DATABASE DESIGN

THE CONCEPTUAL MODEL

OVERVIEW OF THE FIVE DATABASE SESSIONS

- **Session 1: The Transactional Relational Database**
  - **Work product: Conceptual Model**

- Session 2: Normalizing the Transactional Relational Database
  - Work product: Logical Model

- Session 3: Defining Data Structures Specific to a Database Platform (MariaDB)
  - Work product: Physical Model

- Session 4: Database Initialization Scripts to Create Database & Objects
  - Work Product: SQL scripts to create database objects

- Session 5: SQL Essentials to Query Databases
  - Work Product: SQL commands to query the database

SESSION 1 OBJECTIVES

- What is a database?

- What is a relational database?

- What is a transactional relational database?

- What are entities and attributes?

- What are entity relationships?

Exercise: Alter a conceptual model.

WHAT IS A DATABASE?

- A database is "a repository for a collection of computerized data files." — CJ Date *An Introduction to Database Systems*, p.2.

- "[A] **database** is an organized collection of data (also known as a data store) stored and accessed electronically through the use of a database management system." — Wikipedia, *Database*.

DATABASE AND APPLICATION DEVELOPMENT

- The database is the foundation of the application.

- As with a house, you want to ensure that you have a good foundation.

- If there is a problem with the foundation, there will be a problem with the data in the application.

- Bottom line: take the time to get the database design correct based on the business requirements at that time. They are easier to get right than to fix.

WHAT IS A RELATIONAL DATABASE?

- A relational database is a database that stores and accesses information in *tables*, *rows*, and *columns*.
  - The data is organized in a *structured* and *related* manner.
  - Examples of relational database platforms include Microsoft SQL Server, Oracle, MySQL, and MariaDB.
- This contrasts with non-relational databases.
  - Non-relational databases store data in whatever manner works best for the data that is being stored.
  - The data is organized in a semi-structured or unstructured manner.
  - Examples of non-relational databases include email programs, MongoDB.

TYPES OF RELATIONAL DATABASES

- There are two types of relational databases:
  - Transactional
  - Analytical

- Note that there are other uses for relational databases.
  - Extract, Transform, and Load (ETL) processes may, for example, require staging databases. These other uses are beyond the scope of this class.

ONLINE TRANSACTION PROCESSING (OLTP) DATABASES

- Transactional databases:
  - are designed to all for the efficient processing (reading and writing) of individual transactions. These transactions are usually only one of many transactions occurring at the same time.
  - are primarily accessed through one or more applications.
  - support an organization's basic reporting requirements.
    - What items are on this invoice?
    - What was yesterday's sales total?

ONLINE ANALYTICAL PROCESSING (OLAP) DATABASES

- Analytical databases:
  - are designed for the efficient reading of a large number of transactions.
  - usually have one more transactional databases as their source.
  - are primarily access through reporting software and support an organization's higher level operational and strategic reporting requirements.
    - What is my stock out percentage for the month?
    - What are my sales this month and how does it compare to last month or the same month last year and the year before?

OUR FOCUS—TRANSACTIONAL DATABASE DESIGN

- A relational transactional database is a collection of well-organized and indexed data where data can be managed, retrieved, inserted, updated, and deleted.

  - The transactional database is the dominant database system and the backbone of the corporate world.

- The design methodology was created in the late 1960s and become prominent in the database world in the 1980s.

DATABASE DESIGN—FIRST STEPS—CONCEPTUAL MODEL

- In database design the entity-relationship model is the proper format.

- It shows:

  - Entities—Nouns—People, places, things, events.

  - Attributes—Adjectives—Things about the entities that are important to know.

  - Relationships—Case*—Describe how the entities relate to one another.

ENTITY RELATIONSHIPS CARDINALITY

- There are three relationship cardinalities:
  - One-to-many.
    - Most common.
    - For each record in the parent entity, there are zero, one, or one or more records in the subordinate (child) entity.
  - Many-to-many.
    - Next most common.
    - For each record in each entity, many records on the other side are also possible.
  - One-to-one.
    - Least common.
    - As a practical matter usually not part of a conceptual model.
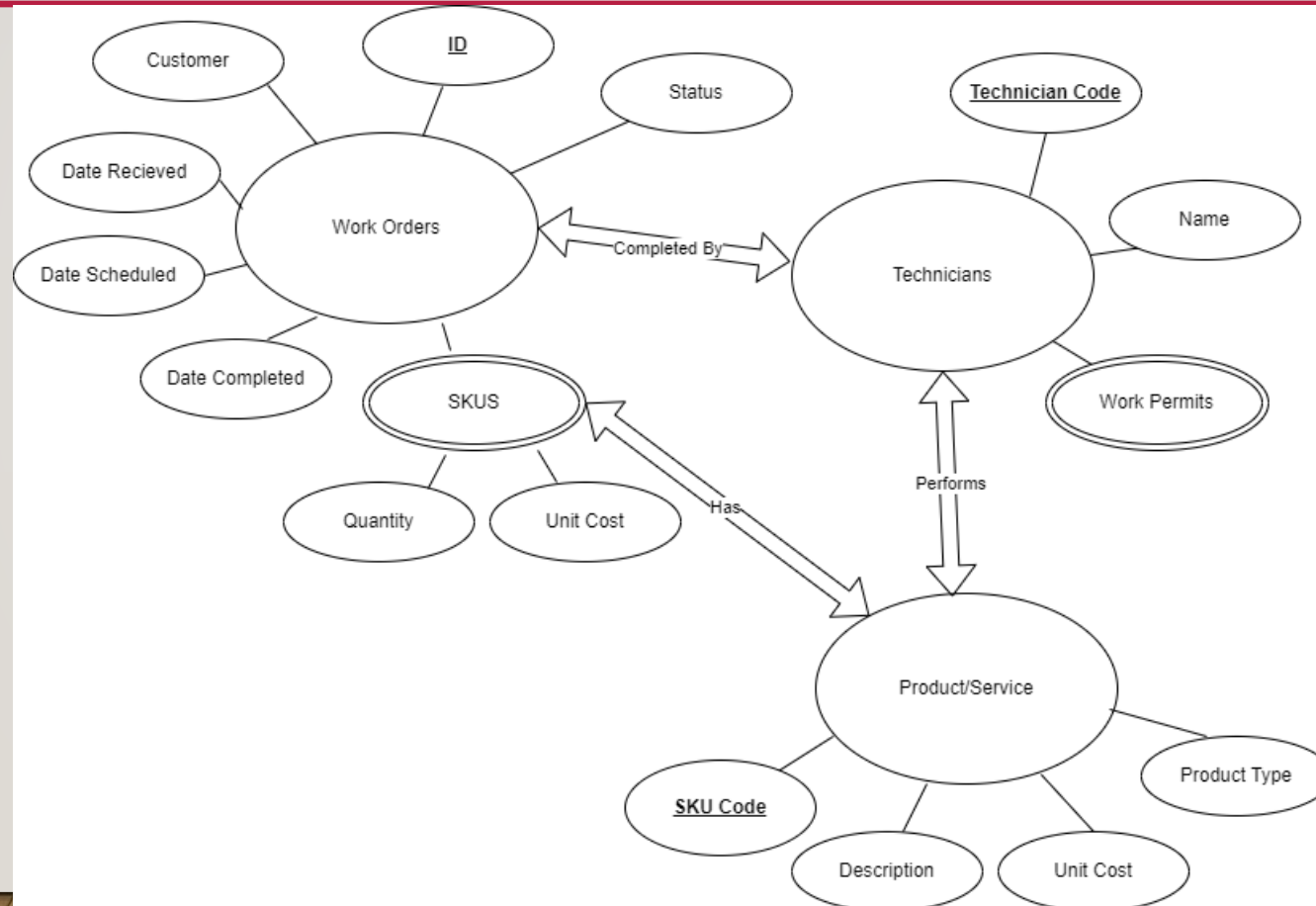
THE CONCEPTUAL MODEL

	Conceptual	Logical	Physical
Understandable By Business Users	**Yes**	No	No
Database Platform Agnostic	**Yes**	Yes	No

WORK ORDER PRO CONCEPTUAL MODEL

CONCEPTUAL MODEL—SURVEY ADDITION

- You have been assigned the task of adding the capability to record survey results for a selection of completed work orders to be done by telephone. The survey should be able to handle four questions with a score ranging from 0-9. A work order should not be surveyed more than once.

- The third question will be used to calculate the Net Promoter Score (NPS).

Net Promoter Score

Promoters (score 9-10) are loyal enthusiasts who will keep buying and refer others, fueling growth.
Passives (score 7-8) are satisfied but unenthusiastic customers who are vulnerable to competitive offerings.
Detractors (score 0-6) are unhappy customers who can damage your brand and impede growth through negative word-of-mouth.

Detractors   Passives   Promoters

0 1 2 3 4 5 6   7 8   9 10

Net Promoter Score = % Promoters — % Detractors

HOMEWORK—PREPARE FOR NEXT CLASS

- Turn your conceptual model into a logical model.