Entities, Instances, Attributes and Identifiers
What Will I Learn?

In this lesson, you will learn to:

• 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
Why Learn It?

Knowing how to organize and classify data makes it possible to draw useful conclusions about seemingly random facts. Our technology-rich world produces vast quantities of facts in need of structure and order.

It is important to learn about entities because they are the things about which we store data.

For example:
A school needs to store data about (as a minimum): STUDENTs, TEACHERRs, COURSEs, ROOMs, GRADEs.
Why Learn It?

It is important to learn about attributes because they provide more information about the entities.

Attributes help you be more specific about what data you need to track.

For example:

• In a restaurant, you need to list the different items in an order so you know how much to charge.

• When building several sales reports for a department, you must pick out the correct sales report from a list of reports.
Why Learn It?

What about unique identifiers?
It is important to learn about unique identifiers because they distinguish one instance of an entity from another.

For example:

• In a classroom, you need to distinguish between one person and another.
• When classifying your CD collection, you need to be able to locate a particular CD.
• When listing transactions on a financial statement you need to be able to distinguish between multiple transactions that occurred on the same day.
Tell Me / Show Me

Look at the magazine advertisements and the Internet sites identified by the teacher.

What is the “main thing” that each ad or website is about?
Tell Me / Show Me

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 instance is a single occurrence of an entity.
Tell Me / Show Me

Entities and Instances

<table>
<thead>
<tr>
<th>Entities</th>
<th>Instances</th>
</tr>
</thead>
<tbody>
<tr>
<td>PERSON</td>
<td>Mahatma Gandhi</td>
</tr>
<tr>
<td>PRODUCT</td>
<td>Nike Air Jordan</td>
</tr>
<tr>
<td>PRODUCT TYPE</td>
<td>shoe</td>
</tr>
<tr>
<td>JOB</td>
<td>electrician</td>
</tr>
<tr>
<td>SKILL LEVEL</td>
<td>beginner</td>
</tr>
<tr>
<td>CONCERT</td>
<td>U2 at the Palladium</td>
</tr>
<tr>
<td>ANIMAL</td>
<td>Dog</td>
</tr>
<tr>
<td>CAR</td>
<td>Volkswagen beetle</td>
</tr>
</tbody>
</table>
Tell Me / Show Me

Entities and Instances

- A Dalmatian, a Siamese cat, a cow and a pig are instances of ANIMAL
- A convertible, a sedan and a station wagon are instances of CAR
- There are many entities
- Some entities have many instances; some have only a few

Entities can be:

- Tangible, like PERSON or PRODUCT
- Non tangible, like SKILL LEVEL
- An event, like CONCERT
Tell Me / Show Me

Entities and Instances
Is DOG an instance or an entity? It depends:

• If we are interested in different kinds of animals, it makes sense to think of an entity ANIMAL with instances DOG, CAT, HORSE and so on

• But what if we run a dog-breeding business? We need to keep data on many different breeds of dog, but not on other species of animal.

• For a dog-breeder, it is more natural to think of an entity DOG with instances TERRIER, POODLE, LABRADOR and so on.
Tell Me / Show Me

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:
• Describes an entity
• Quantifies an entity
• Qualifies an entity
• Classifies an entity
• Specifies an entity

An attribute has a single value.
Tell Me / Show Me

Attributes

Examples of Attributes

<table>
<thead>
<tr>
<th>Entity</th>
<th>Attributes</th>
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<tr>
<td>CUSTOMER</td>
<td>family name, age, shoe size, town of residence, email</td>
</tr>
<tr>
<td>CAR</td>
<td>model, weight, catalog price</td>
</tr>
<tr>
<td>ORDER</td>
<td>order date, ship date</td>
</tr>
<tr>
<td>JOB</td>
<td>title, description</td>
</tr>
<tr>
<td>TRANSACTION</td>
<td>amount, transaction date</td>
</tr>
<tr>
<td>EMPLOYMENT</td>
<td>start date, salary</td>
</tr>
<tr>
<td>CONTRACT</td>
<td></td>
</tr>
</tbody>
</table>

Attributes have values. An attribute value can be a number, a character string, a date, an image, a sound, etc. These are called "data types" or "formats." Every attribute has a data type.
Tell Me / Show Me

Attributes

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What would be the data types of the CUSTOMER attributes? For example, “family name” would be a character string.

Attributes are single-valued. Each attribute can have only one value (at any point in time) for each instance of the entity.
Tell Me / Show Me

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Some attributes (such as age) have values that constantly change. These are called volatile attributes.

Other attributes (such as order date) will change rarely, if ever. These are nonvolatile attributes.

If there is a choice between attributes, use the nonvolatile one. For example, use birth date instead of age.
Tell Me / Show Me

Attributes

Some attributes must have a value. These are mandatory attributes. For example: in most businesses that track personal information, “name” is required.

Others attributes may have a value or be left null. These are optional attributes. For example: cell phone number is often not required, except in mobile or wireless applications.

Email address could be a mandatory attribute for EMPLOYEE if you are modeling an email application. It could be optional for a CUSTOMER if you are modeling an online catalog.
Tell Me / Show Me

Attributes

A disc jockey (DJ) has to be familiar with all kinds of music -- songs, soundtracks, etc. If we were to model a DJ business, the entity that holds the collection of music could be called SONG.

A SONG has attributes.

What attributes would it have?

Can you give examples of values for each attribute?
Tell Me / Show Me

Identifiers
A SONG has a unique identifier (UID).

A UID is an attribute or combination of attributes that distinguish one song from another.

How do you find a particular song in the whole collection? What would be a unique identifier for SONG?

Think about all the students in the classroom. Each student is described by several traits or attributes. Which attribute or attributes allow you to pick a single student from the rest of the class?

That is the student’s UID.
Tell Me / Show Me

Terminology
Key terms used in this lesson include:
Attribute
Data type
Entity
Instance
Mandatory
Nontangible/ Intangible
Null
Optional
Single valued
Tangible
Unique identifier (UID)
Volatile
Summary

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Practice Guide
The link for the lesson practice guide can be found in the course resources in Section 0.