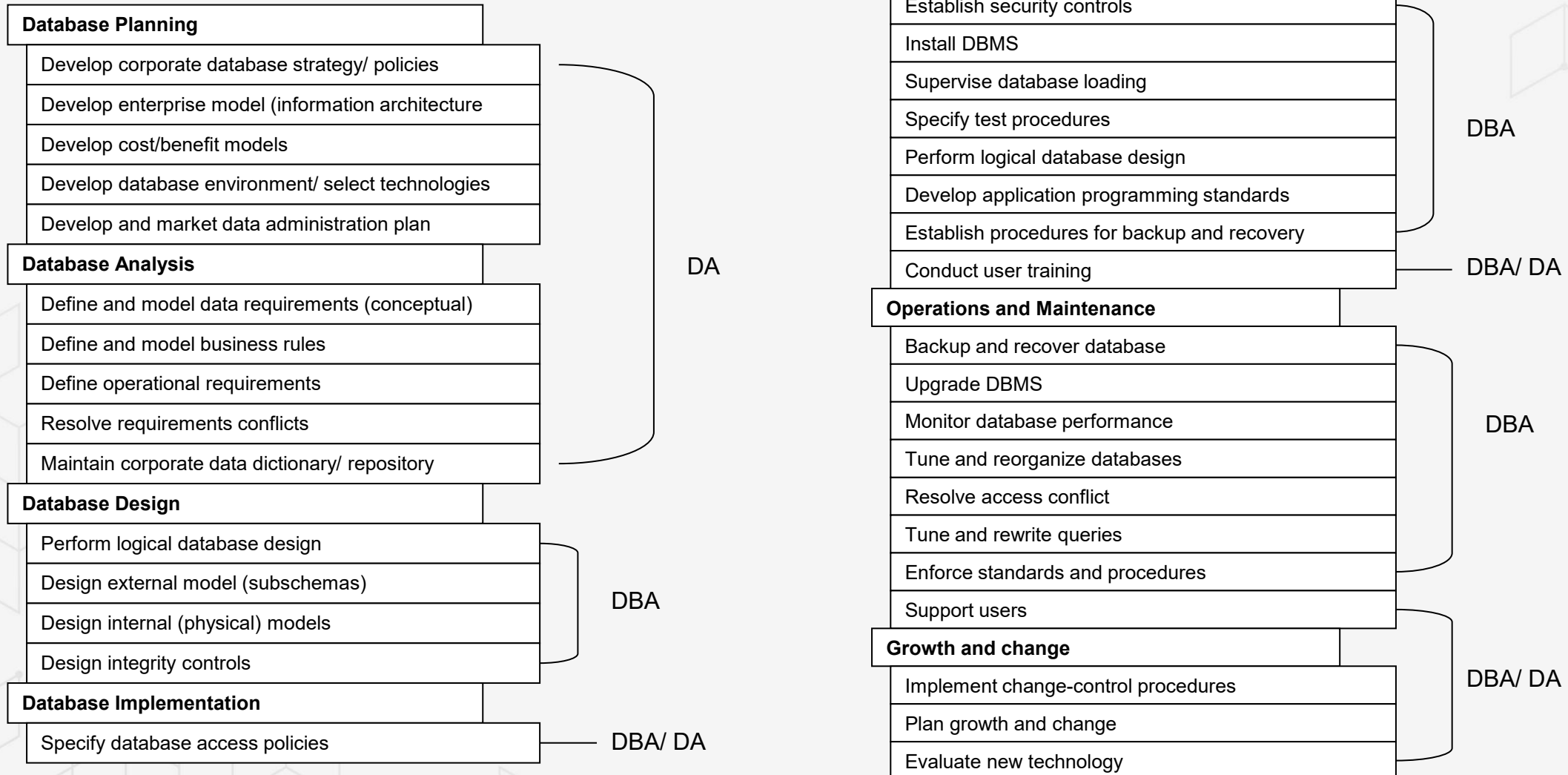
- A high- level function that is responsible for the overall management of data resources in an organization, including maintaining corporate wide definitions and standards.

DATABASE ADMINISTRATION (DBA)

- A technical function that is responsible for physical database design and for dealing with technical issues, such as security enforcement, database performance and back up and recovery.



Functions of Data Administration and Database Administration



Functions of Data Administration and Database Administration

Phase	Data Administrator	Database Adminsitrator
Planning	Develops data strategy, evaluates costs	Assesses hardware/software needs
Analysis	Models' business rules, resolves conflicts	Supports data modeling tools
Design	Defines logical structure, integrity rules	Designs physical storage, indexing
Implementation	Sets security policies	Installs DBMS, tests systems
Operations & Maintenance	Monitors data usage	Performs backups, tuning
Growth & Change	Evaluates new tech	Manages upgrades migrations



Entities

- An entity is any object in the system that we want to model and store information about. It can be a real-world object.
- **Example:** In a school database, **students, teachers, classes, and courses offered** can be considered as **entities**.
- An **entity set** is a collection of similar types of entities. An entity set may contain entities with attribute sharing similar values. For example, a students set may contain all the students of a school.



Attributes

- Entities are represented by means of their properties called **attributes**. All attributes have values. For example, a student entity may have name, class, and age as attributes.



Types of Attributes

- 1. Simple Attribute** - are atomic values, which cannot be divided further. E.g. phone number.
- 2. Composite Attribute** – are made of more than one simple attribute. E.g. name may have first_name and last_name.
- 3. Derived Attribute** - derived attributes are the attributes that do not exist in the physical database, but their values are derived from other attributes present in the database. E.g. age can be derived from date_of_birth.



Types of Attributes

4. Single-value Attribute - Single-value attributes contain single value. E.g. SSS.

5. Multi-value Attribute - Multi-value attributes may contain more than one values. E.g. phone number, email_address.

These attribute types can come together in a way like:

- **Simple single-valued attributes**
- **Simple multi-valued attributes**
- **Composite single-valued attributes**
- **Composite multi-valued attributes**



Relationships

- A **relationship** is an association of entities where the association includes one entity from each participating entity type.
- A relationship is established by a **foreign key** in one entity linking to the **primary key** in another.
- A set of relationships of similar type is called a **relationship set**. Like entities, a relationship too can have attributes. These attributes are called **descriptive attributes**.



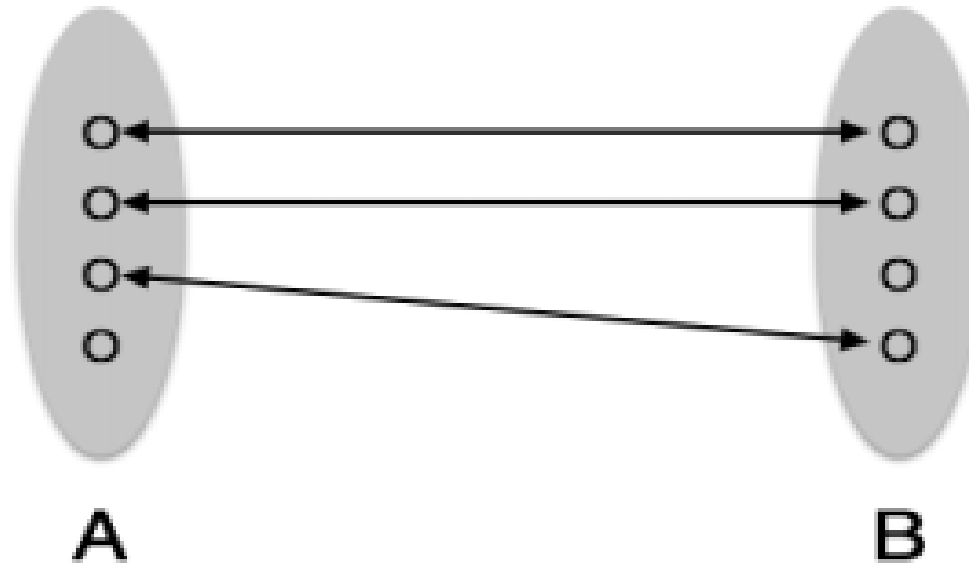
Degrees of Relationship (Cardinality)

- The **degree of relationship** (also known as **cardinality**) is the number of occurrences in one entity which are associated (or linked) to the number of occurrences in another.
- There are three degrees of relationship, known as:
 - One-to-One (1:1)
 - One-to-Many (1:M)
 - Many-to-Many (M:M)



One-to-One (1:1)

- One entity from entity set A can be associated with at most one entity set B and vice versa.

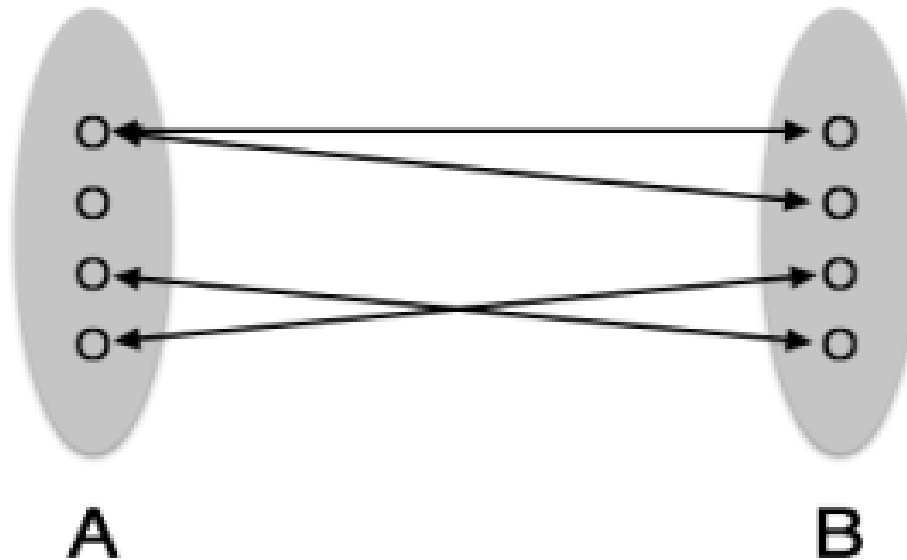


[Image: One-to-one relation]



One-to-Many (1:M)

- One entity from entity set A can be associated with more than one entities of entity set B, however an entity from entity set B can be associated with at most one entity.

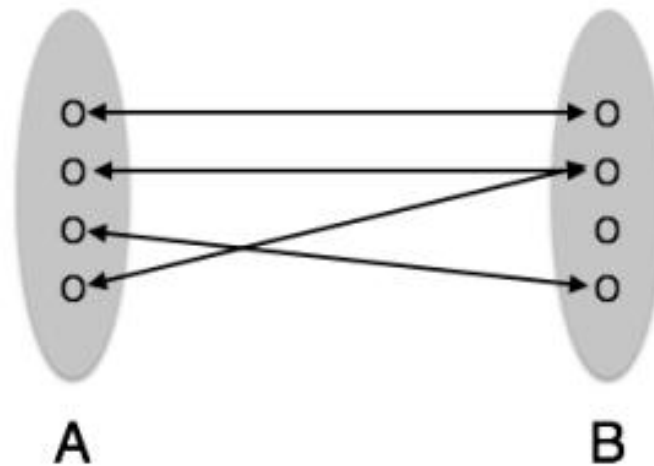


[Image: One-to-many relation]



Many-to-One (M:1)

- More than one entities from entity set A can be associated with at most one entity of entity set B, however an entity from entity set B can be associated with more than one entity from entity set A.

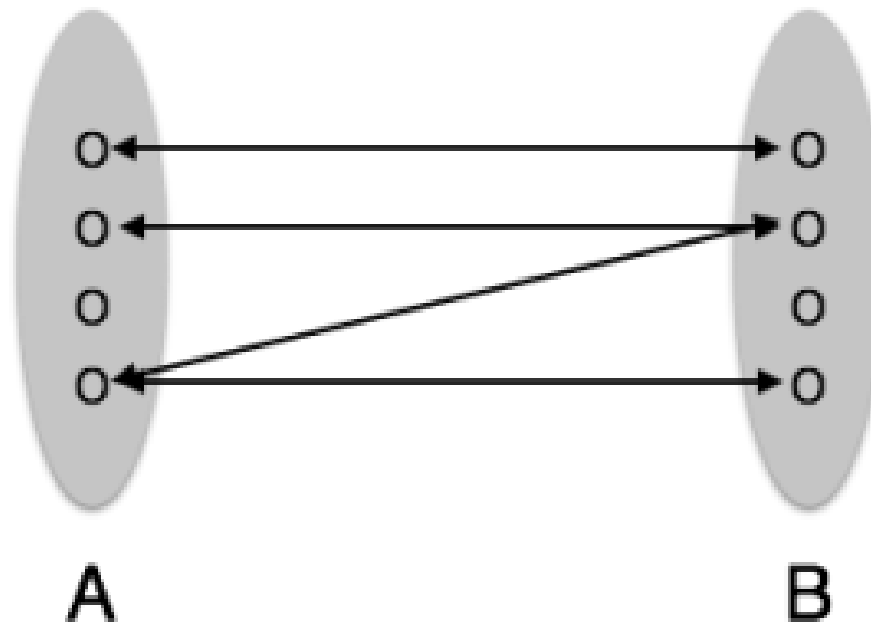


[Image: Many-to-one relation]



Many-to-Many (M:M)

- One entity from A can be associated with more than one entity from B and vice versa.



[Image: Many-to-many relation]



Relational Databases

- A **relational database** is a set of formally described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables.
- The relational database was invented in 1970 by **E. F. Codd**, a young programmer at IBM.
- Examples of relational databases:
 - Microsoft SQL Server, Oracle Database, MySQL and IBM DB2.



Disadvantages of Traditional File Processing System

- Data Redundancy
- Data Inconsistency
- Lack of Data Integration
- Program Dependence
- Data Dependence
- Limited Data Sharing
- Poor Data Control



Advantages of Database Approach

- Improved Data Sharing
- Improve Data Security
- Better Data Integration
- Minimize Data Inconsistency
- Improved Data Access
- Improve Decision Making
- Improved End-User Productivity



Cost and Risks of the Database Approach

- New, Specialized Personnel
- Installation and Management Cost and Complexity
- Conversion Costs
- Need for Explicit Backup and Recovery
- Organizational Conflict



Components of the Database Environment

- DBMS have several components, each performing very significant tasks in the database management system environment.
- List of components within the database and its environment.

Software

Hardware

Data

Procedures

Database Access Language

Query Processor

Run Time Database Manager

Data Manager

Database Engine

Data Dictionary

Report Writer



Range of Database Applications

PERSONAL DATABASE

- designed to support to store and to maintain the personal information.

WORKGROUP DATABASE

- designed to support to maintain database by a group of people.



Range of Database Applications

DEPARTMENT DATABASE

- approach is designed to support to maintain departmental wise activities in an organization. It consist department information , procedures and functions.

ENTERPRISE DATABASE

- designed to support to maintain organization database . It not only control the organizational database but also making decisions to support the database . It perform all the activities of an organization.



History of Database System

1950s and early 1960s

- Magnetic tapes
- Processing of data consisted of reading data from one or more tapes and writing data to a new tape
- Data could also be input from punched card decks, and output to printers
- Tapes (and card decks) could be read only sequentially, and data sizes were much larger than main memory



History of Database System

Late 1960s and 1970s

- Widespread use of hard disks change the scenario for data processing greatly
- **Edgar F. Codd** – worked for *International Business Machines*; invented the **relational model** for database management, the theoretical basis for **relational** databases and **relational management systems**; later won the prestigious Association of Computing Machinery Turing Award for his work.



History of Database System

1980s

- Research rational prototype evolve into commercial systems
 - DB2 from IBM is the first DBMS product based on the relational model
- SQL becomes industrial standard
- Parallel and distributed database system
- Object-relational database systems allow both relational and object views of data in the same database



History of Database System

Early 1990s

- The SQL (*Structured Query Language/Data System*) language was designed primarily for **decision support applications**, which are query-intensive, yet the mainstay of databases in the 1980s was transaction-processing applications, which are update-intensive.
- Many database vendors introduced parallel database products in this period. Database vendors also began to add object-relational support to their databases.



History of Database System

1990s

- Explosive growth of the World Wide Web
- Deployed much more extensively than ever before
- No downtime for scheduled maintenance activities
- Database systems also had to support Web interfaces to data .



History of Database System

2000s

- The first half of the 2000s saw the emerging of XML and the associated query language XQuery as a new database technology.
- This period also saw a significant growth in use of open-source database systems, particularly PostgreSQL and MySQL.
- The latter part of the decade has seen growth in specialized databases for data analysis, in particular column-stores, which in effect store each column of a table as a separate array, and highly parallel database systems designed for analysis of very large data sets.



History of Database System

DATA-STORAGE SYSTEMS

- have been built to handle the data management requirements of very large Web sites such as Amazon, Facebook, Google, Microsoft and Yahoo!, and some of these are now offered as Web services that can be used by application developers.





The Context of Database Entity- Relationship Model

**College of Engineering and
Information Technology**



Republic Act 10173 Data Privacy Act of 2012

**College of Engineering and
Information Technology**

Data Privacy Act of 2012

- **The Republic Act No. 10173**, also known as the **Data Privacy Act of 2012**, officially took effect on **September 8, 2012**.
- The Philippines' primary law governing the collection, processing, and protection of personal information. It applies to both public and private sectors and aims to ensure that personal data is handled securely, ethically, and transparently



Objectives

- Protect the fundamental right to privacy of individuals.
- Regulate the processing of personal data to prevent misuse.
- Promote the free flow of information to support innovation and growth.
- Align with international standards like the EU's GDPR and Canada's PIPEDA.



National Privacy Commission (NPC)

- Established by the Act to enforce compliance, issue guidelines, and investigate violations.
- Acts as the regulatory body overseeing data protection in the Philippines.



Scope

- It applies to entities in the Philippines processing personal data and foreign entities using equipment in the Philippines or processing data of Filipino citizens.
- It covers both **digital and physical forms** of personal data.



Rights of Data Subjects

- Be informed about data collection.
- Access and correct their data.
- Object to processing.
- Request erasure or blocking.
- Be indemnified for damages due to misuse



Data Protection Requirement

- Obtain valid consent or have a lawful basis for processing.
- Implement security safeguards (technical, physical, organizational).
- Provide clear privacy notices.
- Notify the NPC and affected individuals of data breaches within 72 hours



Penalties for Violations

- Unauthorized processing or access.
- Improper disposal of data.
- Concealment of breaches.
- Malicious or unauthorized disclosure.
- Penalties range from fines to imprisonment, especially for public officers





Republic Act 10173 Data Privacy Act of 2012

**College of Engineering and
Information Technology**