THE DESIGN AND IMPLEMENTATION OF AN E-COMMERCE SITE FOR ONLINE BOOK SALES

BY

ARAVINDH & TEAM

Project Report Submitted to the faculty of the rmk Engeneering college,Gummudipundi.
Department of Science and humanity.

Team Members:
1}Aromal Joshep
2}Mohan Raj
3}keshavardhan
4}Lalith Kishore

Abstract

The business-to-consumer aspect of electronic commerce of (e-commerce) is the most visible business use of the World Wide Web. The primary goal of an e-commerce site is to sell goods and services online.This project deals with developing an e-commerce website for Online Book Sale. It provides the user with a catalog of different books available for purchase in the store. In order to facilitate online purchase a shopping cart is provided to the user, In order to develop an e-commerce website, a number of Technologies must be studied and understood.This is a project with the objective to develop a basic website where a consumeris provided with a shopping cart application and also to know about the technologies used to develop such an application.This document will discuss each of the underlying technologies to create and implement an e-commerce website.

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1. Introduction

E-commerce is fast gaining ground as an accepted and used in business system.
More and more business houses are implementing web sites providing functionality for performing commercial transactions over the web. It is reasonable to say that the process of shopping on the web is becoming commonplace. The objective of this project is to develop a general purpose e-commerce store where any product (such as books, CDs, computers, mobile phones, electronic items, and home appliances) can be bought from the comfort of home through the Internet. However, for implementation purposes, this paper will deal with an online book store. An online store is a virtual store on the Internet where customers can browse the catalog and select products of interest. The selected items may be collected in a shopping cart. At checkout time, the items in the shopping cart will be presented as an order. At that time, more information will be needed to complete the transaction. Usually, the customer will be asked to fill or select a billing address, a shipping address, a shipping option, and payment information such as credit card number. An e- mail notification is sent to the customer as soon as the order is placed.

2. Literature Review

Electronic Commerce (e-commerce) applications support the interaction between different parties participating in a commerce transaction via the network, as well as the

management of the data involved in the process The increasing importance of e-commerce is apparent in the study conducted by researches at the GVU (Graphics, Visualization, and Usability) Center at the Georgia Institute of Technology. In their summary of the findings from the eighth survey, the researchers report that “e-commerce is taking off both in terms of the number of users shopping as well as the total amount people are spending via Internet based transactions”.

A good e-commerce site should present the following factors to the customers for better usability:

- Knowing when an item was saved or not saved in the shopping cart.
- Returning to different parts of the site after adding an item to the shopping cart.
- Easy scanning and selecting items in a list.
- Effective categorical organization of products.
- Simple navigation from home page to information and order links for specific products.
- Obvious shopping links or buttons.
- Minimal and effective security notifications or messages.
- Consistent layout of product information.

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Finally, feedback should not distract the user. Actions and reactions made by the web site should be meaningful. Feedback should not draw the user's attention away from the important tasks of gathering information, selecting products, and placing orders.

3. Project Design

In order to design a web site, the relational database must be designed first. Conceptual design can be divided into two parts: The **data model** and the **process model**. The data model focuses on what data should be stored in the database while the process model deals with how the data is processed. To put this in the context of the relational database, the data model is used to design the relational tables. The process model is used to design the queries that will access and perform operations on those tables.

4.Data Model

A data model is a conceptual representation of the data structures that are required by a database. The first step in designing a database is to develop an Entity-Relation Diagram (ERD). The ERD serves as a blue print from which a relational database maybe deduced. Figure 1 shows the ERD for the project and later we will show the transformation from ERD to the Re lational model.

Database Design

In this section, the basic structure of the tables composing the database for the project are shown along with information about primary and foreign keys.

Customer

SNO NAME TYPE DESCRIPTION

1 UserID Varchar Primary key for Customer identification
2 Password Varchar Security for Customer
3 First_Name Varchar
4 Last_Name Varchar
5 Address Varchar
6 City Varchar
7 Zip Integer

8 State Varchar
9 Email Address Varchar
10 Phone_Number Varchar

Books

SNO NAME TYPE DESCRIPTION

1 InventoryID Integer Primary key for Inventory Identification, ISBN of a book
2 Book_Name Varchar
3 Author Varchar
5 Nr_books Integer
6 Price Double
7

State_Tax

SNO NAME TYPE DESCRIPTION

1 State Name Varchar Primary key for State Identification
2 Sales Tax Rate Double Sales tax for each state

Shopping_Cart_Items

SNO NAME TYPE DESCRIPTION

1 ShoppingCartID Integer Primary key for Shopping Cart Identification
2 InventoryID Varchar Foreign key to Inventory
3 Price Double
4 Date Date
5 UserID Varchar Foreign key to Customer
6 Quantity Integer

Order_Details

SNO NAME TYPE DESCRIPTION

1 OrderID Integer Primary key for Order identification
1 UserID Char Foreign key to Customer
2 Receiver's Name Char If order is to be sent to other address rather than to the customer, we need that address
3 Address Char
4 City Char
5 Zip Integer
6 State Char Foreign key to State Tax
7 Type of Shipping Char Foreign key to Shipping Type
8 Date of Purchase Date

Shipping_Type

SNO NAME TYPE DESCRIPTION

1 Type of Shipping Varchar Primary key to define type of shipping
2 Price Double
3 Approximate days for delivery Integer

Credit_Card_Details

SNO NAME TYPE DESCRIPTION

1 Credit Username Varchar Primary key for Customer Identification
2 Credit Card Number Varchar
3 Card Type Varchar Master Card, Visa, Discover
4 CVV Number Integer Number present on the back of the card for extra security
5 Expiry Date Date

Book_Review

SNO	NAME	TYPE	DESCRIPTION
1	InventoryID	Varchar	ISBN of the book on which the review is written
2	Reviews	Varchar	Review on the book
3	Rating	Varchar	Rating given to the book in a scale of 5
4	Review Date	Date	
5	User Name	Varchar	Name of the user providing the review

Purchase_History

SNO	NAME	TYPE	DESCRIPTION
1	UserID	Varchar	Primary key for Customer Identification
2	InventoryID	Varchar	Book purchased by the user
3	Date of Purchase	Date	
4	OrderID	Integer	Foreign key to Order_details
5	Quantity	Integer	

5.User Interface Design

Before implementing the actual design of the project, a few user interface designs were constructed to visualize the user interaction with the system as they browse for books, create a shopping cart and purchase books. The user interface design will closely follow our Functional Decomposition Diagram (Figure 2). Figures 15 – 20 show the initial designs of the web pages.

6.Implementation Technologies

The objective of this project is to develop an online book store. When the user types in the URL of the Book Store in the address field of the browser, a Web Server is contacted to get the requested information. In the .NET Framework, IIS (Internet Information Service) acts as the Web Server. The sole task of a Web Server is to accept incoming HTTP requests and to return the requested resource in an HTTP response. Thefirst thing IIS does when a request comes in is to decide how to handle the request.

7.Internet Information Services (IIS)

IIS is a set of Internet based services for Windows machines. Originally supplied as part of the Option Pack for Windows NT, they were subsequently integrated with Windows 2000 and Windows Server 2003). The current (Windows 2003) version is IIS 6.0 and includes servers for **FTP** (a software standard for transferring computer files between machines with widely different operating systems), **SMTP** (Simple Mail
Features: The web server itself cannot directly perform server side processing but can delegate the task to ISAPI (Application Programming Interface of IIS) applications on the server. Microsoft provides a number of these including ones for Active Server Page and ASP.NET.
Compatibility: Internet Information Services is designed to run on Windows server operating systems. A restricted version that supports one web site and a limited number of connections is also supplied with Windows XP Professional.
Microsoft has also changed the server account that IIS runs on. In versions of IIS before 6.0, all the features were run on the System account, allowing exploits to run wild on the system. Under 6.0 many of the processes have been brought under a Network Services account that has fewer privileges. In particular this means that if there were an exploit on that feature, it would not necessarily compromise the entire system.
a) **Powerful database-driven functionality:** ASP.NET allows programmers to

develop web applications that interface with a database. The advantage of ASP.NET is that it is object-oriented and has many programming tools that allow for faster development and more functionality.
b) **Faster web applications:** Two aspects of ASP.NET make it fast -- compiled code and caching. In ASP.NET the code is compiled into "machine language" *before* a visitor ever comes to the website. Caching is the storage of information in memory for faster access in the future.
c) **Memory leak and crash protection:** ASP.NET automatically recovers from memory leaks and errors to make sure that the website is always available to the visitors.

8. Web Page Programming Options

An e-commerce organization can create data-based Web pages by using serverside and client-side processing technologies or a hybrid of the two. With server-side processing, the Web server receives the dynamic Web page request, performs all processing necessary to create the page, and then sends it to the client for display in the client's browser. Client-side processing is done on the client workstation by having the client browser execute a program that interacts directly with the database.
Figure 22 (reproduced from [3]) outlines commonly used server-side, client-side, and hybrid Web and data processing technologies; client-side scripts are in dashed lines to indicate they are unable to interact directly with a database or file but are used to validate user input on the client, then send the validated inputs to the server for further processing.

9. The Shopping Cart Application

The objective of this application is to provide the user an online website where they can buy books from the comfort of their home. A shopping cart is used for the purpose. The user can select the desired books, place them in the shopping cart and purchase them using a Credit Card. The user's order will be shipped according to the type of shipping selected at the time of placing the order.
Website consists of the following web pages:
1. AddBook.aspx
2. BookDetails.aspx
3. BookReview.aspx
4. Books.aspx
5. ChangePassword.aspx
6. CheckOut.aspx
7. FinalOrder.aspx
8. Footer.ascx
9. ForgotPassword.aspx
10. Login.aspx
11. LogOff.aspx
12. Menu.ascx
13. Order.aspx
14. PurchaseHistory.aspx
15. Registration.aspx
16. Search.aspx
17. ShoppingCart.aspx
18. UserDetails.aspx

Below figures show some screenshots taken from running the application. All the functionalities are explained accordingly.
When the user types the web address in the browser, the main page of the application is displayed which has the list of the top ten popular books available in the store, as shown in Figure 25.

Book Details

The information about books is stored in "Books" table. The user can know the ISBN of the book, book title, author of the book, number of copies available at the store, price of the book. A link to add the book to the shopping cart and also a link to write a review for the book are also provided. The user does not have to login to add a book to the cart or to read/write a review.

10. Search for Books

Books can be searched based on the ISBN, Title or the Author of the book. When searching for books by author "Jesse Liberty", two books are displayed as shown in

Registration

A new user can register on the site by clicking on the registration button on the menu at the top of the page, as shown in Figure 27.

New user registration

The "*" beside the label indicates the required field for successful registration on the site. If the value if not entered, an appropriate message is displayed. If a user with same UserID already exists, the message is displayed. Clicking on Reset will clear all the fields and Submit will submit the information for registration. Upon successful completion, the user is directed to the Books page.

12.User Details

On clicking "User Details", the detailed profile information of the user who is currently logged in are displayed as shown in Figure 28.

User details

Here the users can change their profile except for the UserID and these details will be reflected in the database only when the Update button is clicked. If the user has placed any order previously, those details can be viewed by clicking on the Purchase History button.

13.Shopping Cart

When "Add to Cart" is clicked for any book, it is added to the shopping cart illustrated in Figure 29. If that particular book is already present in the shopping cart, the quantity is increased by 1 and the price is changed accordingly; if not, a new entry is made into the table. All the information in the shopping cart is stored in "shopping_cart_items" table. Adding a book into the shopping cart does not decrease the quantity of books in the Books table. It is decreased only after an order is placed for the book. So, placing the book in the shopping cart does not guarantee the availability of the book at the time of placing the order.

14.Place an Order

When "Place an Order" button is clicked which is located on the bottom of the shopping cart, the application will ask the user to login if he has not already done so.

Order Details

If the user is placing an order with the web site for the first time, they will be

asked to enter the credit card details as shown in the above figure; if not, only the Card Verification Value (CVV) number of the credit card is asked for verification, as shown in At this point, the user can check the shipping address box if shipping address is same as billing address, otherwise the user has to enter the new shipping address as

Shipping details

If the check box provided is checked, the shipping address is obtained from the *Customer* table. The user also has to select the desired type of shipping for the order. When all the information is entered, the user can "Proceed to the Checkout".

15.Check Out

Before placing the final order, the user is shown the total price of the order, which includes total price of books selected, shipping rate and state tax as illustrated in Figure 32. If the user is not satisfied with the order, the order can be cancelled at that point. The information in the shopping cart remains intact, so the user can go back to it and make any changes if necessary. When the "Place Order" button is clicked, the order is placed and the following screen appears which informs the user about the approximate number of days in which the order will be delivered.

Check out

Once the order is placed, the quantity of the books is reduced in the *Books* table. The shopping cart for the user cleared and an appropriate message is displayed, as shown in Figure 33.

Order confirmation

The inventory is updated as shown in Figure 34 after the order is placed.

Updated inventory after order placement

16.Purchase History

Figure 35 details the purchase history of the user "skodali". Purchase history can be reached by clicking on the "Purchase History" tab on "User Details" screen as shown

Purchase history

When viewing the purchase history, the user can view the details of each book by clicking on the book name. The details are displayed as shown in Figure 36.

Book details

Book information can only be changed by the Administrator of the site. All other users can only view the details of the books. The administrator of the site can also "Add Book" or "Remove Book" to/from the *Books* table. Figure 37 allows a book modification form accessible to the administrator.

Administrator - Modify books

In order to add a book, the administrator will enter the ISBN of the book. If the ISBN is already present in the Books table, the administrator is asked to enter the quantity of the books.

Details about new book

If the entered ISBN book is not present in the Inventory, the administrator is asked to enter the details about the book as shown in Figure 38 to add the book to the inventory.

shows the updated inventory after the book details in Figure 38 are entered.

Updated Inventory

When a user logs off the website, the items in their Shopping Cart are cleared. When the user enters a password during the registration, it is encrypted before it is

stored in the database. It is a one-way encryption and the original form cannot be retrieved again. Similar encryption method is used for Credit Card Number.
Suppose there are only three “Programming C#” books available in the store. One user adds all of them to the shopping cart, and by the time he chooses other books and places the order, another user has already placed an order for two of those books. In that case, the first user comes to know about this at the time of placing the order and he is directed to the shopping cart to make the appropriate changes.
As explained earlier, the user need not be logged in to add books to the shopping cart. When the user adds books without logging in, a GUID (Globally Unique Identifier) is obtained from the system and stored in Session["loginid”] variable. This GUID is stored in the shopping_cart_items table along with the selected books by the user. If the user logs in, the GUID in the table is replaced with the actual UserID of the user.
Session variables are used to transfer data from one page to another. As soon as the user closes the window, the session variables are cleared.

17.Transactions in the Application

A transaction is a group of database commands that are treated as a single unit.
Transaction must pass what is known as the ACID test:
Atomic: All operations in the transaction are executed properly or none. In other words, they make up a single unit of work. For example, if a customer moves and a transaction is used to reflect that change in the database, all parts of the address (street, city, state, etc) must be changed as an atomic action, rather than changing street, then city, then state, and so on.

Consistent : The execution of a single transaction preserves the consistency of the database. All the relationships between data in a database are maintained correctly. For example, if customer information uses a tax rate from a state tax table, the state entered for the customer must exist in the state tax table.
Isolation: Each transaction is unaware of the other transactions occurring concurrently. Changes made by other clients cannot affect the current changes. For example, if two data entry operators try to make a change to the same customer at the same time, one of two things occurs: either one operator's changes are accepted and the other is notified that the changes were not made, or both operators are notified that their changes were not made. In either case, the customer data is not left in an indeterminate state.
Durability: Changes the transaction has performed persist in the database. Once a change is made, it is permanent. If a system error or power failure occurs before a set of commands is complete, those commands are undone and the data is restored to its original state once the system begins running again.
Transaction processing is particularly important for Web applications that use data access, since Web applications are distributed among many different clients. In a Web application, databases are a shared resource, and having many different clients distributed over a wide area can present these key problems:

- Contention for resources. Several clients might try to change the same record at the same time. This problem gets worse the more clients you have.
- Unexpected failures. The Internet is not the most reliable network, even if your Web application and Web server are 100 percent reliable. Clients can be unexpectedly disconnected by their service providers, by their modems, or by power failures.
- Web application life cycle. Web applications do not follow the same life cycle as

Windows applications—Web forms live for only an instant, and a client can leave your application at any point by simply typing a new address in their browser

Transaction processing follows these steps:
1. Begin a transaction.
2. Process database commands.
3. Check for errors.
4. If errors occurred, restore the database to its state at the beginning of the transaction. If no errors occurred, commit the transaction to the database.

Suppose two users try to add the same book to the shopping cart and try to place an order at the exact same time. An update should be done to the Books table after the order is placed, but if only the latest transaction is noted down, the book quantity will differ in the real world. This situation has to be handled as in a “Transaction”. As detailed earlier, a transaction is an operation or set of operations that succeeds or fails as a logical unit. That is, either both the updates are not done, or both the updates are done consecutively.

Transactions are normally managed by declaring boundaries around a set of operations. Operations that execute in the context of the transaction boundary then succeed or fail as a unit. For ASP.NET, the transaction boundary is the execution of a single request to a page, which might contain nested components that participate in the same transaction. While the page is executing, if an operation on the page itself or a nested component in the same transaction fails, it can call **ContextUtil.SetAbort**. This is then picked up by the current transaction context, the entire transaction fails, and any operations that were already completed are undone. If nothing fails, the transaction is committed.

the supported transaction attributes. The absence of a transaction directive is the same as an explicit directive to "Disabled".

Table 2 Transaction attributes

Attribute Description

Required The page requires a transaction. It runs in the context of an existing transaction, if one exists. If not, it starts one.

RequiresNew T he page requires a transaction and a new transaction is started for each request.

Supported The page runs in the context of an existing transaction, if one exists. If not, it runs without a transaction.

NotSupported
The page does not run within the scope of transactions. When a request is processed, its object context is created without a transaction, regardless of whether there is an active transaction.

A transaction can be explicitly committed or aborted using static methods of the **System.EnterpriseServices.ContextUtil** class. You can explicitly call the **SetComplete** or **SetAbort** method to commit or abort an ongo ing transaction.

A transaction will commit or abort at the end of the page's lifetime depending on whether SetComplete or SetAbort was called last, provided there is no other object to join the same transaction.

18.Limitations and Future Development

There are some limitations for the current system to which solutions can be provided as a future development:

1. The system is not configured for multi- users at this time. The concept of *transaction* can be used to achieve this.
2. The Website is not accessible to everyone. It can be deployed on a web server so that everybody who is connected to the Internet can use it.
3. Credit Card validation is not done. Third party proprietary software can be used for validation check.

As for other future developments, the following can be done:

1. The Administrator of the web site can be given more functionalities, like looking at a specific customer's profile, the books that have to be reordered, etc.
2. Multiple Shopping carts can be allowed.

19.Conclusion

The Internet has become a major resource in modern business, thus electronic shopping has gained significance not only from the entrepreneur's but also from the customer's point of view. For the entrepreneur, electronic shopping generates new business opportunities and for the customer, it makes comparative shopping possible. As per a survey, most consumers of online stores are impulsive and usually make a decision to stay on a site within the first few seconds. "Website design is like a shop interior. If the shop looks poor or like hundreds of other shops the customer is most likely to skip to the other site"[16]. Hence we have designed the project to provide the user with easy navigation, retrieval of data and necessary feedback as much as possible.

In this project, the user is provided with an e-commerce web site that can be used to buy books online. To implement this as a web application we used ASP.NET as the Technology. ASP.NET has several advantages such as enhanced performance, scalability, built- in security and simplicity. To build any web application using ASP.NET we need a programming language such as C#, VB.NET, J# and so on. C# was the language used to build this application. For the client browser to connect to the ASP.NET engine we used Microsoft's Internet Information Services (IIS) as the Web Server. ASP.NET uses ADO.NET to interact with the database as it provides in-memory caching that eliminates the need to contact the database server frequently and it can easily deploy and maintain an ASP.NET application. MySQL was used as back-end database since it is one of the most popular open source databases, and it provides fast data access, easy installation and simplicity.A good shopping cart design must be accompanied with user-friendly shoppingcart application logic. It should be convenient for the customer to view the contents oftheir cart and to be able to remove or add items to their cart. The shopping cart application described in this project provides a number of features that are designed to make the customer more comfortable.This project helps in understanding the creation of an interactive web page andthe technologies used to implement it. The design of the project which includes DataModel and Process Model illustrates how the database is built with different tables, howthe data is accessed and processed from the tables.

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