




RELATIONAL DATABASES

BSc IoT



Objectives

- Understand the creation of a conceptual model.
- Using a business process description:
 - *Define and give an example of an entity*
 - *Distinguish between an entity and an instance of an entity*
 - *Name and describe attributes for a given entity*
 - *Distinguish between an attribute and its value*
 - *Distinguish between mandatory and optional attributes, and between volatile and nonvolatile attributes*
 - *Select and justify a unique identifier (UID) for an entity*

Purpose of Entities

- Knowing how to organise and classify data makes it possible to draw useful conclusions
- Our technology-rich world produces vast quantities of facts in need of structure and order to be stored
- It is important to learn about entities because they are the things about which we store data.
- For example:
 - *The WITCard needs to store data about (as a minimum) STUDENTs, TRANSACTIONs, MEALs, PRODUCTs.*
- What kind of information would you need to store for a timetable?

Purpose of Attributes

- It is important to learn about attributes because they provide more specific information about an entity.
- Attributes help you distinguish between one instance and another by providing greater detail for the entity.
- For example:
 - *In a restaurant you need to have an order for each table in your restaurant so that you can calculate the bill. What might you store about each order?*
 - *For the WIT card storing information on Students, what details would you store about each student?*

Purpose of Unique Identifiers

- What about unique identifiers?
 - *A unique identifier distinguishes one order from another or one student from another.*
- For example:
 - *In WIT what distinguishes one programme from another?*
 - *In a bank what distinguishes one account from another?*
 - *In Ireland for tax purpose what distinguishes one person from another?*

Entity Defined

- An entity is:
 - *“something” of significance to the business about which data must be known*
 - *A name for a set of similar things that you can list*
 - *Usually a noun*
 - *Examples: objects, events, people*
 - *Entities have instances.*
 - *An instances is a single occurrence of an entity*

| Entities | Instances |
|--------------|--|
| PERSON | Mahatma Gandhi, George Washington |
| PRODUCT | Nike Air Jordan, Gibson Les Paul Custom |
| PRODUCT TYPE | Shoe, Video Game |
| JOB | Electrician, IT Technician |
| SKILL LEVEL | Beginner, Expert |
| CONCERT | U2 at the Palladium, Beyoncé at the Greek Theatre L.A. |
| ANIMAL | Dog, Cat |
| CAR | Volkswagen Beetle, Toyota Corolla |

Entities and Instances

- A Dalmation, a Siamese cat, a cow and a pig are instances of ANIMAL
- A convertible, a hatchback, a saloon and a SUV are instances of CAR
- Some entities have many instances some only a few
- Entities can be:
 - *Tangible, like PERSON or PRODUCT*
 - *Intangible, like SKILL or GRADE*
 - *An event, like CONCERT*

Entities and Instances

- Is DOG an instance or an entity?
- It depends:
 - *If we consider many different kinds of animals, it makes sense the entity ANIMAL would have instances DOG, CAT, HORSE etc*
 - *But if we are breeding dogs then the entity DOG would have instances TERRIER, POODLE, LABRADOR etc*

What is an Attribute?

- Like an entity, an attribute represents something of significance to the business.
- An attribute is a specific piece of information that helps:
 - *Describe an entity*
 - *Quantify an entity*
 - *Classify an entity*
 - *Specify an entity*
- An attribute has a single value

Attributes

- Attributes have values. An attribute can be a number, a character string, a date, an image, a sound etc
- These are all “data types” Every attribute has one data type.

| Entities | Attributes |
|---------------------|---|
| CUSTOMER | family name, age, shoe size, town of residence, email |
| CAR | model, weight, catalog price |
| ORDER | order date, ship date |
| JOB | title, description |
| TRANSACTION | amount, transaction date |
| EMPLOYMENT CONTRACT | start date, salary |

Attributes

- What is the data type for each attribute in CUSTOMER?

| Entities | Attributes |
|---------------------|---|
| CUSTOMER | family name, age, shoe size, town of residence, email |
| CAR | model, weight, catalog price |
| ORDER | order date, ship date |
| JOB | title, description |
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Attributes

- The only attributes we need to model are those that business needs to track.
- Every attribute has a data type
- Every attribute is single valued
 - *An instance of an entity can have only one value for each attribute at any point in time. The attribute value can change over time.*

Attributes

- Some attributes have values that constantly change
 - *These are called volatile attributes*
- Other attributes will rarely change, if ever
 - *These are called nonvolatile attributes*
- If you have a choice, select the nonvolatile attribute
- Why?

Attributes

- Some attributes must contain a value
 - *These are mandatory attributes.*
- Other attributes may either contain a value or be left empty (null)
 - *These are optional attributes*
- Email address could be mandatory for CUSTOMER buying online but optional for records on an EMPLOYEE

Attributes

- If we were to model a Human Resource system, we would have an entity to store data for each worker called EMPLOYEE
- What attributes would EMPLOYEE have?

Identifiers

- An EMPLOYEE has a unique identifier (UID)
- A UID is either a single attribute or a combination of multiple attributes that distinguishes one employee from another
- Before you came to WIT how would you distinguish yourself from other students? What attributes would you use?