

Database Design Term Project

CS6360 Fall 2015

Project Description

Design, develop, and test a sales management database for a homebuilder company. The project consists of four parts: conceptual database design (Phase I), logical database design (Phase II), Oracle relational database implementation (Phase III), and final report & demo (Phase IV).

1. The homebuilder company has many employees. Each employee is identified by her employee ID. We also track the name (first name and last name), phone number (in format of '(xxx)xxx-xxxx'), salary and years of experience of each employee (an integer ranging from 0 to 55). Employees are classified as either sales agents or secretaries. We track the shift for each sales agent (multi-value from Mon. to Sun.) and hourly wage for secretaries.
2. The company has many subdivisions. A subdivision refers to a neighborhood that is under developing by the company. Each subdivision has a unique name (a string with variable length), for instance, Highland Park, Meadows of Willow Bend, etc. The system records the start year, zip code and the rank of school district for each subdivision. Each subdivision has multiple employees. Each employee works at a subdivision of the company. Each subdivision is managed by a manager. A manager can only manage one subdivision. We record the start date of the manager for each subdivision.
3. Each subdivision provides several floor plans. A floor plan cannot be identified by itself; it belongs to a subdivision of the company. Within each subdivision, a floor plan has a unique number (4-digit integer). We record plan name; square footage (4-digit integer); number of floors (integer from 1 to 3); number of bedrooms and baths (integers from 1 to 5); list price (integer); and number of garages (integer from 1 to 3).
4. Each subdivision has a number of lots. Within a subdivision, each lot has a unique number. We record information for each lot including the lot size, facing (North, South, East, or West), and if the lot is 'available' (explained as below) for building new house.
5. Each subdivision has a list of inventory homes (ready-to-move-in) for sale; each inventory is identified by its id (unique within a subdivision). It comes with a preselected floor plan and is built on a preselected lot. Sold lots and the lots that have been selected to build an

inventory home are considered not ‘available’ . For each inventory home we record its list price, and when it became ready for move-in (date in format of ‘MM/DD/YYYY’ , e.g., 05/01/2015, 08/15/2015, etc.)

6. When a customer visits for the first time, the database system creates a profile recording her name, email (unique), phone number (multiple values), income, credit score (integer from 300 to 850) and her preference for the house. Preference for the house is a composition of desired number of bedrooms, number of baths, square footage, as well as school rank. Every time a customer visits a subdivision, we record the visit date and name of the subdivision. [A customer visiting a subdivision may ask an employee working in that subdivision to tour her around some inventory homes, the tour date is recorded.](#)
7. Customers are further classified as either potential or existing customers. A customer is considered as a potential customer until she signs a contract with the company. Each contract is signed between a customer and a specific subdivision. A customer may sign one or more contracts with the subdivisions. A contract is associated with a specific floor plan and a specific lot. A floor plan may fit in many lots; a lot can be used to build only one floor plan. We track the ID (unique), the date signed and the sale price for each contract. Most of the time the sale price is lower than the list price. Each contract is prepared by an employee.
8. [A home-loan applicant submits applications to loan companies. A loan-applicant can be a customer or employee of the homebuilder company. For each loan applicant, the system tracks her credit report, loan approval/disapproval date, loan type \(fixed-rate, ARM, etc.\) and loan term \(15 year, 30 year, etc.\)](#)

Project Questions

- a) Can you think 2 more rules (other than the one explicitly described above) that are likely to be used in the system?
- b) Is the ability to model super-class/subclass relationships likely to be important in such environment? Why or why not?

Project Phases

- I. Draw an EER diagram to accurately represent this set of requirement. This will be your Conceptual Design. Clearly specify any assumption that you are making. You can use any tools (software) to draw the EER diagram. You don’t need to describe the value constraints of

the attributions in the EER diagram. (20%) (Refer to eLearning for due date)

II. Design Logical model for the database. Perform the following steps. (20%)

(Refer to eLearning for due date)

- a. Convert your Conceptual model to a Logical model that can be implemented in a relational DBMS like Oracle. During this process you replace M-N relationships and multi-valued attributes with constructs that can be implemented in the relational DBMS. Draw EER diagram for the logical model after your modifications. Feel free to change your conceptual model (first delivery) if needed.
- b. Document your design in Database Schema format like the one we discussed in the class. Briefly justify your choice of mapping rules.

III. Use a relational DBMS to implement the database. (45%) (Refer to eLearning for due date)

- a. Normalize all of your tables to third normal form. Make any necessary changes to the EER. Explain why these changes needed to be made.
- b. Draw a dependency diagram for each table.
- c. Write SQL statements to create database, tables and all other structures. Primary keys and foreign keys must be defined appropriately. The quantity constraints of the relation between the entities, which should be described in EER diagram, are not required.
- d. Populate your database to test the following views/queries. You don't need to submit your data in report though.
- e. Use the Create View statement to create the following views:
 1. School rank: show the school rank of each subdivision along with the average base price of floor plans the subdivision provides.
 2. Promising customers: show the name, age and email address of potential customers with credit score over 740.
 3. Inventory homes: show the information of unsold inventory homes that have been completed or will be completed by the end of 2015 for each subdivision along with the manager name of the subdivision.
 4. Large floor plans: show the information of floor plans over 4000 square feet for each subdivision.

5. Sales record: for each subdivision, show the name of each sales agent and the number of contracts she prepared in year 2014.
 6. Deal discount: for each subdivision, show the information of the contracts signed for inventory homes with a discount in year 2015. Here contract with discount means that the sales price showed in the contract is lower than the list price of the inventory home.
- f. Answer the following Queries. Feel free to use any of the views that you created in previous part.
1. Retrieve the school rank of each subdivision in decreasing order of the average base price of floor plans the subdivision provides.
 2. For each subdivision, retrieve the number of unsold inventory homes that have been completed or will be ready by the end of year 2015.
 3. For each subdivision, retrieve information of the sales agents who prepared all the contracts with floor plans over 4000 square feet signed in year 2015.
 4. For each subdivision, retrieve the information of the sales agent who prepared the highest number of contracts in year 2014.
 5. Retrieve the information of the inventory home that has not been sold for the longest time since its completion, along with the name of the manager who is in charge of that subdivision.
 6. Retrieve the information of potential customers who have been visiting subdivisions of the company for more than one month and the price range of the inventory homes they have toured lies between \$300,000 to \$400,000.
 7. For each subdivision, retrieve the information of each customer whose home loan has not been approved over one month after he/she signed his/her contract.
 8. Retrieve the name, age and email address of potential customers with credit score over 740 who visited a subdivision in August this year but have not visited any subdivision since September 1st.
 9. Retrieve the average discount received by the customers who have signed a contract to purchase an inventory home.
 10. Retrieve information of the potential customers whose house preferences can be matched by one or more inventory homes that will be ready to move in by the end of

year 2015.

IV. Document the final term project report and demo. (15%) (Refer to eLearning for due date)

- a. Problem description (Copy it from project description).
- b. Project questions (Answer questions listed in this project).
- c. EER diagram with all assumptions.
- d. Relation schema after normalization. All relations must be in 3NF. The relation schema should include primary keys as well as foreign keys (if any) for all relations.
- e. All requested SQL statements.
- f. Dependency diagram.
- g. Demo.