Lab Two: Databases and Design

At the end of this lab, you should have:

- thought about the use of databases and their appropriateness;
- designed data model solutions for example business problems.

You should also have answered the relevant questions at the end of the lab sheet. The above statements are the *learning outcomes* of this laboratory and will be achieved in concert with the other learning activities that you undertake for this unit.

Task One: What is a Database?

1. Spend the first ten minutes of this lab talking to those around you about *what a database is* and is not. Think back to the lecture and the questions posed:

    a. What makes a database a database?

    b. What are the vital components of a database?

    c. How do we know something isn't a database?

    d. Can databases only take one format or can they take many?

    After this, your tutor will spend some time discussing these questions with your colleagues within the tutorial room.

2. Spend the next ten minutes talking to those around you to consider relationships that can't be expressed in terms of a parent-child relationship between two entities. Determine two of these relationships, which you will then share with the room.

3. Consider the following blurb below. What database model do you think is most appropriate of document, relational, graph, NoSQL or object-oriented?

    Kim runs a financial services company that organises peer-to-peer loans between organisations. Some of these organisations loan money to other organisations, some receive loans from other organisations and others do both of the above. Kim is not interested in storing the loan transactional data itself; this is handled by a different system, but rather for risk analysis Kim wishes to understand the relationships between different organisations.

    Discuss this for five minutes with the students surrounding you. Your tutor will then spend some time talking about the classes' responses.

Task Two: Kelly's Mulch

4. Consider the following situation described below:

    Kelly runs a tree-chipping business that converts planted trees into mulch. Kelly wishes to track which sets of mulch are derived from which trees, and who it is sold to, to help with planning her business and to determine which trees are most effective. Each sale consists of a customer with an address. Each sale contains at least one batch of mulch. Each batch of mulch contains of a certain weight of tree and a certain type of tree. Each batch of mulch contains the contents of at least one tree. A tree can be in one or more batches of mulch; however, it does not need to be in a batch of mulch. Each batch has a batch code associated with it.

    Design a data model for Kelly's business, by completing the following tasks:

a. Define the sets of entities that Kelly must store for his system;

b. From this, determine the Tables that are required;

c. (Define and) identify the attributes required for each entity;

d. (Define and) identify the primary and foreign keys;

e. Describe the cardinality of each relationship.

This should then allow you to form an entity-relationship diagram of Kelly's system.

Task Three: Raj's Donuts

5. Consider the following situation described below:

   Raj runs a business selling donuts to customers. Due to demand, each transaction consists only of one donut; however that donut may differ in cost and type between transactions. For compliance reasons, Raj must store the name and email of each customer who purchases a donut and desires to know when the donut was purchased to help understand demand.

   Design a data model for Raj's business, by completing the following tasks:

   f. Define the sets of entities that Raj must store for his system;

   g. From this, determine the Tables that are required;

   h. (Define and) identify the attributes required for each entity;

   i. (Define and) identify the primary and foreign keys;

   j. Describe the cardinality of each relationship.

   This should then allow you to form an entity-relationship diagram of Raj's system.

6. Consider the data that Raj now has. Which of the following can he derive from the data that would be stored in rows for the tables modelled above?

   a. Average transaction price;

   b. Number of donuts sold per customer;

   c. The day's most commonly sold donut;

   d. How long the customer waits to eat the donut;

   e. The most popular of the customers' middle name.

End of activities. Please see the next page for the questions you may wish to answer.

Questions

Ensure you can answer these questions to cement your understanding of the lab.

1. What makes a database a database?

2. What are the vital components of a database?

3. How do we know something isn't a database?

4. Can databases take one format, or can they take many?

5. What are the two relationships you have identified between entities in Question 2?

6. What format should Kim's database take and why?

7. Draw your entity-relationship diagram for Raj's system.

8. Draw your entity-relationship diagram for Kelly's system.

9. Write your answers for what Raj can retrieve from his system below.

End of Lab Two.