IS 475/675 Database Design & Implementation Project

What is the purpose of the project?

The two objectives of this project are to design a database to support the requested operations of the company described in this document and create a prototype to test the design. This project requires you to:

- Identify the data required to be stored for the application.
- Identify the entities, attributes, primary keys, relationships and foreign keys.
- Create a logical data model in third normal form.
- Create a sample prototype database.
- Write a series of queries to test the prototype and check the validity of the database design.
- Write design documents (memos) that explain the structure of your database design and the functions of the prototype.

Project Structure

The application scenario used for the entire project is described in this document. The application scenario will not change for the three parts of the project – it will be the same and will be described only in this document.

The project is divided into three parts: (1) Database Design and Documentation; (2) Prototype Creation; and (3) Prototype Enhancement and Queries. The three parts of the project will be turned in and graded separately to help provide milestones and ensure that the project will be completed by the end of the semester.

What are the deliverables from part 1 of the project?

There are two deliverables for this part of the project: (1) A memo to me; and (2) a data model for the entire application system in third normal form.

The data model should be documented using a logical entity-relationship diagram (ERD). The ERD must be produced using Visio or another computer modeling tool. Please **do not** turn in an ERD drawn by hand.

Describe the data model with a business-style memo. This memo will be written to me, as your instructor so that I can understand any assumptions you made to complete the model. The memo should:

1. **Describe the data model.** When describing your data model, you can assume I know how to read an ERD. You can't assume that I understand your abbreviations or what was in your mind when you designed the database. Explain how your database design will produce the information desired by the client. Review the managerial and operational questions that will depend on the database and explain how your data model will store the data necessary to eventually answer those questions. I recommend dividing your description by area: Marketing and Quality Control.

2. **Explain the assumptions.** If you need to assume anything (existence of data in another system that you will link to, business rules, etc.) please explain those assumptions.

Use a business memo format and incorporate easy-to-understand headers and bullet points. I really like headings/sub-headings and bullet points. The memo should be brief – no more than 2 pages in length.

What is the application?

Replica Toys designs, develops, manufactures, and markets sophisticated, expensive, automated toys for children. Replica Toys sells directly to the public, but most of their toy sales are made through distributors such as Toys-R-Us, World of Toys and independent toy stores. The company's toys are relatively expensive (the least expensive toy sold is priced at $250 and the most expensive toy sells for $25,000) and are also frequently sold through exclusive, specialized, independent toy stores. Replica Toys sells few toys when compared to other toy manufacturers because their market includes only those people who are looking for sophisticated, expensive, very high quality toys.

The company's first product line included a set of miniature ride-able motor vehicles. Each toy is a complex replica of an adult vehicle. Their ride-able toys include all-terrain vehicles, trains, trucks, luxury sedans, sports cars, and vintage automobiles. The product line includes approximately 35 unique ride-able vehicles at any one time. The model number indicates the general model of a toy and could be considered a product identifier. For example, a "Chevy 4 door SUV" is model CSUV7. Each individual toy, however, is uniquely identified by a serial number. Replica Toys will sell more than one model CSUV7, each with its own unique serial number.

Replica Toys wants to create a database to track post-sales information. The database will be used by two different departments in the organization:

1) **Marketing Department**. The Marketing Department will use the database to answer questions about customer purchases. The Marketing Department wants to store customer registration information. They will use registration data to better understand why customers elect to purchase toys from the company. They will use data about customer returns to understand why customers return toys from the company. This database will **not be** used to process financial transactions for orders or returns – it will be used to capture marketing data about the reasons WHY a customer places an order or returns a product.

   The Marketing Department may conduct customer surveys in the future, and they want a way to store data from those surveys. The Marketing Department will also use this database to track

information gathered from the web about customer reactions to their products. They plan to scan the web frequently and download any reviews/comments about the toys.

2) **Quality Control**. The Quality Control group within the Manufacturing Department will use the database to track problems with toys that have been sold. The Quality Control group wants to store problem reports, testing and resolution documents.

The company wants to consolidate all post-sales returns, registration, service and customer data in a single database. This database does not contain customer order data, but in the future it might link to the customer order database. This database does not contain inventory data, but in the future it might link to the inventory database. The purpose of this particular database, however, is to store post-sales data. It is NOT to store order data or inventory data beyond what is necessary to support the processes required by the Marketing Department and the Quality Control group.`

Registration Data

In order to keep track of customers and purchases, Replica Toys asks all customers to fill out the registration form shown on the next page as Figure 1. Customers are usually compliant with that request because Replica Toys offers free service for two years to all those who submit the form. Replica Toys also provides savings offers to current customers for future purchases, if those customers fill out the registration form. Replica Toys has many return customers – their customers tend to buy toys from them many different times.

Registration forms will be filled out online, using the database you are designing as the place to store the data collected from customers. Registration forms are completed by the person who purchased the toy. Most toys are sold through distributors. The company anticipates using the serial number of a toy as the primary key because each toy can be uniquely identified by its primary key. Business rules about the registration data are provided below.

- A registration will contain only one answer to the question "Where did you first learn about Replica Toys?"
- A registration may contain multiple answers to the question "What features were you most interested in when buying the toy?" The Marketing Department anticipates that additional features may be added as they determine which features are most important to customers and identify additional features that might be of interest to customers.
- A registration will contain only one answer to the question "How are you related to the primary user of the toy?"
- Each toy has a unique serial number. A serial number has one and only one registration – Replica Toys does not keep track of re-sale registrations for its toys. A serial number determines the model number of a toy. The model number determines the name and description of a given toy. The company keeps track of the name, description, and recommended price of each model (even though that information is not shown on the registration form in Figure 1), so that data should be in this database.
- A given registration can have only one gender checked.
- The company does not keep track of the name of the intended primary user, since that user is most likely a child. The age of the intended primary user is interesting to the Marketing Department because they want to know the ages at purchase of the recipients of each particular model. The "buyer" is the person who purchased the toy. The buyer (customer) is usually an indulgent relative (parent, grandparent, aunt, uncle) of the intended user of the toy.

Buyer Information		Purchase Information	
First Name	Bert	Model Number	JCSUV7
Last Name	Swanson	Serial Number	19029388-11
Address	7883 Cordova Ave.	Date of Purchase	10/14/2017
City	Rancho Cucamonga	Distributor	Claremont Toy World
State	CA	Price	485.99
Zip	91209	**Primary User of Toy**	
Email	bswanson@gmail.com	Age	3
Primary Phone	714-232-1111	Gender	F

Background Information about the Purchase	
Where did you first learn about toys from Replica Toys? (Check only one)	☐ Advertisement in print ☐ Advertisement on the web **X** Advertisement on TV ☐ Friend's recommendation ☐ In-store display ☐ Catalog ☐ Other
What features were you most interested in when buying the toy? (Check all that apply)	**X** Type of toy (car, jeep, etc.) ☐ Size **X** Color **X** Speed **X** Quality of design ☐ Level of replication from original ☐ Safety features ☐ Cost ☐ Sound features ☐ Other
How are you related to the primary user of the toy? (Check only one)	☐ Parent ☐ Grandparent **X** Aunt/Uncle ☐ Friend ☐ Other Relative ☐ Other
Do you anticipate buying similar toys in the future? (Check only one)	☐ Yes ☐ No **X** Don't know

Figure 1: Sample Registration Form

Return Data

Replica Toys has not kept track of return data in the past, but the Marketing Department wants to understand why people are returning toys. The Marketing Department wants to store data about returns made from toy buyers. They requested that their distributors ask their customers (people buying the toys) to provide an explanation when making a return. This data will be gathered from the cash register systems of the distributors and sent to the Marketing Department at Replica Toys. For those people buying toys directly online from Replica Toys, the data will be gathered from an online form. Return data that the Marketing Department wants to store will include: Serial Number, Date purchased, date returned, reason for return (they plan to have about 10 standard reasons why people would return the product), and

a notes area where people can type in any comments they have about the returned item. Personnel in the Marketing Department anticipate they will be able to persuade their distributors to type in any comments that the customers made about the toy when returning the product. Since this system is not in place yet, they don't have a sample form to provide for you to understand the data required.

Survey Data

The Marketing Department anticipates using registration data to occasionally survey past customers. The folks in the Marketing Department aren't sure how they will conduct the surveys yet, but they know they will need a place to store the data once they do conduct surveys. Surveys would not be related to a specific registration, they would be related to a customer. The folks in the Marketing Department want to be able to store the questions for a survey, possible answers to questions for a survey, and a specific answer given to a specific question by a specific customer. They really aren't sure exactly what the surveys would look like right now, but here are a few samples of questions and answers that they hope to be able to store for a customer:

Question	Answer
1. How many rideable toys have you purchased in total?	5
2. How many of those rideable toys have you purchased from Replica Toys?	2
3. How would you rate the quality of the toys you purchased from Replica Toys in comparison to those purchased from other companies?	Much better
4. How likely are you to purchase another toy from Replica Toys?	Somewhat likely

Review Data

The Marketing Department anticipates gathering data from available sources to capture customer reviews of their products. They plan to relate a review to a given model of a toy. The data that they will store for each review is: Model number, review date, review source (i.e. Yelp, Google), and review text.

Quality Control Data

One of the greatest concerns about the products sold by Replica Toys is that they be safe for children. The products are fairly complicated and it is possible that a toy could harm a child if the design is flawed or if the implementation of the design is not correct. As a result, the company monitors the problems reported with toys very closely. If there are any problems with a toy, Replica Toys notifies customers and distributors directly.

To keep track of problems reported for a product, employees at the company fill out the problem report form shown below as Figure 2. Whenever a customer or distributor calls in with a problem, an employee at Replica Toys fills out the form in Figure 2 with detailed information about the problem. There is a standard set of problems (problem types) used to fill out the problem description area of the form in Figure 2, but each problem reported is currently typed in as text by the employee filling out the form. Problems are related to a specific serial number, but a specific serial number may have more than one problem reported.

Date/Time of Report	11/02/2017 9:35AM				Report ID	760-22931	
Model Number	JCSUV7				Serial Number	19029388-11	
Returned?	Yes		No	☒	Return Date		
Person Reporting Problem (Check only one)	☒ Customer ☐ Employee of Replica Toys ☐ Distributor ☐ User ☐ Other						
Complaint Made	☐ WebForm	☐ Phone	☒ Email	☐ Twitter	☐ Store		
First Name	Bert						
Last Name	Swanson						
Address	7883 Cordova Ave.						
City	Rancho Cucamonga						
State	CA						
Zip	91209						
Phone Number	714-232-1111						
Email	bswanson@gmail.com						
Type of Problem (Check only one)	☐ Inadequate finish – toy does not look good ☐ Inadequate operation – toy does not operate correctly ☒ Poor operation – toy tips over during use ☐ Inadequate operation quality – toy broke during use ☐ Poor operation quality – toy hurt user ☐ Other						
Description of Problem	When driving around corners, the Chevy Tahoe seems top heavy and tips over unexpectedly. Happens most often on uneven terrain.						
Injury	☐ Yes ☒ No						
Description of Injury							

Figure 2. Sample Problem Report Form

Problem reports can be initiated by a distributor, an employee of Replica Toys, or a customer. A problem report is initiated by only one person. The person who initiates a problem report could fill out multiple problem reports. Multiple problem reports could be filled out for a given toy (uniquely identified by a serial number).

It is not necessary to have a registration form stored to create a problem report. For example, a customer does not have to register a toy to call the company with a problem with a specific toy. While this post-sales system includes both Marketing and Quality Control data, they are only tangentially related to each other.

Once a problem report is filed, Replica Toys does testing and evaluates the validity of the complaint. Employees fill out reports for each test performed in relation to a problem report. An example of the Test form is provided in Figure 3.

Problem Report ID	760-22931	Date and Time of Report	11/08/2016 8:30AM
Model Number	JCSUV7	Serial Number	N/A
EmployeeID	35002	Test Type	Operational
Test Description	Used computer simulation of vehicle with 40 pound rider 3 MPH; 5MPH; 10MPH; 15MPH test runs. Tried it on qualified uneven terrain including potholes. Tried it on unqualified terrain (sand).		
Test Results	Slight outside tilt; no tipping at any speed on qualified terrain. Tipping occurs when vehicle is used on sand.		
Recommended Resolution	No problems with expected performance. Provide additional documentation to Marketing about intended operating environment for JCSUV7. Recommend inclusion of additional information in operating manual stating: don't operate on sand.		
Test complete?	Yes.		

Figure 3. Test Form

More than one test form may be completed per problem report. A test form is not filled out unless initiated by a problem report; there must be a problem report stored in the database before a test form can be completed. It is possible that the recommended resolution of a test form is to perform another test. When that occurs and another test must be performed, the "test complete" question on the form is answered as "no".

Managerial and Operational Questions

Two disparate groups (Marketing and Quality Control) each have different types of questions they hope to answer from information obtained from this database. Both groups have data from other databases in the organization – Marketing gets most of its data from the ordering database, while Quality Control uses the manufacturing database. But neither of those databases stores post-sales registration, return, survey, and service data. Here are samples of the questions that the two groups hope to answer from this database:

- How old is the average user for each of the different styles of vehicles?
- What is the preferred purchase by gender?
- What are the most important features to a grandparent purchasing a vehicle for a grandchild?
- How do grandparents hear about our toys?
- Which toy models are returned the most often?
- What reason is given for returns for those toy models returned the most often?
- Which user age group has the most returns?
- What is the relationship of the customer to the intended user for those toys returned the most often?
- What is the relationship to the primary user for our different models? In other words, do grandparents or parents buy the most SUVs? Which type of buyer buys the most sports cars?
- Which model has the most problem reports? Which model has the least problem reports?
- Who reports the most problems – distributors or customers?
- What is the gender and age group of the primary user with the most and least problem reports?
- What is the current status of a specific problem report?
- What tests did we run on a specific date?
- Are there any problem reports that have not had any tests run?
- Which problem reports are not complete (have not been issued a "yes" on the "test complete" question of a test form?
- What is the count of injury reports by model?
- What is the count of injury reports by model by age of primary user?
- What is the count of injury reports by model by location of buyer? Or by location of distributor?
- When did we receive the most current injury report for model CVR722? (or any other specific model)