

CS 4400 Database Project

Online Bookstore

Spring Semester 2003

Purpose of the Project

Analyze, specify, design, implement, document and demonstrate an information system application to support the operation of an Online Bookstore. You are required to use the Classical Methodology for Database Development. The system must be implemented on ORACLE available at ACME.

Project Phases

The three phases of the project cover the following work processes from the Methodology for Database Development:

Phase		Due Date
I	Analysis and Specification	February 26
II	Design and Database Load	March 26
III	Implementation and Testing	April 22
	Demonstration	April 23-25

Groups

Projects with Lightweight Phase III may have three members.
Projects with JDBC/Java GUI may have four members.

Reports

A typed report is handed in for grading at the end of each phase.

The Phase I Report must contain a description of the purpose of the project and the purpose of this phase of the project. It must describe the problems encountered in this phase and justify the solutions. It must contain all documentation produced in this phase, including Information Flow Diagrams, E-R Diagrams, and Task Forms.

The Phase II Report must contain a description of the purpose of this phase of the project. It must contain the Phase I Report and must describe any revisions made to the specification described in the Phase I Report. It must further describe the problems encountered in Phase II and justify the solutions. It must contain all documentation produced in Phase II with the addition of a relational schema, and abstract code with SQL (for each task). The relational schema specification should include integrity constraints, foreign keys, primary keys, and domain constraints.

The Phase III Report must contain a description of the purpose of this phase of the project. It must contain the Phase I and Phase II Reports and must describe any revisions made to the specification described in the Phase II Report. It must describe the problems encountered in this

Phase III and justify the solutions. It must contain all documentation produced in Phase III, including the schema definition, a source program listing (well documented), and a short description on your decision on creating indexes (see note on “Task Statistics at the end). It must contain a brief users’ manual for the system. Also, the specific contribution of each member must be indicated.

Grading

The project will consist of three phases (deliverables) as well as a final demonstration to the TA. Phase I and Phase II of the project are each worth 10% credit. Credit for phase III depends on the implementation option you choose:

GUI/JDBC Phase III Option (20% credit): We will use the embedded SQL feature of ORACLE, called JDBC, which allows us to embed SQL statements in a Java program.

Lightweight SQLPLUS Phase III Option (5% credit): We will use the SQLPLUS feature of ORACLE, which allows us to execute SQL statements.

Overview of Online Bookstore

For this project, you will develop an information management system that supports some of the services involved in an Online Bookstore (e.g., Amazon.com).

When the customer accesses the Online Bookstore, the first page that she¹ sees is depicted below.

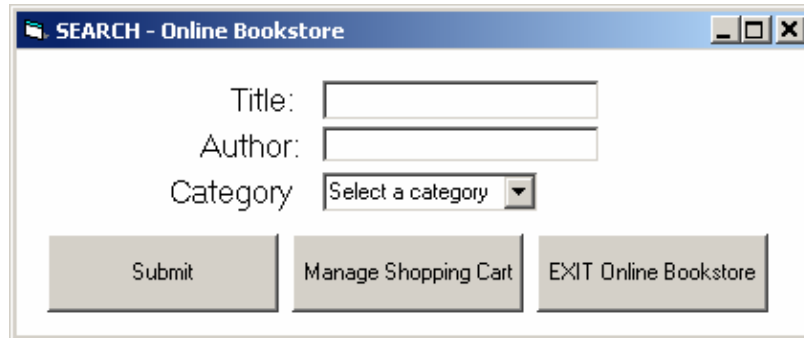


Figure 1: Initial Page

¹ We will use *she* to refer to the customer with no intended bias.

Search Only

Let's say that the user only wants to search the bookstore for a specific book. She clicks "Search Only" and the following pops up:



SEARCH - Online Bookstore

Title:

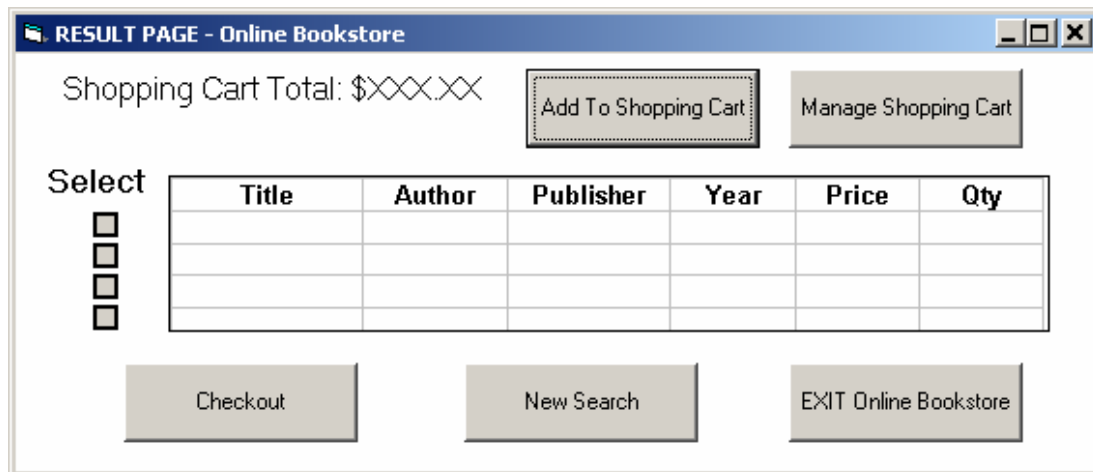
Author:

Category:

Submit Manage Shopping Cart EXIT Online Bookstore

Figure 2: Search Books

The user then fills out the fields accordingly, and hits the "Submit" button. It is not necessary for the user to enter data for all the fields. When the system finishes executing the search, the screen depicted in Figure 3 pops up. The option "Manage Shopping Cart" is addressed next. If the user does not enter any data in any of the fields, and click on the "Submit" button, the system will bring the entire book catalog.



RESULT PAGE - Online Bookstore

Shopping Cart Total: \$XXXXXX Add To Shopping Cart Manage Shopping Cart

Select

	Title	Author	Publisher	Year	Price	Qty
<input type="checkbox"/>						
<input type="checkbox"/>						
<input type="checkbox"/>						
<input type="checkbox"/>						

Checkout New Search EXIT Online Bookstore

Figure 3: Search Result

Books that are not in stock will be flagged and cannot be shown in the Search Result (Figure 3).

At this point, the user has five options.

- *Add To Shopping Cart*: Add to the shopping cart the selected books from the search result list. When we add the new books to the shopping cart, the shopping cart total displayed in this page should be updated accordingly.
- *Manage Shopping Cart*: View the list of books in your shopping cart and modify this list accordingly. The interface for this option is depicted in Figure 4.

- *Checkout*: Place an order for the books in your shopping cart and make the payment. If you are a new user, this will bring first screen from Figure 5. Otherwise, the system will pop up Figure 8.
- *New Search*: Perform a new search, which will bring Figure 2 back. The shopping cart holds whatever it contains but the search screen is cleared.
- *Exit Online Bookstore*: Exit the system, which will pop up the Initial Page (See Figure 1).

If the user decides to manage her shopping cart, the following window will pop up:

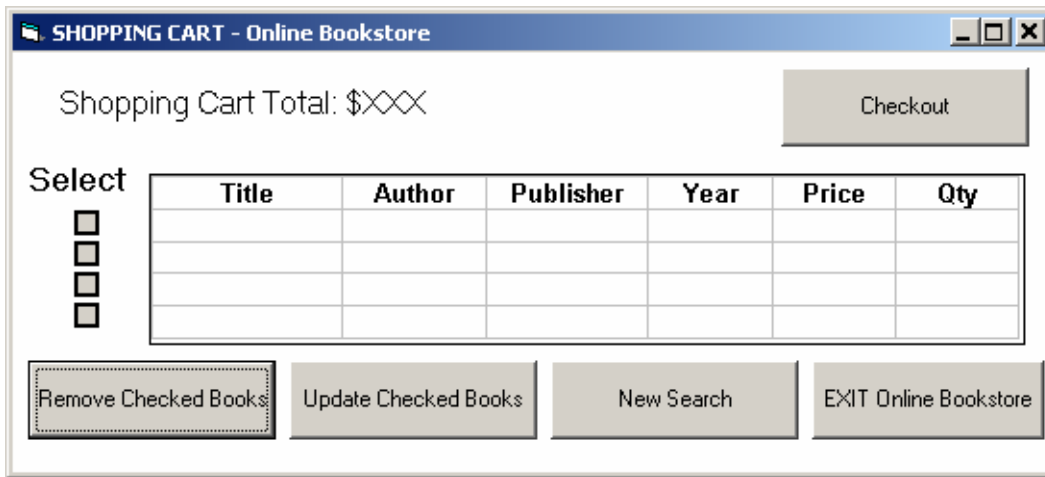


Figure 4: Manage Shopping Cart

There are two new functionalities on this page: “Remove Checked Books” and “Update Checked Books”. The former allows the user to remove some of the books that she puts into the shopping cart. The latter applies when the customer wants to change the quantity ordered. If books are removed from the shopping cart or if quantities are updated, the shopping cart total must be updated accordingly.

If the user clicks on “Checkout”, the following sequence of windows will appear:

CUSTOMER REGISTRATION - Online Bookstore

Username:

PIN: Re-type PIN:

First Name:

Last Name:

Address:

City:

State: ZIP:

Credit Card: Credit card number:

Expiration Date:

Figure 5: Customer Registration

Because the customer was not registered, she needs to do it now in order to proceed with the purchase. When registering to the Online Bookstore, the customer needs to provide a username and a password (or PIN) along with other information addition information (see Figure 5). If the provided username already exists in the database, the system will ask the customer to provide an alternative username. The customer data will be indexed according to their usernames. The password can be anything that customer provides. The customer's username and password will be required on subsequent access to the Online Bookstore.

If the customer decides not to register, she will not be able to proceed with the payment and the screen in Figure 6 will pop up. By clicking "OK" in this screen the system will bring up the Search screen (Figure 2).

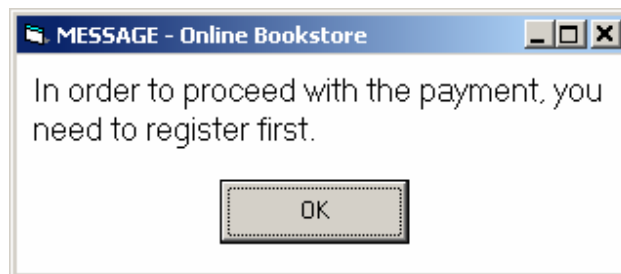


Figure 6: Message informing the user why she needs to register to the system.

After successfully registering to the system, the user will see the following payment screen:

CONFIRM ORDER - Online Bookstore

Confirm Order

<Customer Name>
 <Street Address>
 <City> , <State> <ZIP code>

Use Credit Card on file:
 VISA - 1234567890

New Credit Card

VISA
 Expiration Date:

Title	Author	Publisher	Year	Qty	Unit Price	Total Price

Note: The books will be delivered within 5 business days.

Total: \$XXX.XX
 Shipping/Handling: \$XXX.XX
 Final Total: \$XXX.XX

Figure 7: Confirm Order screen

If the user provides a new credit card number, this number will be stored in the database. By pressing “Cancel”, the system will return to the Search screen (Figure 2), but the shopping cart will not be cleared. If this is the first time that the customer is making a purchase at the Online Bookstore, she may not have a credit card on file and will be asked to provide one. For this project, assume that payments can only be made using credit card and the system will store only one credit card information for each registered user.

In order to simplify the project, we assume that all deliveries will always take five business days and the cost of shipping and handling will be \$2.00 per book. Don’t worry about sales tax.

If the user needs to update some of her information (e.g., provide a different address), she can do it by clicking on the “Update Customer Profile” button, which will bring the screen shown in Figure 8. The customer can only file one credit card.

UPDATE CUSTOMER PROFILE - Online Bookstore

Username: <customer-username>

PIN:

First Name:

Last Name:

Address:

City:

State: ZIP:

Credit Card: Credit card number

Expiration Date:

Update Cancel

Figure 8: Update customer profile screen

The only information that the customer cannot update from her profile is the username because we are going to use this field to index the customer information in the database. When opening this screen, the system must display all the information that is available on file for this customer. The update will take place only if the customer clicks the “Update” button. If the customer clicks on “Cancel”, no update is made to her profile. Once the user is done with the update, the system will return to the screen called Confirm Order (Figure 7).

Once the user has provided all the necessary information in screen Confirm Order and clicked the “BUY IT!” button, the transaction ends and the system pops up the following screen:

PROOF OF PURCHASE - Online Bookstore

Proof of Purchase
Please, print this page as a proof of purchase

<Customer Name>
<Street Address>
<City> , <State> <ZIP code>

Use Credit Card on file
VISA - 1234567890

New Credit Card
VISA Enter Credit Card Number
Expiration Date: MM/YY

Title	Author	Publisher	Year	Qty	Unit Price	Total Price

Note: The books will be delivered within 5 business days.

Total: \$XXXX.XX
Shipping/Handling: \$XXXX.XX
Final Total: \$XXXX.XX

Continue

Figure 9: Proof of Purchase screen.

When the customer clicks the “Continue” button in the Proof of Purchase screen, the system will update the inventory accordingly, generate the needed book orders to be placed by the administrator (see “Behind the Scenes” Section for further discussion on placing orders), clear the shopping cart content, and return to the Search screen (Figure 2).

Register New Customer

Let’s say that the customer wants to register with our online bookstore. The main reason for registering with our system is to allow us to provide a more personalized environment for the user whenever she comes back. Although there are number of possible ways of personalization, for this project we will use only a simple one: every time a returning customer logs in, the system will provide a list of books from the years 2002 and 2003 that are on the same category of books that the customer purchased in the last transaction (if any). If in her last purchase the customer bought books from different categories, choose one of the categories, and construct the list.

The screen for registering a new customer is presented in Figure 5. Once the registration is completed, the system brings the customer back to the Search screen (Figure 2).

Returning Customer

If the customer has already registered with our system, she can enter it by selecting “Returning Customer” from the Initial Page (Figure 1). After clicking the “Submit” button in this screen, the

system will pop up the User Login screen as shown in Figure 10. Once the customer logs in, the system will then fetch her profile, and based on that, will present a list of suggested books as shown in Figure 11. (See “Register New Customer” on how to construct this list.)

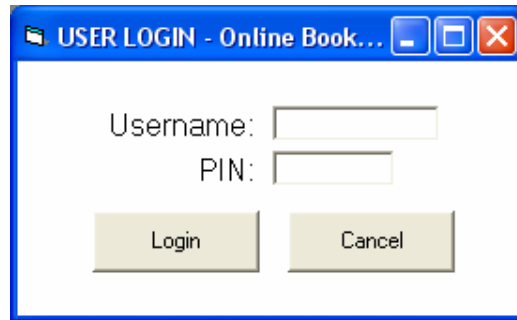


Figure 10: User Login

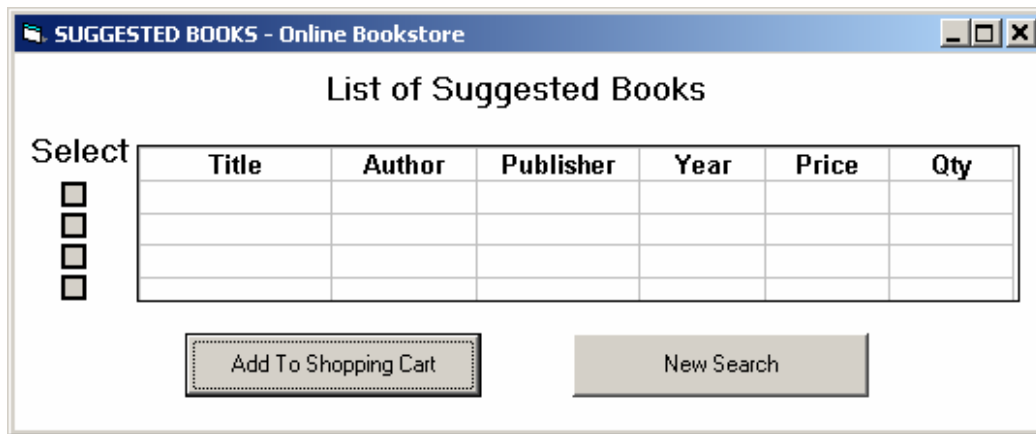


Figure 11: List of Suggested Books

The customer may add some of the books to her shopping cart, or simply click the “New Search” button, which will lead to the Search screen (Figure 2).

Administrator

The administrator will be responsible for maintaining the system inventory up to date. In order to log in to the system, the administrator needs to first select the “Administrator” option in the Initial Page (Figure 1), click Submit, and enter her username and PIN as depicted in Figure 10. We assume that the administrator username will be “admin”.

Once the administrator log in to the system, the following page pops up (Figure 12):

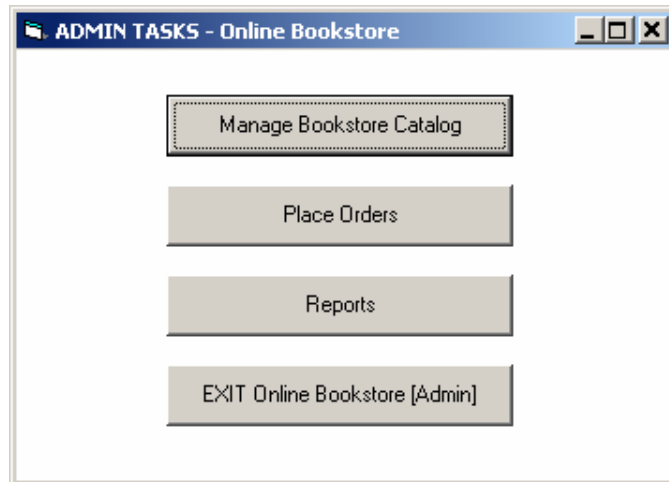


Figure 12: List of Administrator Tasks

Manage Bookstore Catalog

When a book becomes out of print or a typo on a book title is identified, or when the publishers announce new titles, the administrator needs to update the catalog accordingly, which brings up the screen in Figure 13.

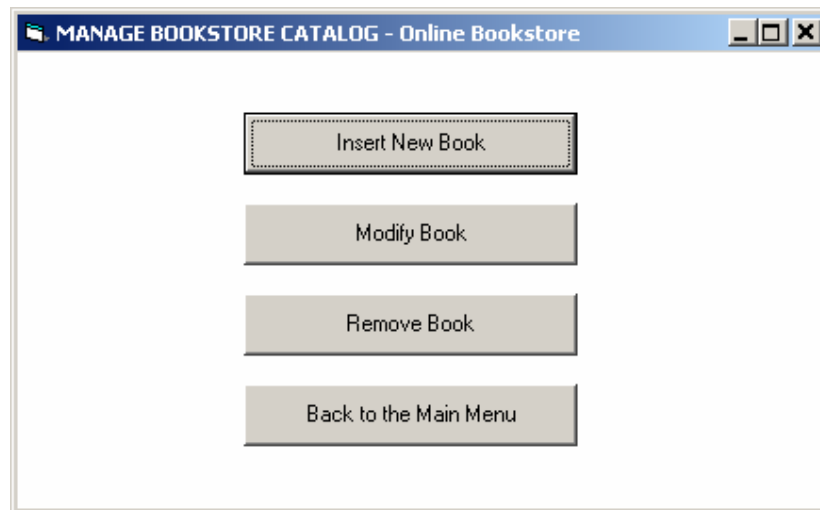


Figure 13: List of Tasks associated with Manage Bookstore Catalog

Inserting a New Book

The screen associated with the insertion of a new book title is depicted in Figure 14. As discussed in "Behind the Scenes" Section, the system will need to keep a minimum quantity of books in stock. When the current quantity in stock drops below this minimum requirement, the administrator needs to place an order of size specified in "Size of the Orders" in the screen below.

INSERT NEW TITLE - Online Bookstore

ISBN:

Author:

Title:

Publisher:

Year:

Category:

Price: Minimum Qty Required In-Stock:

Qty In-Stock: Size of order:

Figure 14: Book Insertion interface

After the insertion is successfully completed, the system returns to the initial menu (Figure 13). Before inserting a new book in the database, the system should check if the ISBN² does not exist. If there is already a book with the same ISBN, the system will display an error message that requests the administrator to provide a different ISBN. The books will be indexed by the ISBN.

Modifying an Existing Book

In order to modify a book, the administrator will need to either provide the ISBN for the book or provide the following information about the book, in case she does not know the ISBN.

MODIFY/DELETE TITLE - Online Boo...

ISBN: (Optional)

Title:

Author:

Year:

Figure 15: Book Search page for finding a book that will be modified or deleted.

It is not necessary for the administrator to provide all the above information. However, if this search results in more than one book, the system will display the following error message:

² ISBN is the unique number assigned to every book by the Library of Congress.

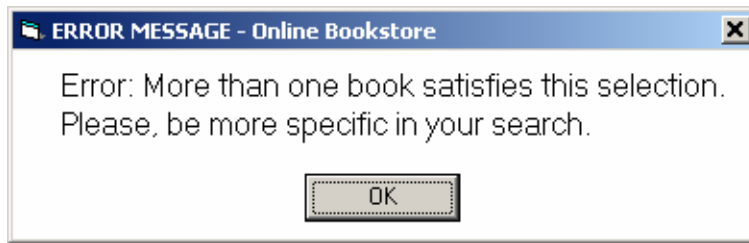


Figure 16: Error Message

By clicking “OK”, the system will pop up again the interface on Figure 15.

Once the book is selected then the screen for modifying, it will be similar to the interface shown in Figure 14 for inserting a book.

Deleting an Existing Book

The process and screens for removing a book title from the catalog are similar to the process and interfaces described for modifying a book title.

When deleting a book from the bookstore database, we should just flag that the book was deleted, and not actually removing the book from the catalog. The reason for that is because the book that is being deleted maybe be related to sales done previously. Considering that we want to generate reports about sales occurred in the last months, if we remove this book from the database, we are going to be deleting important data on sales information.

Place Orders

Another responsibility of the administrator is to guarantee that there are enough books in stock. But she needs to order more books for a given title only when there is a demand for it. Otherwise, she will end-up over-stocking books that are rarely or never sold. In order to determine whether there is a demand for placing book orders, the administrator has to click on “Place Orders” button. If there is no book order to be placed at this time, the screen shown in Figure 17 will appear. By clicking “OK”, the system will pop up the screen in Figure 12. We discuss how book orders are generated in the “Behind the Scenes” Section.

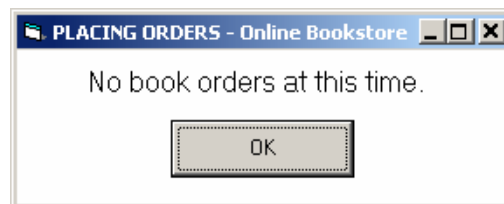


Figure 17: No orders to be placed.

If there are books to order, the following screen will pop up:

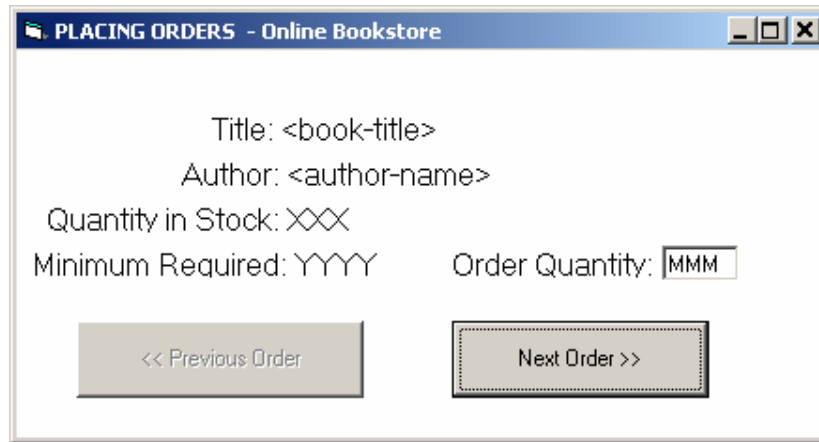


Figure 18: Place Orders

The order quantity displayed will be retrieved from the “Size of Order” field specified in Figure 14. However, the administrator may decide to override this number, as long as she guarantees that after the order there will be at least the minimum required books in stock.

Placing orders will be an iterative process. For each order that needs to be placed, the screen in Figure 18 will pop up, and the administrator will overwrite, if the necessary, the suggested quantity to order. When all the orders were placed, the following window pops up:

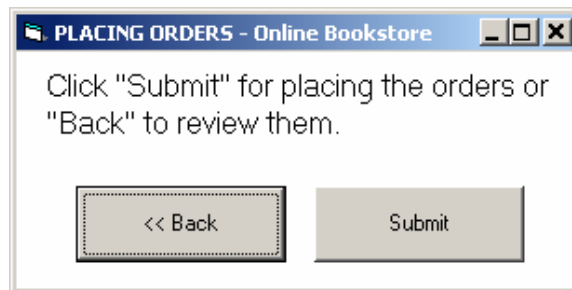


Figure 19: Book Order Confirmation.

In a real situation, at this point the system would send the request to the respective suppliers and only update the actual quantity of the requested books when the order arrives. However, in this project we assume that when the administrator clicks the “Submit” button, the inventory automatically updates the actual quantities of books accordingly. It is important to note that before updating the inventory, the system needs to certify that the administrator has placed orders of size that are at least the minimum required in stock plus one. If this is not satisfied, an error message will be displayed requiring the administrator to revise the placed orders, and the screen from Figure 19 will pop up again.

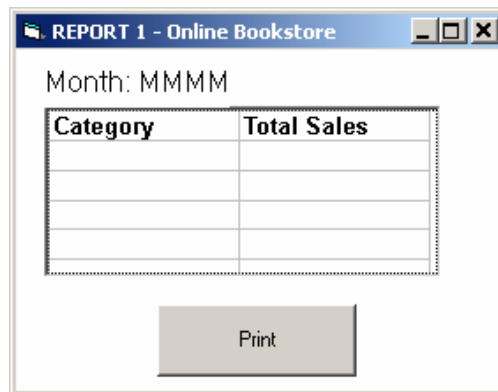
After successfully placing the orders, the system will then pop up the screen in Figure 12.

Reports

In order to have an idea of how the company is doing in terms of sales, the administrator can request the following reports to the system:

- **Report 1:** Total sales from last month for each category
- **Report 2:** Total number of books in stock for each category
- **Report 3:** List of the top ten best sellers, in descending order of sales, for the last X months
- **Report 4:** List the most expensive books for each book category in descending order
- **Report 5:** For each book category, list the total number of distinct buyers (as identified by their PIN).
- **Report 6:** Statistical report (you may choose any layout):
 - Average amount of sale per customer, last month
 - Average number of books per transaction
 - Average number of customers per day

Report 1 Layout



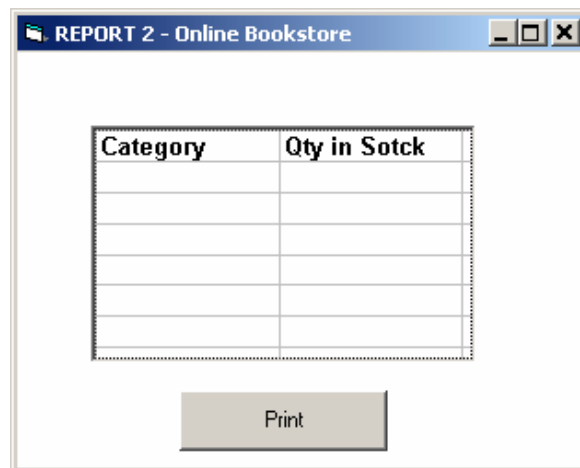
REPORT 1 - Online Bookstore

Month: MMMM

Category	Total Sales

Print

Report 2 Layout



REPORT 2 - Online Bookstore

Category	Qty in Stock

Print

Report 3 Layout

REPORT 3 - Online Bookstore

Top 10 books for Last MMM months

Title	Author	Category	Price	Total Sales

Print

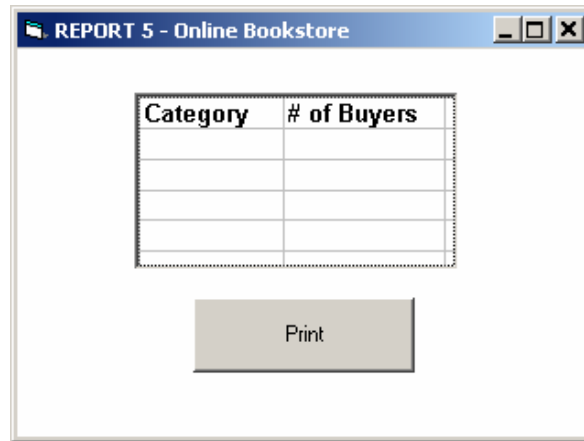
Report 4 Layout

REPORT 4 - Online Bookstore

Title	Author	Category	Price

Print

Report 5 Layout



Summary of possible screen sequences in the system

Here is a summary of possible screen sequences for each of the four types of users:

- **Browsing User**: Start by clicking “Search Only” on the Initial Screen (Figure 1) → Search Books (Figure 2) → Search Result (Figure 3) → Manage Shopping Cart (Figure 4) → Customer Information (Figure 5) → PIN Assignment (Figure 6) → Final Receipt (Figure 8) → Transaction Completed (Figure 9).
- **New Customer**: Start by clicking “New Customer” on the Initial Screen (Figure 1) → Customer Information (Figure 5) → PIN Assignment (Figure 6) → Search Books (Figure 2) → Search Result (Figure 3) → Manage Shopping Cart (Figure 4) → Final Receipt (Figure 8) → Transaction Completed (Figure 10).
- **Returning Customer**: Start by clicking “Returning Customer” on the Initial Screen (Figure 1) and providing the PIN → List of Suggested Books (Figure 11) → Search Books (Figure 2) → Search Result (Figure 3) → Manage Shopping Cart (Figure 4) → Final Receipt (Figure 8) → Transaction Completed (Figure 10).

In the sequences above, we only describe the situation where the customer ends up buying some books. However, each customer could execute many searches, update her profile a number of times, cancel the purchasing transaction more than once, etc. The sequence of screens for the administrator should be straightforward from the discussion presented under the “Administrator” Section.

Behind the Scenes

In order for the system to work smoothly, we are going to need the following tasks to be performed behind the scenes by the system:

- Shopping Cart
- Customer Profile
- Sales statistics collection

- Generate book orders event
- Administrator account

Shopping Cart

Whenever a new or existing customer logs in, the system creates a new shopping cart for the customer. Each time customer selects a book to buy, it places in shopping cart. Repeated searches do not affect contents of shopping cart. After user completes a buy transaction, inventory is modified according to the shopping cart contents and the shopping cart is cleared.

Customer Profile

For each registered customer, the system will maintain a profile with the following information: name, address, credit card information (if any), a list of book categories from the user *last* purchase (if any). Whenever a registered customer comes in, the system will use one of the categories from the customer's list of categories (if any) to provide a list of recent books (year 2002 and 2003) on the same category.

Monitoring the Stock Level

After successfully completing each purchase transaction, the system needs to update the stock level of the bookstore accordingly. When the quantity of a book drops below a given threshold (the minimum quantity in stock), a message is generated and sent to the administrator to place an order of size "order quantity" for this books. Order quantity and minimum quantity in stock are two different numbers for each book. Order quantity is a suggested number of books that should be order each time. Minimum quantity in stock is a threshold that determines *when* an order for the book needs to be placed. For each book, you have to determine these two numbers.

Sales Statistics Collection

In order to be able to generate some of the administrator reports, the system will have to collect information on the book sales. This information will mainly consist of: date of the purchase, books that were purchased by each customer, total sale, and PIN (for distinct customers).

Generate "book orders" event

Whenever a purchase transaction is completed, the system will update the book inventory accordingly. If the quantity of books in stock for a given title drops below minimum required (the minimum quantity in stock), the system will generate a book order, which will have to be completed by the administrator.

Administrator account

The administrator account will be created by the DBA while creating the bookstore database. The username for the administrator will be "admin".

Some general assumptions about the system

- There will only be one user (customer or administrator) at a time using the system. This should facilitate the implementation as we don't need to consider concurrency issues, or maintaining multiple customer sessions (shopping carts) opened at the same time.
- When the customer is new and has chosen not to register to the system (Search Only), we still need to create a temporary ID for this unknown customer because we need to create a shopping cart for him. When she finally registers in the system, we then update the temporary ID with the correct one.
- Every book is listed once in the catalog (no multiple editions for different years)
- A customer can file only one credit card in the system. She may update it, but can only have one current credit card active.

General Comments

- The following screens have variable number of items (i.e., they are scrollable):
 - Search Result (Figure 3)
 - Manage Shopping Cart (Figure 4)
 - Final Receipt (Figure 8)
 - List of Suggested Books (Figure 11)
 - All reports

Data

Book data file will be provided before Phase II. Each book will have a suggested order quantity and a minimum quantity in stock threshold. Customer and other data should be created by each team.