

# In Class Activity 1

## Includes activities of class 1 to class 4

The following exercise allows you to conceptualize a database. Using the following text, describe the problem you are trying to solve. Determine which information is necessary to create a database (to create the Data Dictionary). In other words, outline the database deciding which information will be saved in each entity.

In this class activities, you should follow the step-by-step of database design process before you create your first database.

### Database design basics

A properly designed database provides you with access to up-to-date, accurate information. Because a correct design is essential to achieving your goals in working with a database, investing the time required to learn the principles of good design makes sense. In the end, you are much more likely to end up with a database that meets your needs and can easily accommodate change.

Decide what information you need, how to divide that information into the appropriate tables and columns, and how those tables relate to each other.

Certain principles guide the database design process. The first principle is that duplicate information (also called redundant data) is bad, because it wastes space and increases the likelihood of errors and inconsistencies. The second principle is that the correctness and completeness of information is important. If your database contains incorrect information, any reports that pull information from the database will also contain incorrect information. As a result, any decisions you make that are based on those reports will then be misinformed.

A good database design is, therefore, one that:

- Divides your information into subject-based entities to reduce redundant data.
- Provides the information required to join the information in the entities together as needed.
- Helps support and ensure the accuracy and integrity of your information.
- Accommodates your data processing and reporting needs.

### The Design Process

The design process consists of the following steps:

- **Step 1. Determine the purpose of your database**  
This helps prepare you for the remaining steps. When designing a database, you have to make decisions regarding how best to take some system in the real world and model it in a database.
- **Step 2: Determine the Entities (tables) you need**  
Find and organize the information required. Gather all of the types of information you might want to record in the database, such as product name and order number.



- Divide the information into entities  
Divide your information items into major entities or subjects, such as Products or Orders. Each subject then becomes a table.
- **Step 3: Determine the attributes (fields) in each entity**  
Turn information items into attributes (columns). Decide what information you want to store in each entity. Each attribute becomes a field and is displayed as a column in the table. For example, an Employees table might include fields such as Last Name and Hire Date.
- **Specify primary keys**  
Choose each entity's primary key. The primary key is a column that is used to uniquely identify each row. An example might be Product ID or Order ID.
- **Step Four: Create the Data Dictionary**  
A DBMS component that stores metadata – data about data. Thus, the Data Dictionary contains the data definition as well as the characteristics and relationships
- **Step Five: Determine the Relationships**  
Create the Entity-Relationship Diagram (ERD). Look at each entity and decide how the data in one entity is related to the data in other entities: one-to-one, one-to-many, or many-to-many. Add attributes to entities or create new entities to clarify the relationships, as necessary.
- **Step Six: Convert the ERD diagram to a Relational Database System**  
An entity type within ER diagram is turned into a table. Each attribute turns into a column (attribute) in the table.
- **Refine your design**  
Analyze your design for errors. Create the tables and add a few records of sample data. See if you can get the results you want from your tables. Adjust the design, as needed.
- **Apply the normalization rules**  
Apply the data normalization rules to see if your tables are structured correctly. Adjust the tables, as needed.
- **Step Seven: Choose a DBMS** – Oracle, SQL Server, Db2, Sybase

### About the Company - Office Machines Inc.

Office Machine Inc. makes office furniture and school materials. The company employs about fifteen full- and part-time workers in the Green building in the town of Niceville. The company's director John Brush wants to manage **the absences and overtime of his employees**. He asks you to create a database management system. Of course, you accept with joy! Here are the pertinent elements to create the database.

The company has four **departments** identified by numbers. An **Employee** works for only one department. On their hired date, employees are assigned unique employee numbers that they must memorize. Everything is based on that number. Mr. Brush negotiates each salary individually. In the database management system, he wants to save all the relevant information pertaining to employees such as employee full name, gender, address, social insurance number, job description and category, hourly wage, seniority, and if the employee works full-time (35 hours a week) or part-time.

The employees of Office Machine Inc. are not unionized since Mr. Brush offers exceptional working condition. The fiscal year start January 1<sup>st</sup>. At the beginning of the year, all the full-time employees receive six paid sick days and part-time employees receive a certain number of the discretion of Mr. Brush. All employees have the



right to paid absentee days for special occasions (marriages, births, deaths, etc.) When employees return after taking time off, they must fill out a form giving their employee number, their name, the start day of their absence, its length in days, the date of their return to work, the absentee code, as well as a personal note.

The employees also have vacation days. The numbers of days vary according to the seniority of the employee as of January 1<sup>st</sup>. Vacation days are usually between 5 and 35 days. Employees must fill out an absentee form indicating they have taken or will take a vacation. On December 31<sup>st</sup>, the balance of sick days becomes vacation days.

Mr. Brush occasionally asks his employees to work overtime in exchange for hours off. It may be paid in exact time, time and half or double time. This way Mr. Brush never pays a penny in overtime. It allows employees to arrive late or live early without having to fill out absentee form. The overtime and the time repaid must recorded on an overtime form. Here, employees write their employee number, their name, the date of the overtime, the number of actual hours worked, the ratio repaid (1, 1.5, 2, -1), the new balance of their overtime and a personal note.

Mr. Brush thinks this is all information you will need on his business, and what he wants to manage is absenteeism and overtime.

