JAKARTA INTERNATIONAL UNIVERSITY

JIU

Management Information System

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4. Data, Database, and Information Quality

Learning Objectives

By the end of this session, students should be able to:

- Differentiate data, information, and knowledge
- Explain how databases support business processes
- Identify common data quality problems
- Evaluate the managerial impact of poor information quality
- Connect data management to decision-making effectiveness

PART 1: DATA

Imagine this situation:

Imagine this situation.
A company launches a marketing campaign.
But the customer data is outdated and incomplete.
Emails are sent to the wrong addresses.
Customers receive irrelevant promotions.

What went wrong?

What Went Wrong?

Data existed.

But:
It was inaccurate.
It was incomplete.
It was not updated.

Result: Bad decision making.

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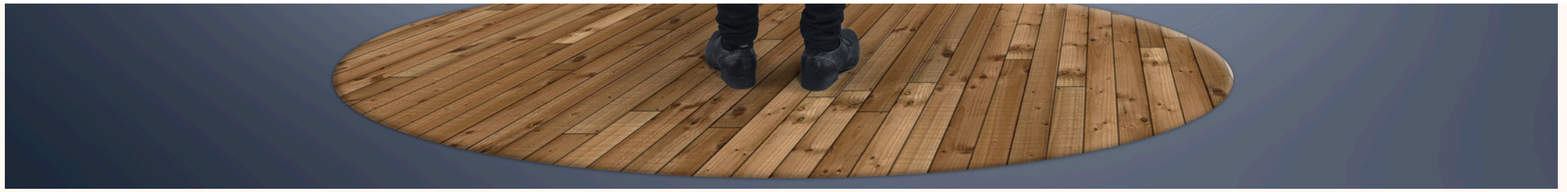
Data is Available Everywhere



If a company has millions of data records, does that automatically make it intelligent?

If a company has less data but higher quality data, and another has massive but messy data — Which company will make better decisions?

Why Data Matters in the Digital Economy?

Modern organizations rely on:

- Real-time analytics
- Customer behavior tracking
- Demand forecasting
- Personalization

Without reliable data:

- Decisions become assumptions
- AI becomes dangerous
- Strategy becomes unstable

Data as a Business Asset

Data is not just numbers.
It is a strategic asset.

Companies use data to:

- Understand customers.
- Improve efficiency.
- Gain a competitive advantage.

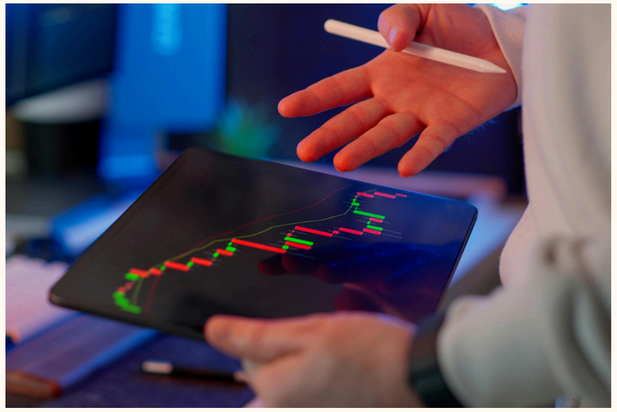
Cost of Poor Data

Poor data leads to:

Wrong decisions

Canva Library: Abhishek Navlakha from Pexels

Financial losses



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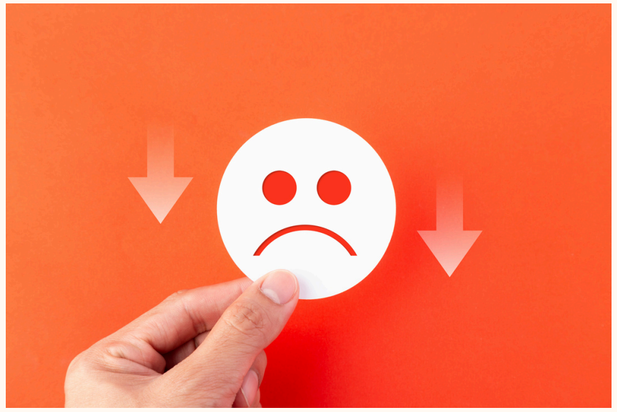
Customer dissatisfaction



Canva Library: Touchr from Touchr

Companies lose millions due to poor data quality.

Good decisions require good data.

Bad data  **Bad decisions**

Data vs Information vs Knowledge

Data

- Raw facts
- Unprocessed symbols
- No context

Examples:

- 2026-03-03
- 150
- Product ID #A145

Information

- Processed and meaningful
- Organized for purpose

Examples:

- 150 units of Product A sold today

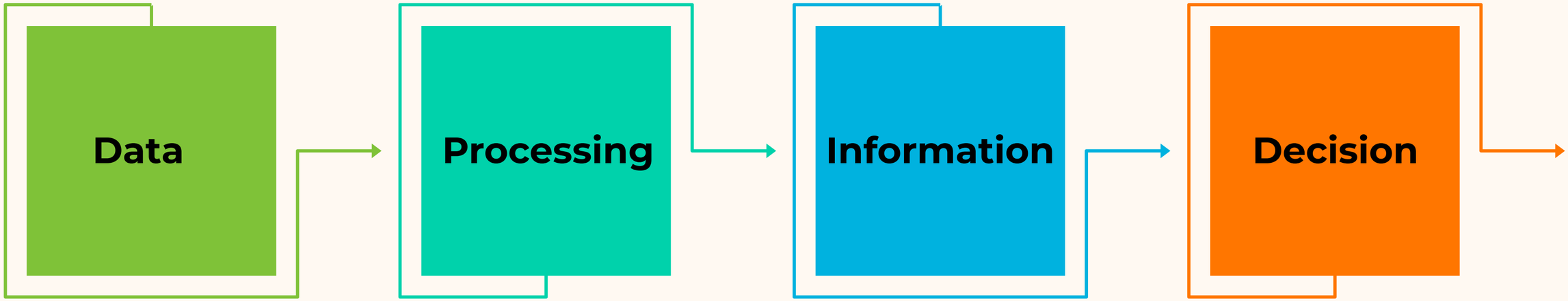
Knowledge

- Actionable insight
- Experience + interpretation

Examples:

- Sales spike due to promotional campaign

Transformation Process



This is the foundation of MIS.

PART 2: DATABASES

What Is a Database?

Database is a structured collection of related data stored electronically.

Key purpose:

- Store
- Retrieve
- Update
- Manage

Why Databases Are Important

Without databases:

- Data is scattered.
- Difficult to manage.

With databases:

- Centralized.
- Structured.
- Efficient.

Database Example

HOSPITAL DATABASE:

Examples of data:

- Patient ID
- Medical history
- Diagnosis
- Prescriptions
- Doctor information

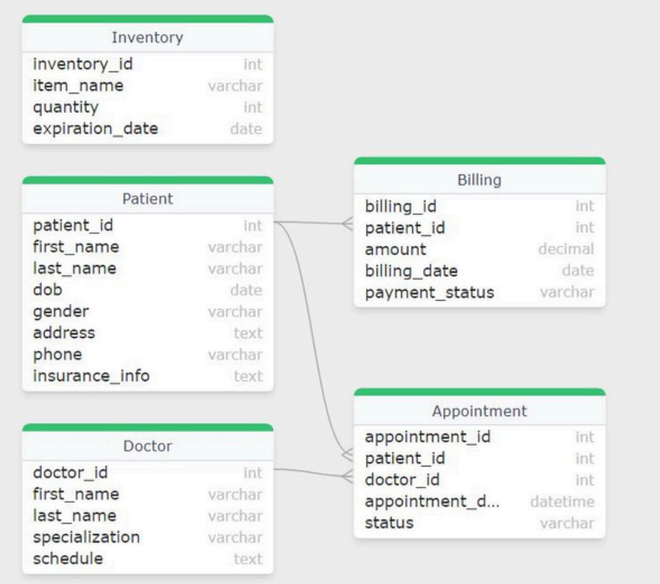
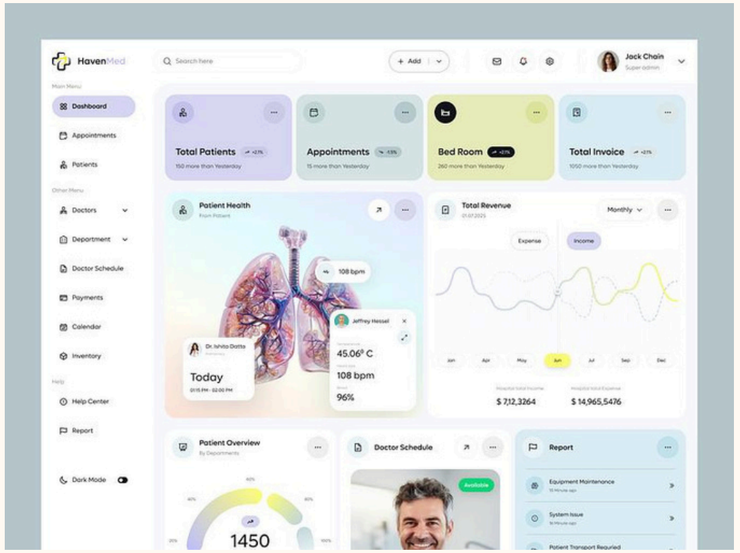


Table 2: Doctor

Field Name	Description	Type	Length
doctor_id (PK)	Doctor ID	varchar	10
name	Doctor Name	varchar	30
age	Doctor Age	int	3
gender	Doctor gender	varchar	50
address	Doctor Address	varchar	50

Table 3: Lab

Field Name	Description	Type	Length
lab_no (PK)	Laboratory Number	varchar	10
patient_id (FK)	Patient ID	varchar	10
doctor_id (FK)	Doctor ID	varchar	10
date	Laboratory Date	Date/Time	10
amount	Amount of Lab	int	20



Purpose: Support patient care and medical decision-making.

Source: ChatGPT Image generator

Database Example

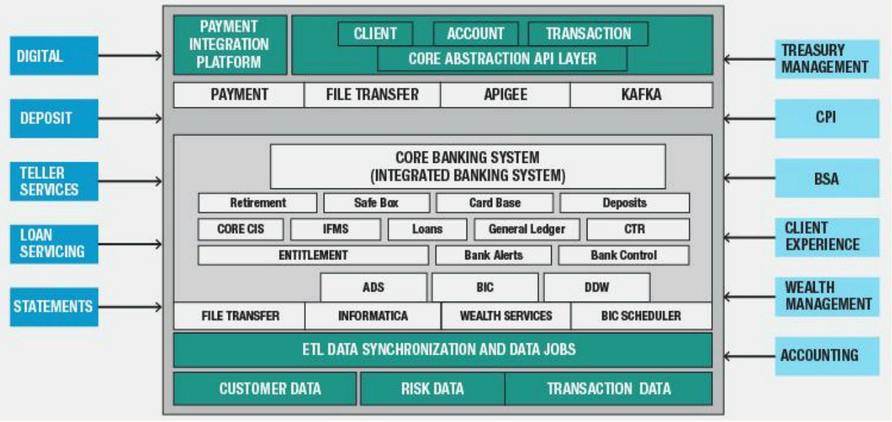
BANK DATABASE:

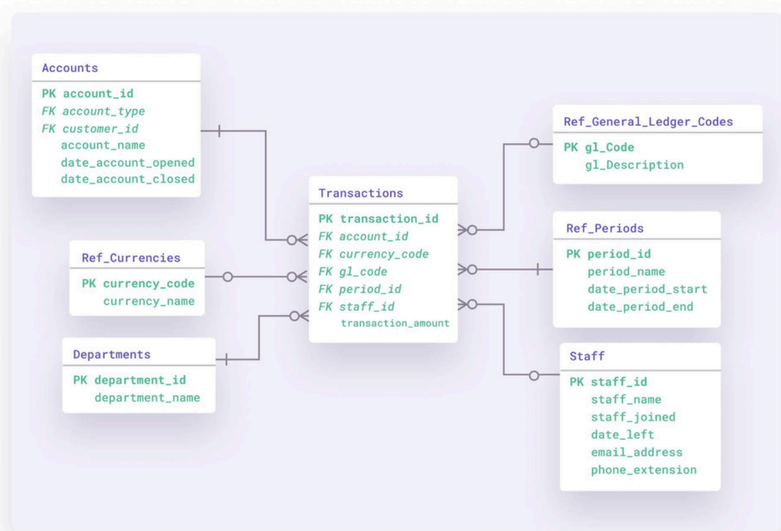
Examples of data:

- Account number.
- Customer name.
- Transaction history.
- Account balance.
- Loan information.

id	account_id	txn_date	amount	txn_type
1	1	2025-01-05 09:15:00	1000.00	DEPOSIT
2	1	2025-01-10 11:30:00	500.00	DEPOSIT
3	1	2025-01-15 14:00:00	2000.00	DEPOSIT
4	1	2025-02-01 10:00:00	-1800.00	WITHDRAWAL
5	1	2025-02-03 16:20:00	1200.00	DEPOSIT
6	1	2025-02-20 09:00:00	-2500.00	WITHDRAWAL
7	2	2025-01-02 08:50:00	3000.00	DEPOSIT
8	2	2025-01-10 12:10:00	-200.00	WITHDRAWAL
9	2	2025-01-11 09:00:00	-150.00	WITHDRAWAL
10	2	2025-01-20 13:30:00	500.00	DEPOSIT
11	2	2025-02-10 10:05:00	-1000.00	WITHDRAWAL
12	2	2025-03-01 15:45:00	200.00	DEPOSIT
13	3	2025-01-08 09:00:00	50.00	DEPOSIT
14	3	2025-02-08 09:10:00	25.00	DEPOSIT
15	3	2025-03-05 10:00:00	-30.00	WITHDRAWAL
16	4	2025-01-03 10:20:00	2000.00	DEPOSIT
17	4	2025-01-07 11:00:00	-500.00	WITHDRAWAL
18	4	2025-01-07 11:05:00	-200.00	WITHDRAWAL
19	4	2025-02-14 09:30:00	1000.00	DEPOSIT

(19 rows)





Purpose: Manage financial transactions and ensure accuracy.

Source: ChatGPT Image generator

Database Example

UNIVERSITY DATABASE:

Examples of data:

- Student ID
- Name
- Courses enrolled
- Grades
- Tuition payment status

Purpose: Manage academic records and student performance.

University Sample Database

Student Table

stuId	lastName	firstName	major	credits
S1001	Smith	Tom	History	90
S1002	Chin	Ann	Math	36
S1005	Lee	Perry	History	3
S1010	Burns	Edward	Art	63
S1013	McCarthy	Owen	Math	0
S1015	Jones	Mary	Math	42
S1020	Rivera	Jane	CSC	15

Faculty Table

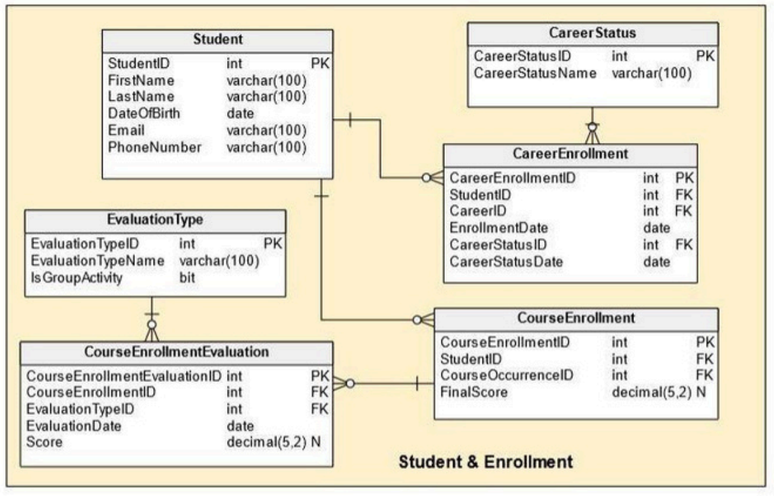
facId	name	department	rank
F101	Adams	Art	Professor
F105	Tanaka	CSC	Instructor
F110	Byrne	Math	Assistant
F115	Smith	History	Associate
F221	Smith	CSC	Professor

Class Table

classNumber	facId	schedule	room
ART103A	F101	MWF9	H221
CSC201A	F105	TuThF10	M110
CSC203A	F105	MThF12	M110
HST205A	F115	MWF11	H221
MTH101B	F110	MTuTh9	H225
MTH103C	F110	MWF11	H225

Enroll Table

stuId	classNumber	grade
S1001	ART103A	A
S1001	HST205A	C
S1002	ART103A	D
S1002	CSC201A	F
S1002	MTH103C	B
S1010	ART103A	
S1010	MTH103C	
S1020	CSC201A	B
S1020	MTH101B	A



Source: ChatGPT Image generator

Database vs Spreadsheet

Spreadsheet:

- Simple.
- Limited control.

Database:

- Structured.
- More powerful.
- Supports large data.

Database Management System (DBMS)

- **Database Management System (DBMS):** A group of program or **software** for **creating, storing, maintaining, and accessing** database file as well as provide an interface between the database and the user of the database and other application programs.

- A DBMS makes using databases more efficient.

Examples of DBMS

Source: https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcQbzG4m0Lx9E0tjr-gr8JaCaImIXIepvWM90A&s
Source: https://en.wikipedia.org/wiki/Oracle_Financial_Services_Software#/media/File:Oracle_Logo.svg
Source: https://surabaya.proxsisgroup.com/wp-content/uploads/2018/01/Microsoft-SQL-Server.png

DATABASE DESIGN

Why Database Design Matters

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Duplicate data

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Inconsistency

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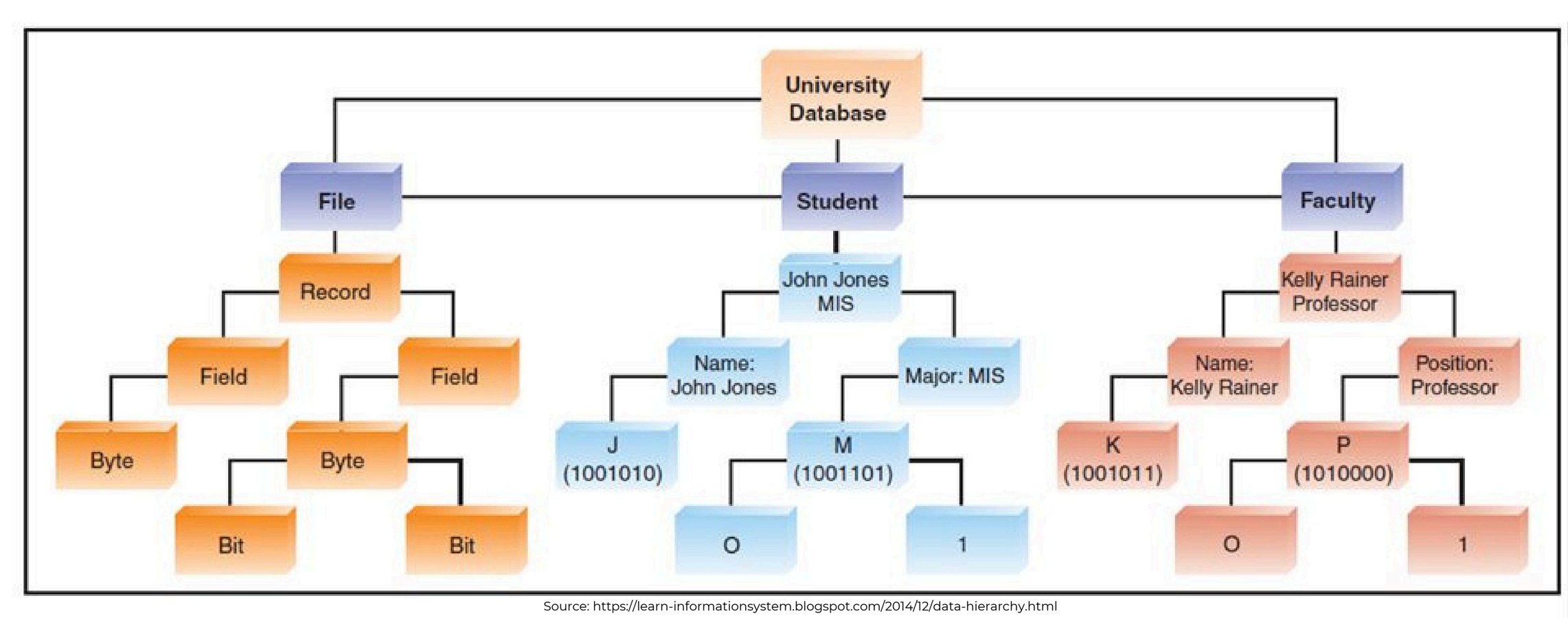
Errors

Data Hierarchy



Source: https://learn-informationsystem.blogspot.com/2014/12/data-hierarchy.html

Data is organized in levels.
Bit → Byte → Field → Record → File → Database

Data Hierarchy

- **Bit:** (binary digit) represents the smallest unit of data a computer can process.
  - Binary digit: 1 0 0 1
- **Byte:** represents a single character.
  - Eight bits: 01101010
- **Field:** A logical grouping of related characters
- **Record:** A logical grouping of related fields
- **File (or table):** A logical grouping of related records
- **Database:** A logical grouping of related files

Designing The Database

Things to consider when building database:

- Content: What data should be collected and at what cost?
- Access: What data should be provide to which provided and when?
- Logical structure: How should data be arranged so that it makes sense to a given user?
- Physical organization: Where should data be physically located?

Designing The Database

Data model

- **Data model:** a diagram that represents entities in the database and their relationship.

- **Entity :** a person, place, thing, or event which an organization maintains information.
- **Instance:** is a specific, unique representation of the entity.
- **Attribute:** a characteristic or quality of a particular entity.
- **Primary key:** a field that uniquely identifies a record.
- **Secondary keys:** other field that have some identifying information but typically do not identify the file with complete accuracy.

ERD (Entity Relationship Diagram)

- ERD is a visual representation of database structure.
- Entity Relationship Diagram (ERD) shows:
  - Entities: object (e.g., student, course).
  - Attributes: properties (e.g., name, ID).
  - Relationshipp: connection (e.g., enrolls in).

Relationship Between Entities

Cardinality

maximum number of times one entity can be associated with another entity in a relationship.

How many instances of one entity can relate to another?

Modality

Minimum number of times an entity must participate in a relationship.

Is participation mandatory or optional?

Relationship Symbols

Relationship =

One =

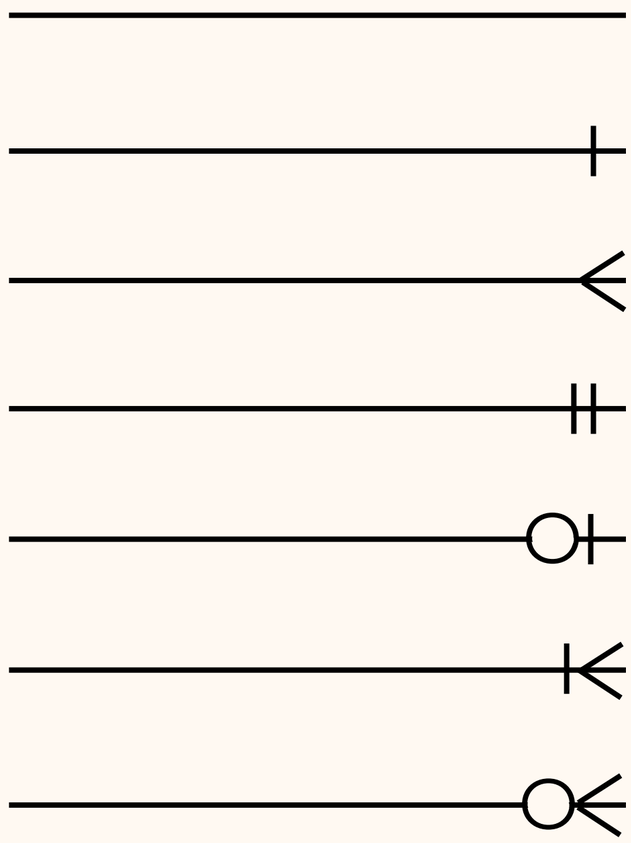
Many =

One and ONLY one =

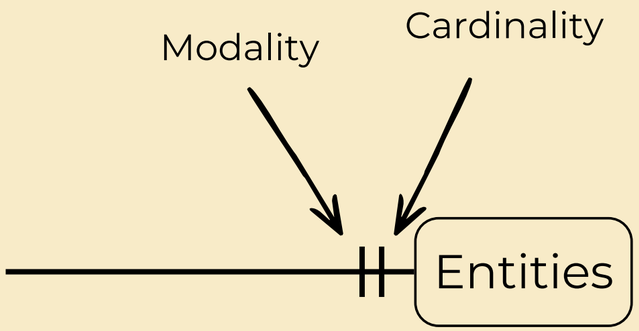
Zero or one =

One or many =

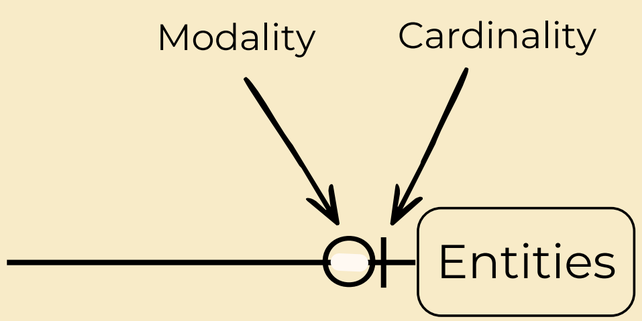
Zero or many =



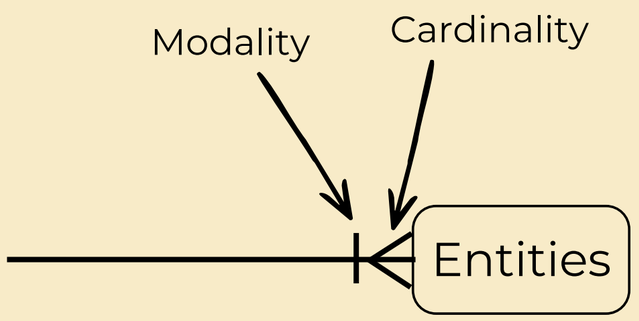
Cardinality and Modality Relationship



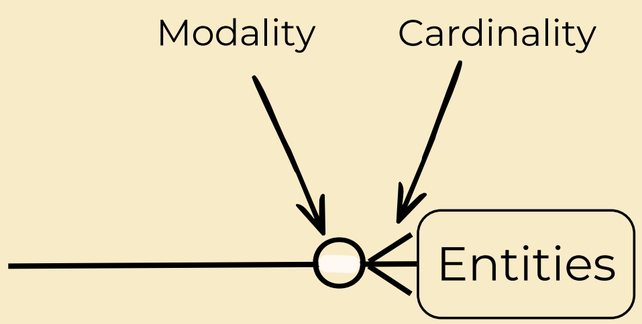
Mandatory Single



Optional Single

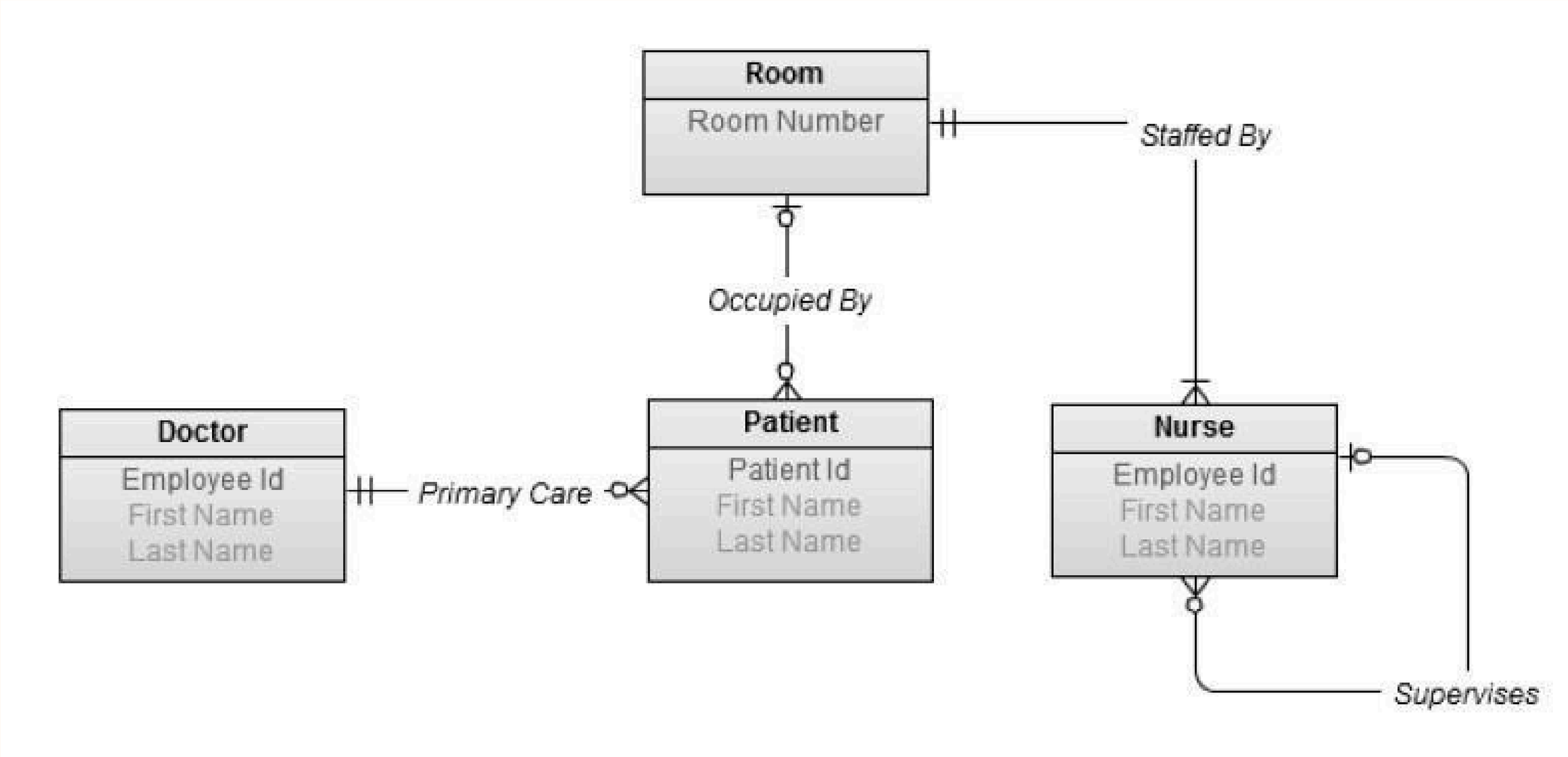


Mandatory Many



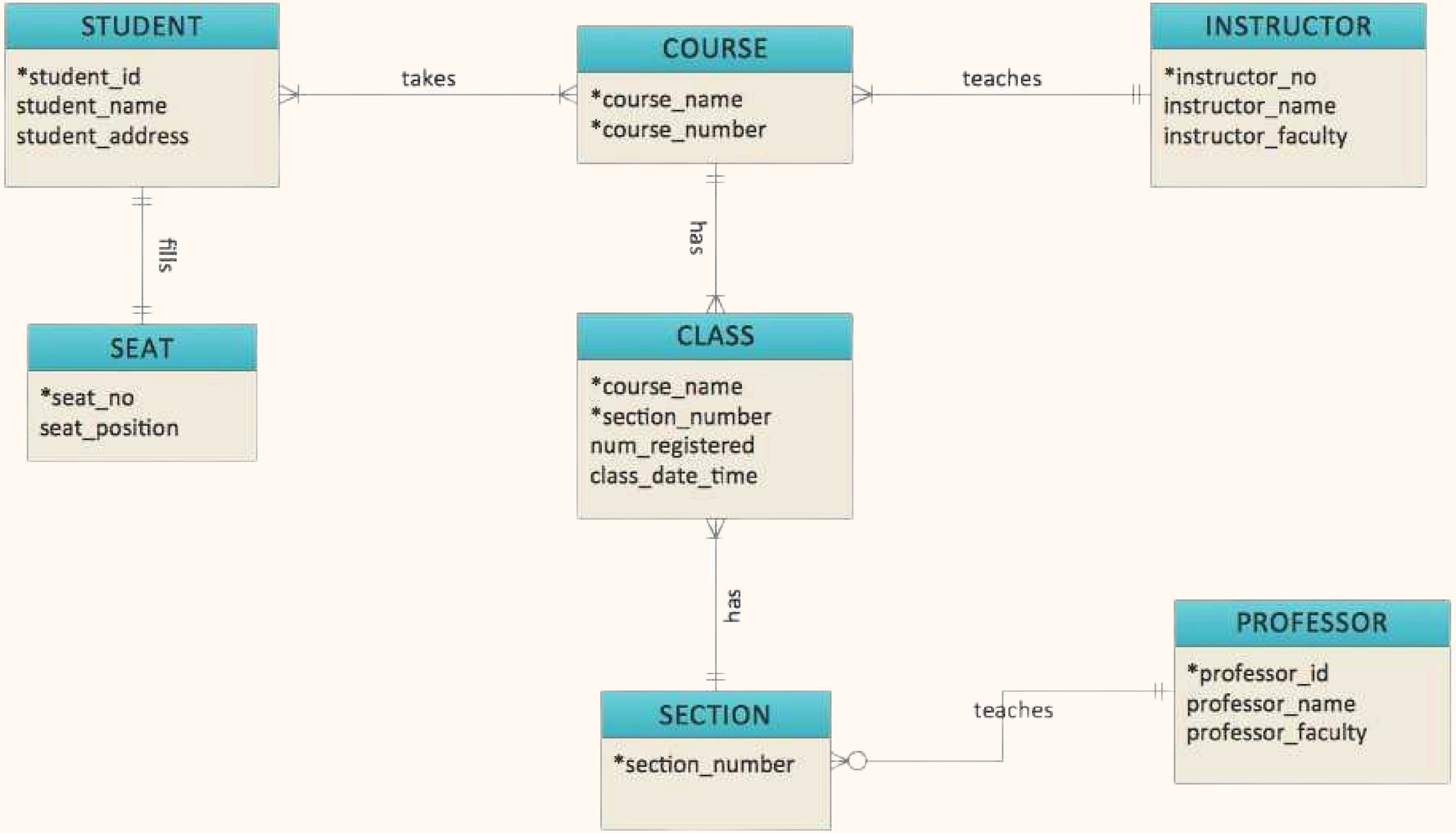
Optional Many

Example: Hospital



Source: ChatGPT Image generator

Example: University



Source: ChatGPT Image generator

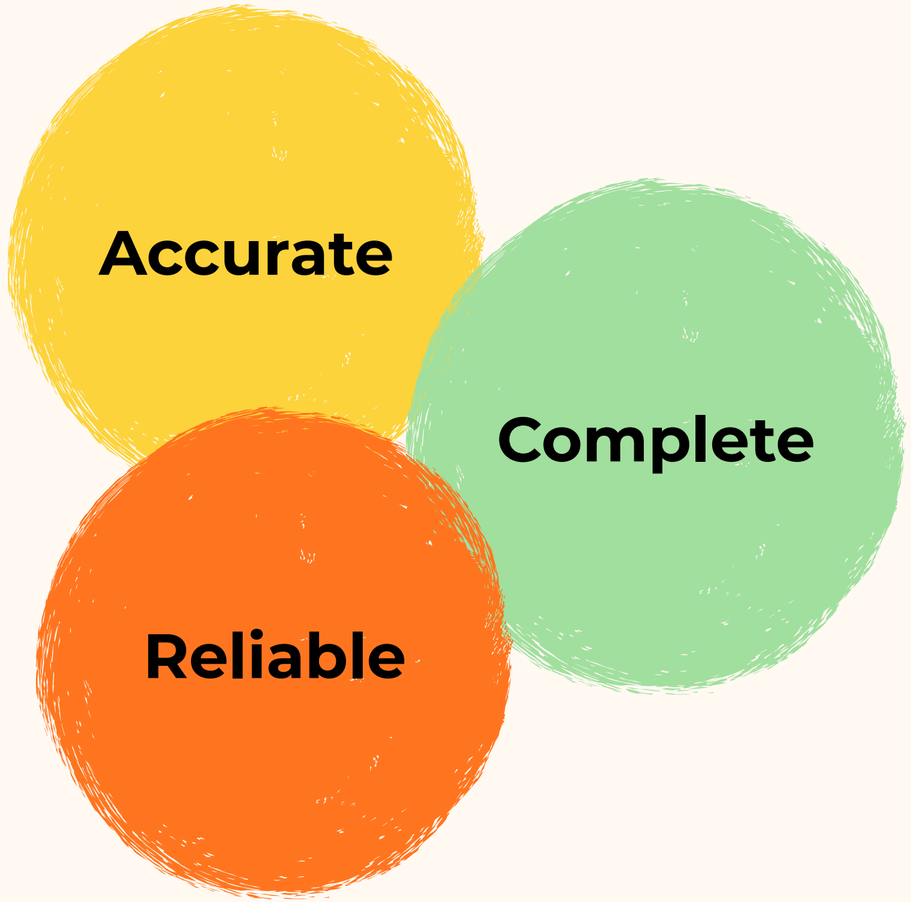
Difficulties in Managing Database

- Amount of data increases exponentially over time;
- Data are scattered throughout organizations;
- Data obtained from multiple internal and external sources;
- Data degrade over time;
- Data subject to data root;
- Data security, quality, and integrity are critical, yet easily jeopardized;
- Information systems that do not communicate with each other can result in inconsistent data;
- Federal regulations.

PART 3: DATA & INFORMATION QUALITY

What Is Data Quality?

Data quality =
how good the data is.



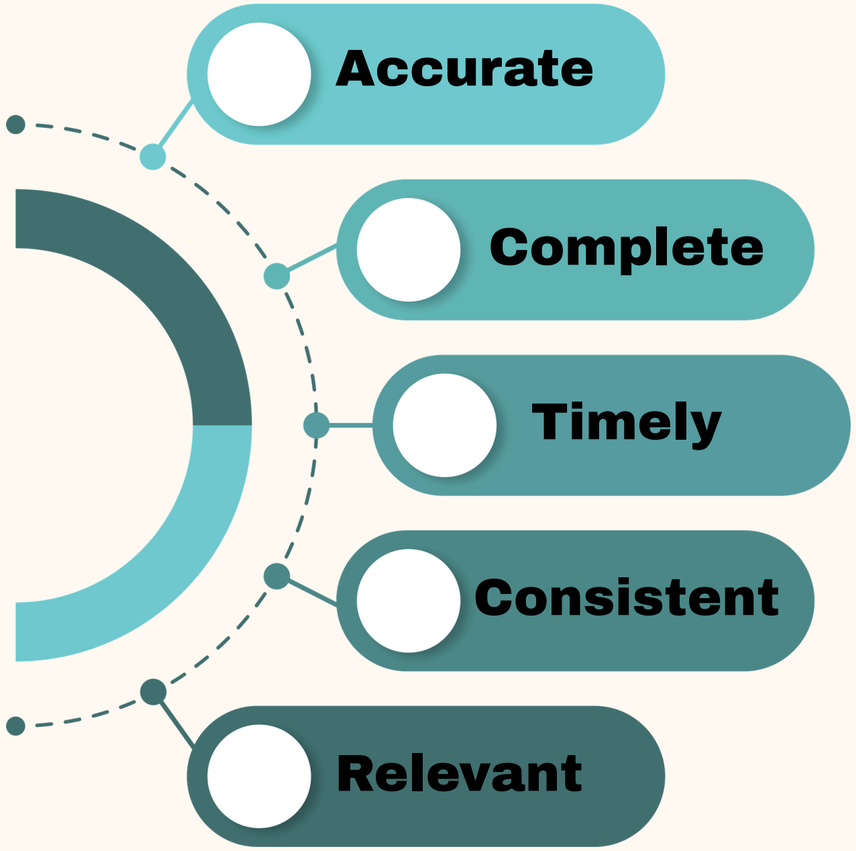
Why Data Quality Is Critical?

Poor data quality leads to:

- Wrong decisions
- Customer dissatisfaction
- Financial loss
- Reputational damage

What Is Information Quality?

Information quality refers to the degree to which information is:

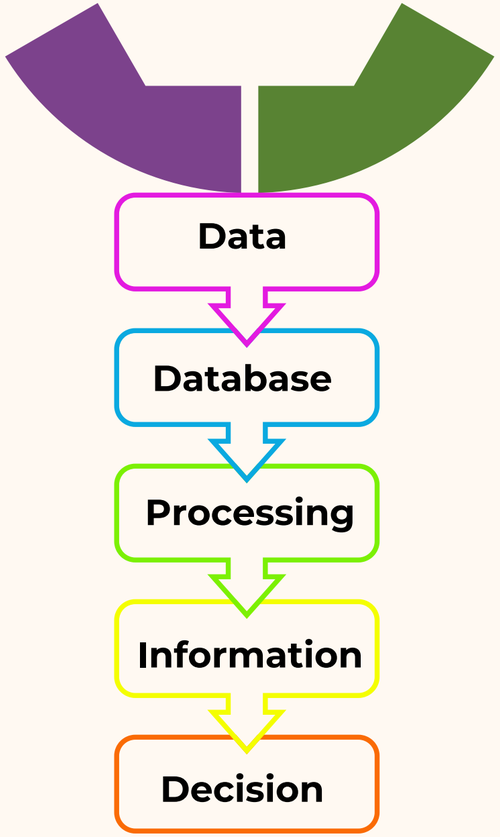


Dimensions of Information Quality

- **Intrinsic:** accuracy, reliability.
- **Contextual:** relevance, completeness.
- **Representational:** clarity.
- **Accessibility:** easy to access.

INTEGRATION & APPLICATION

From Data to Decision

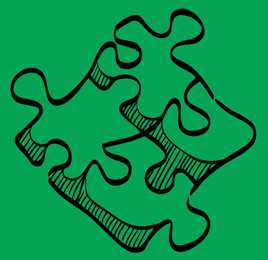


Everything must be high quality.

Which is more dangerous:
having no data or having inaccurate data?

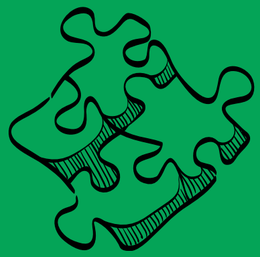
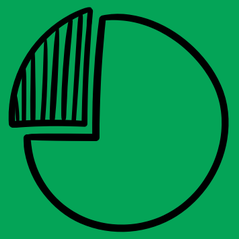
Key Takeaways

- Data alone has no value without context
- Databases enable process integration
- Information quality determines decision quality
- Poor data creates operational and strategic risk





Thankyou!