# IS 475/675 – HW #2

Bring two copies of your homework to class – one to turn in for grading, and one for notes during class. You will turn in the grading copy at the beginning of class and then use the other copy as a reference during class. This assignment should be turned in on paper.

Create a logical ERD for each of the problems below using the crowsfoot notation discussed in class. Be sure that each entity has the entity name at the top of the box, the primary key attribute or attributes in the middle of the box, and the non-key attributes in the bottom of the box. Lines should separate each part of the entity box. The ERD should not include any M:N relationships and all attributes should be placed within an entity. Each entity must have a primary key defined. A primary key may consist of one of more attributes. Each relationship should have at least one relationship verb or verb phrase. Please include all required foreign keys and denote the foreign key(s) with the notation (FK) on the ERD. I recommend that you NOT use Visio for this assignment but if you want to create entity boxes in Word or another computer tool, feel free to do that.

1.      Design a database to help a consulting organization keep track of employees, projects, and customers. For each employee, the organization keeps track of an EmployeeID (primary key), name, address, and birthdate. For each project, the organization keeps track of a ProjectID (primary key), project name, and date that the project started. A project is contracted for by a customer of the consulting organization. For each customer, the organization keeps track of the CustomerID (primary key), the name, address, and phone number. Each project is contracted for by one and only one customer, but a customer may have multiple projects with the consulting organization. The organization keeps track of customers whether or not that customer has a current project with the organization. Each project is managed by one and only one employee, but an employee can manage more than one project. It is also possible that an employee does not manage any projects. The organization also wants to keep track of employees assigned to work on projects. A project must have at least one employee assigned to it, but can have multiple employees assigned to it. An employee does not have to be assigned to a project, but can be assigned to multiple projects. The organization wants to keep track of the date when an employee is initially assigned to work on a project, and the dollar billing rate that the employee charges for a particular project. An employee's billing rate may be different for each project that he/she is assigned to.

2.      Design a database for ShapeShifters Fitness Center, a company that provides personal training. ShapeShifters plans to use this database to keep track of: customers and potential customers, membership type, trainers, personal training events (both those that are scheduled and those that are completed), and notes and price related to a specific training event. Sample data for ShapeShifters is provided in the Excel workbook called "ShapeShiftersData" available as a link in the same cell where you found this assignment. Each row in the worksheet represents one person signed up for one personal training event conducted, or scheduled to be conducted, by a trainer at ShapeShifters. Here is some additional information about the sample data:

- A customer has only one name and phone number.
- A customer who is a member has a membership typeID. It is possible for a customer to get training from ShapeShifters, but not be a member of the fitness center. If a customer is not a member (like Jim Beaker in the sample data) then the membership typeID is null for that customer.

- A membership type and membership monthly fee is related to a membership type. For example, a "standard" membership type is always $72/month, while a "corporate" membership fee is always $65/month.
- A training event consists of only one trainer, but there could be many customers at a single training event. In the sample data, Melanie Flobert, Maria Hernandez, Jill Johnson, and Loquesha Bartlett are signed up for Marianne Yourdon's Cross-Fit Specialization training event (Training EventID 13 in the data).
- A trainer may schedule many training events, and a customer may schedule many training events.
- A training event does not have a specific name. Most of the time, the training notes are filled in after a training event has occurred to document what happened during the training event. Sometimes, the training notes are completed prior to training, such as training event ID 13, the Cross-fit specialization class. When the training notes are completed should not affect the design of the database.
- The hourly rate paid to a trainer is related to a trainer. A trainer only has one hourly rate.
- The training hourly price is related to a specific training event. The price may change for each event.

3.  Use the business rules below to identify and write all appropriate relationships and cardinalities between the entities shown on the next page. Also include primary keys and foreign keys for each entity. Do not add any entities to the diagram. The data model shown on the next page depicts the entities required for a customer ordering system at a pizza restaurant. A few of the attributes and primary keys have been included on this model to get you started.

This system accepts orders from customers for such menu items as pizza, ravioli, calzones, etc. This is a take-out or eat in restaurant. The restaurant keeps customer information in order to make deliveries of orders to the customer's home (or business).

a. An order is placed by only one customer. A customer is capable of placing many orders.

b. A customer is kept in the system whether or not an order for that customer is currently part of the system.

c. An employee accepts an order that is placed by a customer. An employee may accept zero or many orders, but an order is accepted by only one employee. It is possible that an order is placed directly by a customer over the phone but the customer and employee information is still stored with that order.

d. An employee delivers the order if the order is supposed to be delivered. An employee may deliver zero or many orders. The employee who accepts the order may or may not be the same employee who delivers the order. The company wants to keep track of the employee who delivers an order.

e. A menu item is an item such as a pizza or an order of ravioli. An order may have more than one menu item and each menu item may be on more than one order, so the intersection between the two is an orderline. An order has at least one order line and may possibly have many order lines. An order line is composed of one and only one menu item. A given menu item may be on many order lines.

f. A menu item is made up of one or more ingredients. A menu item must use at least one ingredient.

g. An ingredient can be used in more than one menu item. An ingredient must be used on at least one menu item to be considered part of the system.

**Customer**

| | |
|---|---|
| | |

**Order**

| | |
|---|---|
| | |

**OrderLine**

| | |
|---|---|
| | quantityordered |

**MenuItem**

| PK | **menuitemID** |
|---|---|
| | description<br>price |

**Employee**

| PK | **employeeID** |
|---|---|
| | name |

**Ingredient**

| | |
|---|---|
| | |

**ItemIngredient**

| | |
|---|---|
| | quantityrequired |