Session Objectives

- Understand the background of the relational model
- Learn to
  - Model a single entity
  - Model a multi-table database
Data Model Redux

- Integrated collection of concepts for describing data, relationships between data, and constraints on the data used by an organization.
- Has three components:
  - a structural part;
  - a manipulative part;
  - a set of integrity rules.

Modeling Reality

- A database must mirror the real world if it is to answer questions about the real world
- Data modeling is a design technique for capturing reality
  - Object modeling
  - Entity-Relationship modeling (ERD)
  - Relational Data Modeling (RDM) – directly model tables and columns

We use an RDM approach

Data modeling is important for IS students

ER and OO modeling are using a more consistent notation
Entity Review

- Usually corresponds to something concrete in the domain of the application
- Represented by a rectangle
- An instance is a particular occurrence of an entity (corresponds to a row in a DB table)

```
Entity name ➔ Shares
```

Attribute Review

- Also referred to as properties
- An attribute is a discrete data element that describes an entity
- Attribute names should be meaningful

```
+ Shares +
| code   |
| name   |
| price  |
| quantity |
| dividend |
| pe     |
```

```
attributes ➔ Shares
```
Primary Key Review

- Every instance of an entity (think row of a table) must be uniquely identified
- A primary key (identifier) can be an attribute or collection of attributes
- Preferred approach is to use an identifier that does not relate to a domain attribute (guaranteed uniqueness)
- A leading asterisk denotes an identifier (sometimes other notations is used, e.g., “PK”)

<table>
<thead>
<tr>
<th>Shares</th>
</tr>
</thead>
<tbody>
<tr>
<td>*ID</td>
</tr>
<tr>
<td>code</td>
</tr>
<tr>
<td>name</td>
</tr>
<tr>
<td>price</td>
</tr>
<tr>
<td>quantity</td>
</tr>
<tr>
<td>dividend</td>
</tr>
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</table>

Approaches to Modeling

- Question of primacy of DB vs. OO modeling
- Classical (historical)
  - Model the entities and attributes (usually an ER diagram)
  - Translate the model into a physical DB model
- Pragmatic
  - Directly model the DB as an RDM (assumes a relational implementation)
- Automatic
  - Model results from OO specification

We assume an RDM approach
Workbench

- Select File/new model
- Add a diagram

Workbench

- Use vertical icon menu to add tables, etc to your diagram
Modeling a Table

• In MySQL Workbench, we can make a first-cut at a RDM table
• You can select a part of the RDM, and make changes
  • Table
  • Columns

Column Property Check Boxes

• Properties
  • PK: Primary key
  • NN: Not null
  • UQ: Unique
  • BIN: Binary
  • UN: Unsigned
  • ZF: Zerofill
  • AI: Auto-increment
Workbench Relationships

- Use graphic tools
- Use relationship arrow selector
- Use Foreign Keys tab

Are We on Track?

- Open MySQL Workbench, and create a model of the Shares and Nations database
Were We on Track?

- Note the one-to-many relationship between the two tables

Homework

- Create a new SBU_Awards DB in Access (SBU_ActiveProjects.xlsx) on class site
  - Follow same procedure as last time
  - This time use the wizard to create a multi-table DB (Select the Wizard in the checkbox in the final import dialog)
  - Wizard steps show you how new tables are created to reduce duplicate data
  - Let the wizard decide what data goes into each table
  - Finish the wizard
  - Rename tables (e.g., Sponsors)
  - Review the tables
  - Change “nonfederal” to “non-federal” in awardTypes, save it, and see how the display of other tables change
Session 8 – Relational Data Modeling

Homework

- Update Table names
- Reposition ID field
- Update field names
- Adjust types if necessary

In the original DB, sponsors, award types, organizations and PIs contained duplicates

The foreign key might not be shown in an RDM (it can be inferred from the relationship)
Homework

- Using Workbench, develop an RDM diagram for the SBU_Awards data

Did You Achieve the Objectives?

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