

UNIVERSITY of MARYLAND

University College - Asian Division

Project 4: Relational Database Design (Conceptual Design & Logical Design) & Prototype Implementation

Objective:

1. To practice analyzing material in terms of the database elements of information systems design requirements;
2. To utilize the conceptual modeling methods studied in class for translating user views and initial data requirements into entity-relationship diagrams;
3. To apply design methods studied in class for translating data requirements and entity relationship diagrams into logical schemas (e.g., normalized relations); and
4. To learn database application development skills by implementing the relational design in Access 2000.
5. Project 4 is an individual effort and is not a group project.

Design Assignment Part 1 - Conceptual Model

- 1) Read the narrative description of the case study that is included as a separate handout for this course. Make sure you have a sound understanding of the organization and its major units, functions, processes, and entity types. [NOTE WELL: It is unreasonable to assume that all necessary aspects of the problem are clearly described in the problem statement. Clients are unable to tell you everything you need to know about their application environment, even if they could collectively agree (HINT: Use your instructor as a client resource for this assignment!). And the designers would not be able to think of asking all the necessary and relevant questions. Therefore, be sure to state explicitly and clearly any assumptions you make in developing your data model. Also discuss any ambiguities or difficulties encountered.]
- 2) Prepare a list of additional questions that need to be answered for your completion of the database design. Set up and conduct an information requirements interview with your instructor to get the questions answered. This will be done class 2 of week 5. Document the questions and answers as part of the design documentation of the assignment.
- 3) Provide a well-written narrative description of what you believe to be the *information requirements* that a DBMS application would need to satisfy. Be sure to note any assumptions about the organization's operations that will be critical to the implementation of the database. This narrative description will be your Database Initial Study to be turned in with your final project report for this design assignment.
- 4) Develop the conceptual data model for the database. The conceptual model should address all of the information requirements of the case description. Draw a finalized version of an entity-relationship diagram for the case using PowerPoint. Label it clearly and be sure to provide the cardinality of all relationships (1:1, 1:N, N:M), and to resolve all non-specific relationships. For simplicity of the diagram, don't indicate attributes on the diagram. Indicate all entities and attributes for each entity on a separate sheet as a data dictionary in tabular form using Excel. Provide a written explanation of your diagram and conceptual model, including any assumptions made, problems in interpretation, etc. The conceptual model is due class 1 week 6. Bring to class both your E/R drawing as a PowerPoint file and your data dictionary as a Excel file on a 3.5" diskette. Make sure you virus scan the disk.

Design Assignment Part II - Logical Schema (Model) & Implementation

- 1) Based on your finalized entity-relationship diagram, develop the logical design for the database system.
 - a) Provide a final relational model normalized to 3NF relations using "short hand" notation. Primary keys (Bold Underlined), foreign keys (Bold Italic), and referential integrity constraints must be noted using linking arrows.
 - b) Provide a listing of any notes, assumptions, or caveats about your final logical design that help to explain why you developed the design that you did.
- 2) Implement the database application using MS Access 2000 RDBMS. Do these required tasks before considering any extra effort for this project:
 - a) define and create the appropriate tables for a relational database implementation;
 - b) define keys and indexes;
 - c) define the relationships among your tables;

- d) define any necessary referential integrity constraints between your tables;
- e) populate the tables with sample data that you develop to test your application;
- f) implement a data entry form for the event(s) described in the case study;
- g) implement a report as a query;
- h) provide hard-copy printouts of the database structure, the contents of all database tables, the code/text for the standard reports/queries, and the results of running the queries/reports listed in part (g) above

Deliverable Expectations:

- Use a word processor and some drawing software (e.g., PowerPoint, Visio, or other) to develop your answers to the assignment exercises. Turn in a printed copy on the due date.
- A cover page with your name, date of assignment, assignment name.
- **Your Design Assignment Report should include the following sections:**
 - 1) Design Report Overview
 - a) Purpose of design report (1 paragraph explanation)
 - b) Database Initial Study
 - 2) Conceptual Model
 - a) A finalized E/R diagram for database
 - b) Data dictionary for database
 - c) Listing of any notes, assumptions, caveats about your final conceptual model that help to explain why you developed the conceptual design that you did.
 - 3) Logical Model
 - a) Finalized relational model of 3NF relations. Include notation to depict functional dependencies, primary keys, foreign keys, and referential integrity constraints.
 - b) Listing of any notes, assumptions caveats about your final logical design that help to explain why you developed the design that you did (e.g., especially normalization decisions).
 - 4) Physical Prototype Implementation
 - a) Hard copy printouts of database structure
 - b) Hard copy printouts of contents of all database tables
 - c) Hard copy printout of the relationships
 - d) Hard copy printout of the queries in SQL View. Explain the generated code.
 - e) Results from running queries
 - 5) Project Appendix
 - a) Interview questions and answers
 - b) Other materials that helped to shape your database design and implementation
 - c) Include the final Access 2000 database on a diskette.

Due Date and Grading:

Project 4 is due, the second class of week 8. Late projects will be reduced 20% of the total point value for each class period late up to the final. No project will be accepted after the final exam. Grading will be 80% objective (results, explanations, conclusions) and 20% subjective (neatness, clarity, conciseness, extra work). A project report that correctly meets all specifications in a minimal way will receive a score of no more than 80% of the total points.

Project 4: Case Study

Overview

Tori Video is the Iwakuni base video store. The store has been moved to a new location and has lots of cash for improvements. One of the improvements will be updating their movie rental and sales processing. Transactions have been conducted on a cash basis and customer records have been kept manually using an archaic DOS program on a failing PC-XT. Tori video does not have membership plans nor do they require deposits. The inventory of each store is maintained on hand-written journal sheets stored in a three-ring binder and updated on a quarterly basis.

A team of consultants was hired to develop preliminary information requirements based on interviews with Tori Video store managers and clerks. The preliminary information requirements (i.e., what data is currently captured, what is the current organization of the data, what events need to be supported by the system) have been documented in the textual narrative in the remainder of this document.

Your assignment is to take the next steps in the analysis/design process:

- (1) Refine the initial information requirements;
- (2) Develop the conceptual data model;
- (3) Translate the conceptual data model into the logical design (for a relational model);
- (4) Use Microsoft Access 2000 to produce a working database for the Tori Video rental and sales system.

Tori Video Operations

Rental information:

The standard time period for a movie rental is two days after the borrowed movie is issued. However, "new release" movies are due back one day after the borrowed movie is issued. The movie must be returned by 9PM on the due date. Failure to return the movie by 9PM on the due date results in a late charge of \$3.00/day on the customers account. If the customer fails to return the borrowed movie by 1PM on the second day after it is due, then it is time to contact the customer by telephone to request return of the items.

A rental is the borrowing of a movie by a customer in exchange for cash. The rental rate for new releases is \$3.00 and \$2.50 for all other movies. If a movie is late, there is a late charge of \$3.00 per day. Customers can rent more than one movie at a time.

Movie information:

A movie can be either in videocassette or DVD format. Each movie has an identification number, a title, a release date, a type (western, action, drama, comedy, science fiction, family, musical, mystery, new release), names of key actors/actresses, and rental rate. There can be more than one copy of each movie in both formats.

A movie copy can be rented, it can be sitting on the shelf waiting to be rented, it can be overdue from rental period, it can be reserved for a customer, or it can be available for sale (but not rental). Movie copies are purchased from national wholesalers on a monthly basis to replenish each store's inventory.

Customer information:

Customers have an identification number, names, address, telephone, and email. Tori Video would like to track the renting history of its members and reward those members who maintain a frequent renting record. These frequent renters will be called Video Samurai and qualify by renting at least 2 movies the previous week or have rented more than 50 movies in the past year. These members will pay a flat rate \$2.00 per rental on all future rentals including new releases. To provide better customer service Tori Video would also like the following features incorporated in the database: customer reservation of movies for a specific date, customer searching for movies by title, and actor/actress.

Other details

There are a number of standard events that the Video Rental system must accommodate. The following table provides a sample set of events that the Video Rental system must support:

Sample Events for the Video Rental System

| | |
|----------|---|
| Event 1 | Customer requests movie for rental from Tori Video store. |
| Event 2 | Customer makes rental payment. |
| Event 3 | Tori Video store clerk adds new movie to store inventory. |
| Event 4 | Tori Video store manager retires old movie copies from store inventory. |
| Event 5 | Customer pays late charge. |
| Event 6 | Tori Video store manager submits a rental rate change to a movie. |
| Event 7 | Customer returns movie to Tori Video store. |
| Event 8 | Tori Video store clerk needs to produce a report of current movie rentals from the store. |
| Event 9 | Tori Video store clerk adds a new customer to the store database. |
| Event 10 | Tori Video store clerk changes a customer's phone number. |
| Event 11 | Tori Video store manager needs to view a list of active customers. |
| Event 12 | Tori Video store manager needs to review the store's movie inventory and determine what additional movie copies to order from the wholesaler. |
| Event 13 | Customer requests a movie to be reserved from a Tori Video store. |
| Event 14 | Customer buys a movie from a Tori Video store. |
| Event 15 | Tori Video store manager needs to review current members and their rental history to determine upcoming rental promotions. |