Course Project

Purpose

To analyze the requirements, design, implement, document and test a database application for Book Fetch, Inc. The User Requirements of the database application are given in Appendix A below.

Materials to submit

You will be asked to submit reports at various milestones as major phases of the project are completed. Further, you will also need to demonstrate the database application you designed and developed. Details about the milestones of the project, the phases they include and their due dates will be posted on the course web site.

Project Report/Phases

The project consists of the following phases. In addition, you will develop and maintain a Project Report. Your Project report should consist of a section for each phase, as well as an executive summary, introduction, and conclusion.

A. *Requirements*

Analysis of the requirements of the project and a high-level description of the tasks involved.

B. *Conceptual Design*

This stage involves the following :
> Develop an Entity-Relationship model detailing the relations involved.
> Identify a minimal set of attributes that identify the entities and the relations.
> Don't forget cardinalities.
> List the constraints for each relation and entity.
> You should be able to explain the reasons for the particular design approach you have chosen.

C. *Logical Design*

This stage involves the mapping of your conceptual design above onto the relational data model. In this stage, you will design the tables for all your entities and relations. You should apply all normalizations you find useful and/or necessary. Ensure that your design still satisfies the user requirements. Justify your design choices.

D. ***Physical Design***

   This stage involves the following:
   ◦   Design a MySQL database based on the design developed in section B.
   ◦   Implement MySQL tables for the relations and the constraints.
   ◦   Maintain scripts for the creation and deletion of tables.
   ◦   Maintain scripts for loading data into your tables.
   ◦   Design the user interfaces for your application.
   ◦   Ensure that your design still satisfies the user requirements.
   ◦   Justify your database design choices.

E. ***Prototype, Development, and Testing***

This consists of the following:
   Write Python code to access, update and administer the SQL tables made.
   Develop minimal user interfaces, using Python, which satisfy the functional user
   requirements. The user interface can be a command line interface and will be
   required only for a specific subset of functionality of project as indicated in
   Appendix A.
   Create indices for the database application. Justify the reasons.

 F. ***Research***

Choose one of the research topics to explore. Prepare a 5 minute presentation for the
end of the semester.

Project Demonstration

Populate the tables with data for :

How you will populate the tables will be forthcoming in the next few weeks.

Miscellaneous

The final project report should document all the activities with appropriate E-R
diagrams, relation schema, etc. It should also give a list of the limitations of the
application and give possibilities for improvement. Features and functions other than
specified in the document can also be added but should be documented clearly and
demonstrated as well.

Appendix A

Book Fetch, Inc.
User Requirements

Book Fetch Inc. specializes in online sales and rentals of new and used textbooks as well as electronic books for students.   The site is specifically for college students.

System Scope

There are 2 types of users: students and employees. Students may buy books or rent books. There are two types of employees, customer support users log technical problems with the web site, perform order cancellations and log general complaints. There are also employees who administer the online store. They handle trouble tickets that are produced by the customer support employees and students. They adjust inventory of books when new shipments are available. They also add course book requirements from universities. For any given university, a set of departments will exist and a set of courses will exist for a given semester and year. A student may choose to buy or rent a book based on a course book requirement or they may buy or rent a book that is not associated with a course. It is assumed that all users have network computers capable of running IE or Chrome Web browsers and Python applications.

Data Requirements

Student Users

The student users are assumed to be college students who wish to rent or buy books. The users have a first name, last name, email address, address, telephone number, birth date, university affiliation, major, student status (graduate or undergraduate), and year (1st, 2nd, 3rd, 4th, etc.). Students can also enter trouble tickets if they have a problem using the site. A trouble ticket entered by a student is set to a status of 'new' and only a customer support user can access it. Students can review books and provide a rating only. Ratings are from 1-5 where 5 is the highest rating.

Customer Support Users

The customer support users are employees of Book Fetch Inc. They have an employee ID, a first name, last name, gender, salary, SSN, email address, address, and telephone number. A customer support user cannot perform administrator actions, only customer support actions such as logging technical problems with the web site, canceled orders and general complaints. No returns are processed by this system. A technical problem or complaint can be entered by a customer support user or a student. If entered by a student only the customer support user can access the ticket, it will be in a state of 'new'. Once the ticket is viewed by a customer support, they then can assign the ticket to the administrators. The status of the ticket changes to 'assigned'.   Customer support users can view tickets in any status but can only change

tickets in a state of 'new'.

Administrators

The administrators are also employees of Book Fetch Inc. They also have an employee ID, a first name, last name, gender, salary, SSN, email address, address, and telephone number. Administrators can adjust inventory, add university course required books to the web site and also handle trouble support tickets that are in a state of 'assigned', 'in-process' or 'closed'. They cannot create new tickets and they cannot edit tickets in a state of 'new'. An administrator cannot perform customer service tasks. There is one super-administrator who can enter new customer service employees and new administrator employees into the system.

Books

Books can be rented or bought. Books can be used or new. Books can be offered as hard copy or electronic. Books should have a type (new or used), a purchase type (rent, buy), price, quantity, book title, author list, ISBN, ISBN-13, publisher, published date, edition number, language, format (hardcover, soft, electronic), and weight. Books belong to a category and one or more subcategories. Each book should have a set of keywords associated with the book. Books also have ratings. Ratings are from 1-5 (with 5 being the best) and are provided by students. Each book may have a list of courses it is associated with for a number of different universities.

Universities

There are multiple universities that send course listings to Book Fetch Inc. Each university has an ID, name, address, and a representative first name, last name, email address and phone number that is used for contacting the university. Universities have associated departments, courses, and instructors.

Departments

Departments are associated with universities. Each department has a name and a university.   Each department has a set of courses offered for a particular semester.

Instructors

Instructors are associated with universities and departments. Each instructor has a first name, a last name, a university affiliation, a department affiliation and courses by which they are associated.

Courses

Courses are associated with departments and instructors, and courses are associated with books. Each course is associated with a single department. Each course can be associated with multiple instructors. Each course has a course ID, a name, a

department, a year and semester it is offered, an instructor, and a university. Courses are also associated with books. Each course will have a list of books that are used for that course for the given year, semester and instructor.

Trouble Tickets

Each trouble ticket will be associated with a category of the web site. There are 5 categories (user profile, products, cart, orders, other). Each trouble ticket will have a date logged, a customer service employee who created the ticket or a student who created the ticket, a title, a date completed, a description of the problem, a description for how it was fixed, a status or state ('new', 'assigned','in-process','completed'), and an administrator who fixed the problem. Since tickets can go through a number of states it is important to capture how the ticket changed states and by who.

Cart

A student can have a cart. The cart will consist of books that the student wishes to purchase or rent. A cart will have a cart ID, a date created, a date last updated and a list of books associated with the cart. The student can have only 1 cart at any given time and carts can be empty.

Order

When a student makes a purchase, a cart turns into an order. The order will have an ID, the student, a date created, a date fulfilled, the list of books purchased/rented, a shipping type ('standard','2-day','1-day'), a credit card number, a credit card expiration, a credit card name, a credit card type and an order status ('new','processed','awaiting shipping','shipped','canceled'). There are no returns allowed in this application but an order can be canceled.

Recommendations

Book Fetch Inc. wants to increase their revenue by suggesting books to students that may be of interest to them. Therefore, a history of past purchases must be kept. When a student logs into the web site, the recommendations will be displayed on the web site. Recommendations are based on what purchases were made by the student in the past given a 1 month time frame, the category of the purchase, and the keywords associated with the books purchased. For any book not previously purchased, which has the same category, a rating over 3, and matches any keywords, then the book will be recommended.

Functional Requirements

There will be three user interface modules to this application, the student module, the customer service module and the administrator module.

Enter the details of :

Student Module:
a new student
a cart for a user
a new order based on a cart
a new book review

Customer Service Module:
a new trouble ticket
an order cancellation

Administrator Modules:

Administrator:
a new book with inventory
a new university with department, courses and book associations

Super Administrator:
a new customer service employee

Update/delete the details of:

Student Module:
a student
a cart
an order

Customer Service Module:
a trouble ticket
an order status

Administrator Modules:

Administrator:
a book with inventory

Super Administrator:
an administrator

Queries and Reports:

1. List the details of students attending 'UMBC'. - Student attributes

2. List the details of students from all universities that are graduate students. - Student attributes

3. List the details of students majoring in "Computer Science" and buying on average more than 2 books. - Student attributes

4. List the books that have sold the most or that have been rented the most. - Book title, book PK

5. List by category and subcategories all the books. - Category, subcategory, book title, book PK

6. List all the book names that are required for a course except books that are of the "Computer Science" category. - course name, book title

7. List all the books that have been bought by students not associated with a course at a university but have at least 2 keywords in common with books that are associated with a university. - book title, book PK

8. List all the books and a count of the number of courses each book has been associated with. - the book title, PK and count of courses

9. List book titles that are related to 'Linear Algebra' - the book title

10. List books with overall ratings higher than 3. - the book title

11. Show a list of books, the number of purchases (orders) made, and the overall rating for each
book, order by rating (if the book does not rating still include it) - the book title, count of purchases (orders), and overall rating (aggregate)

12. List the average number (qty) of books bought by students grouped by book category. - List the category, the avg number of books

13. List the details of each university, including departments, courses and number of instructors per course . - university name, department name, course name, count of instructors per course

14. For each university, find the total number of books bought that were associated with that university, include the sum and do not forget that books can be bought by students not attending that university (filter out the students that do not belong to the university). the university name, count of books, total sum of book costs

15. List each customer service employee and the total number of tickets they created.- the CS name and PK, count of tickets created

16. List the names of administrators, ordered by salary. - the admin name, and salary, ordered

17. List the names of administrators and the total number of tickets closed. - the admin name, the count of tickets closed

18. List the tickets grouped by their state, the total number created by a student and the total number created by customer support. - state, total number

19. Find the average time it takes for a ticket to go from created to closed. - the avg

20. For each ticket that is closed, show the history of the ticket, ordered by ticket - the ticket title/PK, ticket attributes including state

21. For each student list the books that are recommended based on our definition of a recommendation above. - the student name, recommended book titles

22. For each book , list the total count of students that have purchased (ordered) books with at
least one keyword in common with the book (excluding the current book). - the book title, count of students

23. List books by overall ratings and by number of students who rated them -the rating, book titles, number of students who rated each book

24. List the books with a rating of 5 (not averaged across ratings) and the students who rated the books, along with the student's universities - the book title, rating, student name, university name