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Building Online Shopping Website Based On ASP.NET and SQL Server

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<p>This project aimed to develop an online shopping website prototype selling mainly Asian food and groceries on the Internet. The website includes both a front-end portal for customers, and a back-end management system used by system administrators to manage the website in the background.</p> <p>The website was named Asian Online. It was designed for people who prefer online shopping of Asian items at home in the Helsinki area. The portal was developed using ASP.NET framework and written in C# language. The back-end system was developed using Microsoft SQL Server 2008 as database. Visual Studio .NET provided various kinds of ASP.NET controls.</p> <p>As a result, the website was developed and most functions for online shopping were implemented. Furthermore, people living in Helsinki can buy their favourite products online. More Finnish people are offered a platform to become familiar with oriental diet and culture. For further development, market research in Helsinki is necessary before the website will be formally established.</p>	
Keywords	ASP.NET, SQL Server, Asian Food, Website

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1 Introduction

E-commerce represents the direction of future trade development. Promotion of e-commerce will bring great benefits to the society and the economy. For example, e-commerce improves the speed and quality of services of transaction, promotes the globalization of markets, and cuts down cost. For these reasons, this project aimed to design and implement an online shopping website for selling Asian food and groceries in the Helsinki area. The website is designed for people who prefer online shopping of daily necessities, especially Asian food. This website covers the entire process from product management, classification and querying, to the shopping cart, and user order processing.

According to a simple market research, there are large domestic supermarket chains located around every city in Finland and every corner in Helsinki. However, the selection of commodities in these different supermarkets is almost same, and there are only few Asian food items on the shelf. In addition, only three large scale Asian supermarkets are located in Helsinki and they are in the same place in the city centre. According to information received from friends, a lot of Finnish people like Asian diet. Thus, the goal of this project is to provide a platform for more and more Finnish people to become familiar with Asian food and purchase it online, and to develop an independent online shopping system based on ASP.NET and SQL Server.

In the future, this project could be used for the establishment of a personal online shopping portal, or it could be sold to a company interested in Asian product trading. The system includes both a front-end portal for customers and a back-end management system used by administrators to manage the website in the background. ASP.NET is used as the framework for the project to facilitate software development, maintenance and upgrading. Background system consists of Microsoft SQL Server as database and is written in object-oriented C# language.

2 Background knowledge requirements

2.1 ASP.NET and .NET Framework

ASP.NET is the successor of Microsoft ASP (Active Server Pages), but it is developed to be more powerful than ASP. It can be used to build dynamic websites and web-based distributed applications, respond to data submitted by the user from the HTML form, and access to the data or database, then return the results to the browser. ASP.NET is a development platform provided by .NET Framework and features a completely object-oriented programming model, which includes an event-driven, control-based architecture that encourages code encapsulation and reuse. When coding ASP.NET applications, programmers have access to classes in the .NET Framework. ASP.NET is integrated with the .NET framework, which is divided into a large collection of functional parts totalling more than 10,000 types [1;7]. In addition, it is easy to deploy and configure. Figure 1 shows an overview of .NET Framework.

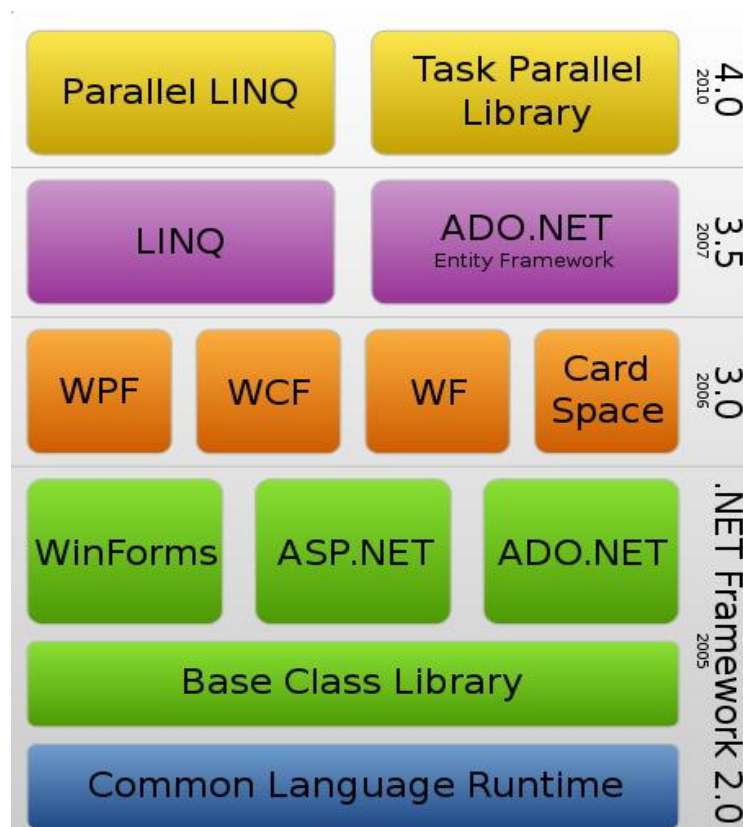


Figure 1 The .NET Framework Stack [2]

The most important aspect of the ASP.NET engine is that it runs in the runtime environment of the CLR (common language runtime). CLR has some major benefits: Firstly, it provides a pool of threads that can be used by various classes, an object is automatically allocated by space, and unused memory for inaccessible objects is reclaimed by the garbage collector. Secondly, the compiler can verify that every call is valid at runtime, and whole categories of low-level errors are completely obliterated by the safety layer. Thirdly, the information about classes and members is only one of the types of metadata that .NET stores in a compiled assembly [1;11-12]. Figure 2 shows a high-level look at the CLR and the .NET Framework.

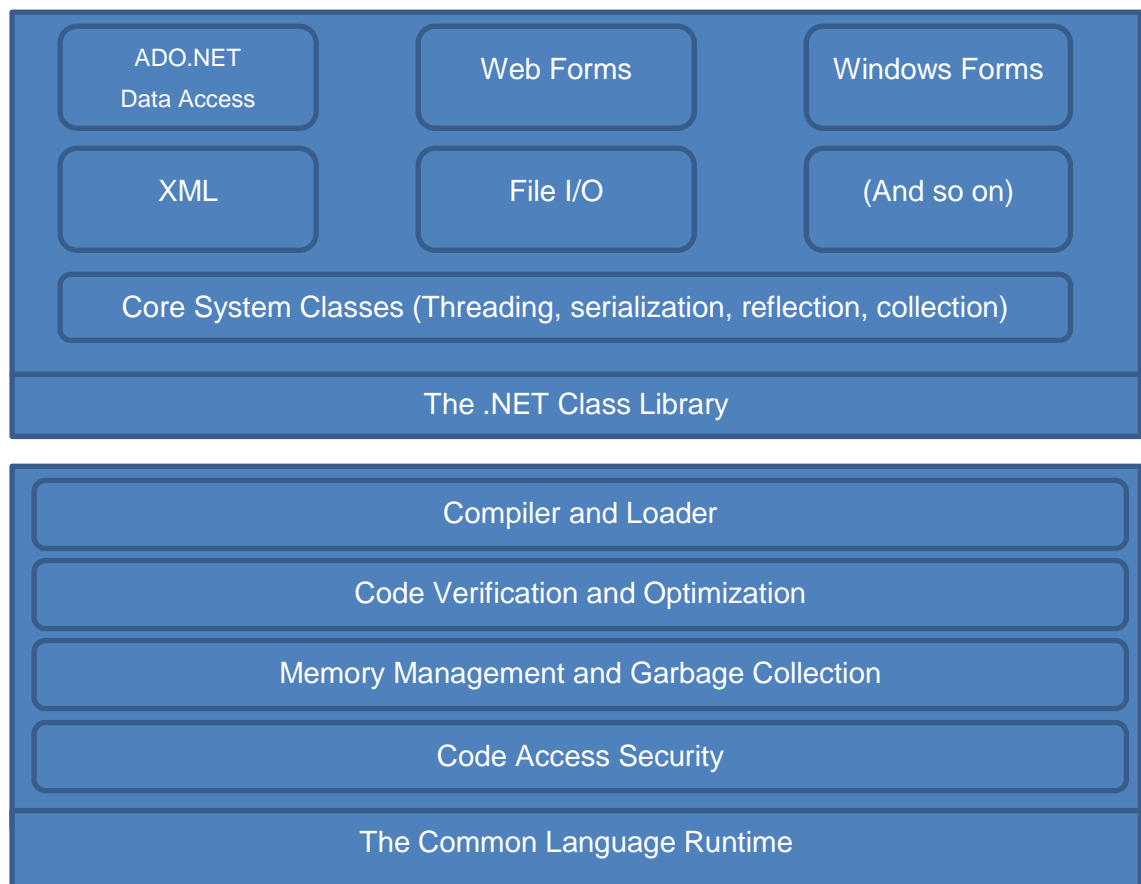


Figure 2 The CLR and the .NET Framework [1;12]

ASP.NET uses solely OOP (object-oriented programming) language (at present stage support to C #, VB, Jscript) to develop, using WYSIWYG (What You See Is What You

Get) editor to edit the web form. It supports the separation of code and the content of the page [3]. Programmers can take full advantage of the object-oriented inheritance, encapsulation, reusability, and the characteristics of the event-driven for programming. ASP.NET web form can be visually edited without having to worry about the compiler automatically adding or modifying code will affect the script running.

2.2 Differences between PHP and ASP.NET

The most essential difference between PHP and ASP.NET is that PHP is a programming language and ASP.NET is a development platform. Approximately 1/3 of the web applications in the world are written in PHP at present. Most of these PHP programs run on an Apache server. As a programming language, PHP is independent of the operating platform. In contrast to PHP, ASP.NET is a platform rather than language. The ASP.NET program not only can be written in C#, but also can be written in any language which was compiled to runs on .NET CLR. Usually, ASP.NET runs in Windows platform and IIS server. In this sense, the difference between PHP and ASP.NET, like iPhone and Widows 7. Choose one of them, is equivalent to choose a style. [4]

ASP.NET consumes very large in terms of memory usage and execution time, due in a long code path. For web-based applications, these limitations would be a serious problem, because on the web, application may be extended to thousands of users per second. Memory usage may also become a problem on the Web server. On the other side, obviously the advantages of ASP.NET depend on its simple design and implementation. This is the dream of object-oriented programming: Language flexible and support to complex object-oriented features. In this sense, it could be able to interoperate with the existing skills of programmers. Another advantage of ASP.NET is the development environment. For example, developers can use WebMatrix (a community-supported tools), Visual Studio .NET or Borland tools (such as Delphi and C + + Builder). Visual Studio allows programmer to set breakpoints, tracking code snippet and view the call stack. All in all, it is a complex debugging environment. Many other third party of the ASP.NET IDE solution also will inevitably arise in the future. This project used ASP.NET as development platform rather than PHP because the environment of Microsoft (Windows + ASP.NET + SQL Server + Visual Studio 2010) is convenient than LAMP (Linux + Apache + Mysql + PHP), and it is oriented-object programming. [4]

2.3 SQL 2008 Server Database

Microsoft SQL Server is a database management and analysis system for e-commerce, line-of-business, and data warehousing solutions, it is a powerful and easy-to-operate back-end database management system, increasingly favored by the majority of database users[5]. More and more development tools are provided with SQL Server interface. SQL Server is a relational database management system, originally developed by three companies, Microsoft, Sybase and Ashton-Tate jointly. The first version was OS/2, launched in 1988. After the release of Windows NT, Microsoft and Sybase SQL Server developers parted ways, Microsoft moved SQL Server to Windows NT system, and focused on the development and promotion of SQL Server Windows NT version.

At present, the major database systems already on the market include MySQL, Access, Microsoft SQL Server, Oracle (9i, 10g, 11g). SQL Server and Oracle are the most common database systems in use. This project selected Microsoft SQL Server 2008 as database system because of the following reasons: firstly, although Oracle can be run on all major platforms, and has solved the problem of cross-platform, its enterprise manager is more complex for use. SQL Server 2008 can only run on Windows, but the degree of integration with Windows is better than that of Oracle. In addition, SQL Server is easy and convenient to use and study. Secondly, Oracle is suitable for large-scale projects. SQL Server 2008 applies to small and medium-sized projects. Because the relationship between the data tables in the system of the final year project is complex, SQL Server 2008 provides sufficient functionality to meet the project requirements.[6]

SQL Server cannot only be applied to small and medium-sized database management and the establishment of a distributed relational database, but also to develop a desktop database. In fact, the basic structure of the SQL Server database processing uses relational database model. SQL Server Enterprise Manager is a key management tool for SQL Server, and complies with the MMC standard user interface, allowing users to define the instance of SQL Server group. The SQL Server also supports functions like registering individual servers the group, configuring all SQL Server options for each registered server, creating and managing all SQL Server database objects, log-ins, users and permissions in for each registered server, and defining and executing all SQL Server administrative tasks on each registered server.

DBMS (Database Management System) is large-scale software used to the manipulation and management of the database. It is used to create, use, and maintain the database. DBMS has unified the management and control of the database to ensure the security and integrity of it. The user can access the database in the DBMS, and the administrator through the DBMS database for maintenance. DBMS provides a variety of functions, and multiple applications, and users can use different methods to create, modify, or query the database at the same time or at different times. Microsoft SQL Server is a typical relational database management system, using Transact-SQL language to complete data manipulation. Microsoft SQL Server is an open system, and other systems can interoperate with it. The features of SQL Server include its reliability, scalability, availability, manageability, and provide users with a complete database solution.[7]

2.4 ADO.NET

The .NET Framework possesses its own data access technology, ADO.NET. ADO.NET technology is a programming model to create a standards-based system oriented for distributed data sharing applications. It is an extension of the ADO (ActiveX Data Objects) technology and development, and superior to ADO technology in interoperability, maintainability, programmability and performance. ADO.NET contains many classes. Programmers use these classes to get the data. ADO.NET is commonly used by programmers to access and modify data stored in relational database systems, though it can also access data in non-relational sources. The small miracle of ADO.NET is that it allows a developer to write more or less the same data access code in web applications that developers write for client-server desktop applications, or even single-user applications that connect to a local database [2;259].

Generally web pages access a database with the following steps: first create and open an ADODB connection object interface, and then bound to an object corresponding data source (both named and unnamed data source), depending on the requirements decide whether to create or not a record set. Finally the web page is executed or opened to the corresponding table in the data source link. Figure 4 shows the layered design between an ASP.NET application and a database.

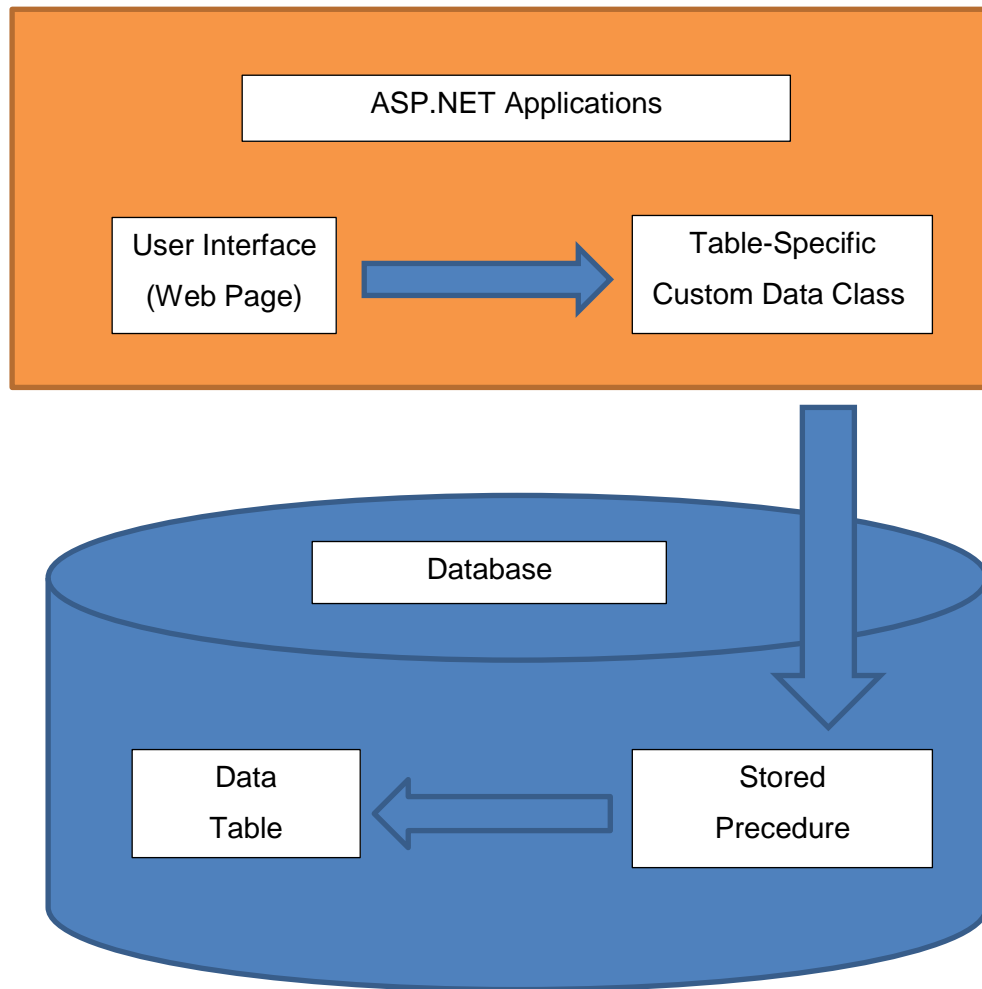


Figure 3 Layered design with a database class

ADO.NET object model has five major components: connection, command, dataset command, dataset, and data reader. Dataset in ADO.NET operates as a data container, and is used when the application is disconnected from the database. Dataset contains one or more data tables. Each data table contains a collection of rows. Generally, a data table can be seen as a disconnected record set. A data adapter works when connecting to the database. The single data adapter's role is to use the data filling with data table, or return the modified data table to the database. The data adapter requires a command object to perform different database operations. The command object stores the SQL statement or the name of a specified data access method procedure.[8] Each data adapter has four attributes as follows:

Select Command: This command object is used to select data from the database.

Update Command: This command object is used to update existing records in the database.

Insert Command: This command object is used to insert a new record to the database.

Delete Command: This command object is used to delete a database of existing records.

Figure 4 interprets these objects and their relationships.

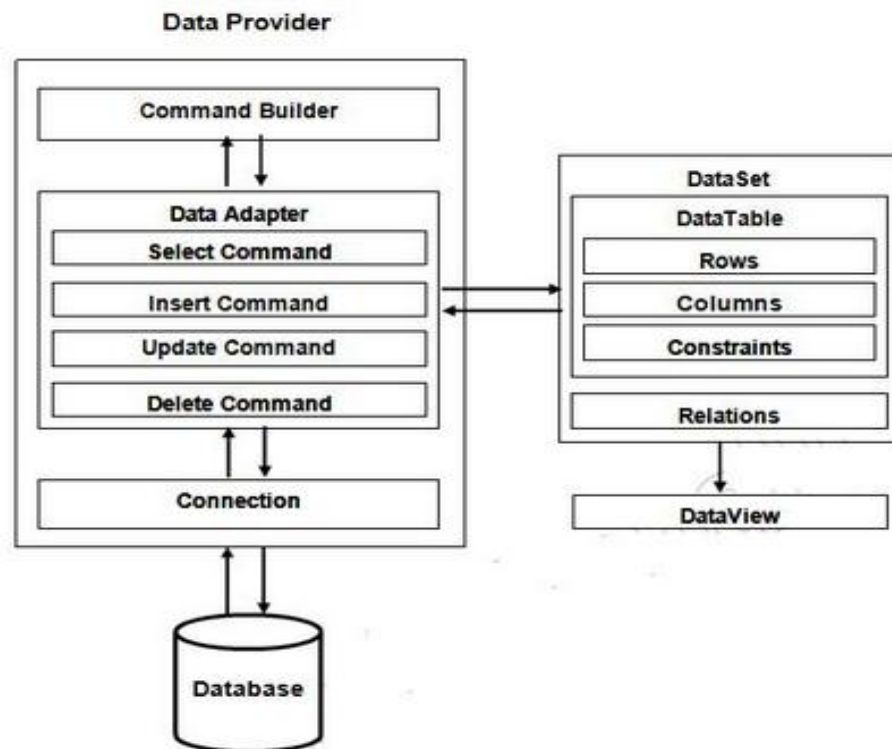


Figure 4 The ADO.NET components model [8]

3 System analysis

3.1 Market demand analysis

In the Helsinki area, a supermarket seems to be the main channel for people shopping, both daily necessities and food items. However, according to a short survey and talk with surrounding friends, a lot of people have a great interest in Asian food. Some Finnish people seem to be tired of their native or Western diet. They prefer to go to an Asian restaurant for lunch, such as sushi, fried noodles and Chinese cuisine. Some of them even go to an Asian supermarket every week, though it is located far away from their home. This project was designed for those people, to provide an online website as a platform for them. People could purchase different styles of food for cooking or eating while sitting in front of the computer. They only need to click the product, pay it online, and then wait for the delivery of their package in one or two days.

3.2 Selection of platform and technologies

This final year project used a B/S (Browser/Server) structure, three layers operation mode, and at the same time, it was designed for Intranet/Internet. The first layer is a browser, which is the system interface. The second layer is application logic service. The third layer is a data link, which functions as the system of data access service. This three-layer structure greatly simplifies the load of the client computer, reduces system maintenance, updates costs and the workload, and reduces the overall cost of the user. In such a structure, the user interface is realized by a www browser, and very little of the business logic is placed in the front end, i.e. the browser reach. The B/S structure of the software only needs the management server and the client browser has no need for any maintenance.

This project used the current mainstream computing mode for development. The front-end development tool was ASP.NET which allows visualization to build the sales module. The back-end code was done with fully object-oriented C#. The ASP.NET is easy-to-use, universal and efficient. The back-end database development tool used was SQL Server 2008. It is able to handle large amounts of data while maintaining data integrity and provides a number of senior management and data distribution functions. These two development tools are powerful, and a good interface for development. Therefore, it is feasible to employ this system.

3.3 System function requirements analysis

The implementation of the online shopping process is different from the traditional way of shopping. First of all, the whole process of online shopping is carried out through the network. Customers cannot see businesses and commodities in real life, and they must understand the information on the goods only through the network. The general process of online shopping is as follows: businesses publish new product information on the web through the system management function, and then customers browse these product details through the system sales module, and can also search for more targeted product information according to their needs. For ease of administration, the customer must be registered as a member of the site to buy a product and choose the payment method and mailing option. After the arrival of the goods, the customer inspects and verifies whether the products are practical and match the online description, and can then give a review for other customers.

Some famous online shopping sites such as Walmart, Amazon, and E-Bay were studied and analysed to establish a logical process of online shopping. Based on this, the main functional requirements of this system were divided into two modules: sales and system management. The sales module function allows the customers to browse the goods. The customers are to be registered as members in order to place products in the shopping cart and pay for them. System management functions are used to the release of products, and to manage the registered membership, product information, order, news, and comments.

3.3.1 Sales module functions analysis

To build the online shopping website for Asian food, the portal should have the following sections and functions for the customers:

1. Member registration: Provides registration function. After the registration, a user can pick products to the cart on the site, otherwise only view product information.
2. Member Login: Allows a visitor to log in as a registered member. Each visitor is only able to log in to one account.
3. Reclaim password: When a registered member forgets his/her password, user name or mailbox, the password question and answer function will support the reclaim of the password.

4. Commodity information browsing: The home page displays special columns for special offers, hot sales, recommended and newly released products, and lists all products category navigation of the website.
5. Special offers module: The special offers module shows larger discounts of goods.
6. Best-selling: According to the orders record, the home page displays the top ten best-selling products.
7. Shopping cart: The products selected by a logged in member are temporarily stored in the shopping car. The customer can modify the number of purchases by viewing the cart.
8. New releases: According to the database information, the home page displays the products released within the last three days or a week.
9. News: Home page rolling displays recent news entries according to the time sequence of the recent news.
10. Advertisements: Depending on the time, advertisements will be displayed on the home page to publicize the different products.

The above functions form the basic pattern of the front-end website.

3.3.2 Background management system functions analysis

The system management module is used by the administrator to release products. The background system functions consist of registered members, product information, orders, news, and comments. The functional requirements of the system management module are as follows:

1. Members function: Implementation of management of the members who have registered on the website. An administrator can manage all members of the site.
2. Products function: Managing the information of a product, such as description, price, images, inventory and so on.
3. Order function: For the registered members' orders in sales module, the administrator will verify, and then deliver the products. Each order corresponds to only one member, but it can correspond to multiple products.
4. News function: Managing the news. A news data table can be updated according to the current date.
5. Administrator function: Managing the basic information of the system administrator, such as adding an administrator, modifying password. An administrator can maintain the information of all members.

6. Administrator login: Only when logged in to the system management homepage, the administrator can use all the features of the system management module.
7. Release new products: Showing detailed information of new products for customers.
10. Logout: When the administrator clicks the "Logout", he/she will safely exit.

In addition, not only for the security requirements, but also in order to standardize the management of the sales module and management module of the system, the following is to be done:

For customers: The non-registered members are only able to search and browse product information, view special offers, sales ranking, new arrivals and news. Shopping cart and user centre functions are for registered members only. For administrators: If the administrator does not enter log in account and password, he/she does not have access to the system management homepage. If the user bypasses the system administration login page and goes straight to the main page, the system will be forced to return to the login page.

3.4 Data flow analysis

The data flow diagram is used to depict the logical model of the system, and describes an integral module of the system and the relationship of each part, and the flow of information and data conversion.

Firstly, through the product management function in the background system, the administrator saves product information into databases. Then, when a customer is registered as a site member, he/she can select and buy goods. After the completion of the selection, choice of payment method and shipping method, members submit an order. Finally, administrators deal with every new order issued by the member. The top-level data flow diagram of the system is shown in Figure 5.

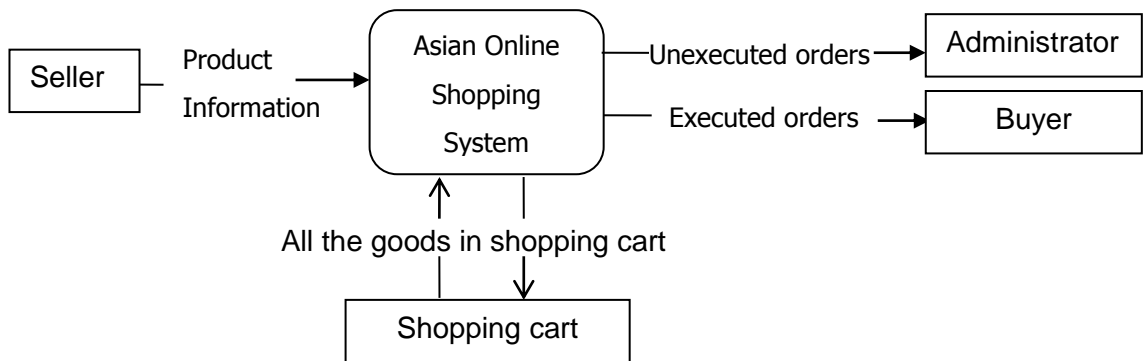


Figure 5 Top-level data flow diagram

For the system sales module, the customer provides data to the database, including registration information, login information, purchase information and the order information. For system management module, the data input is done by the administrator, including the input of product information and news information, and output of all the information could be viewed in sales module. The entire data flow is shown in Figure 6

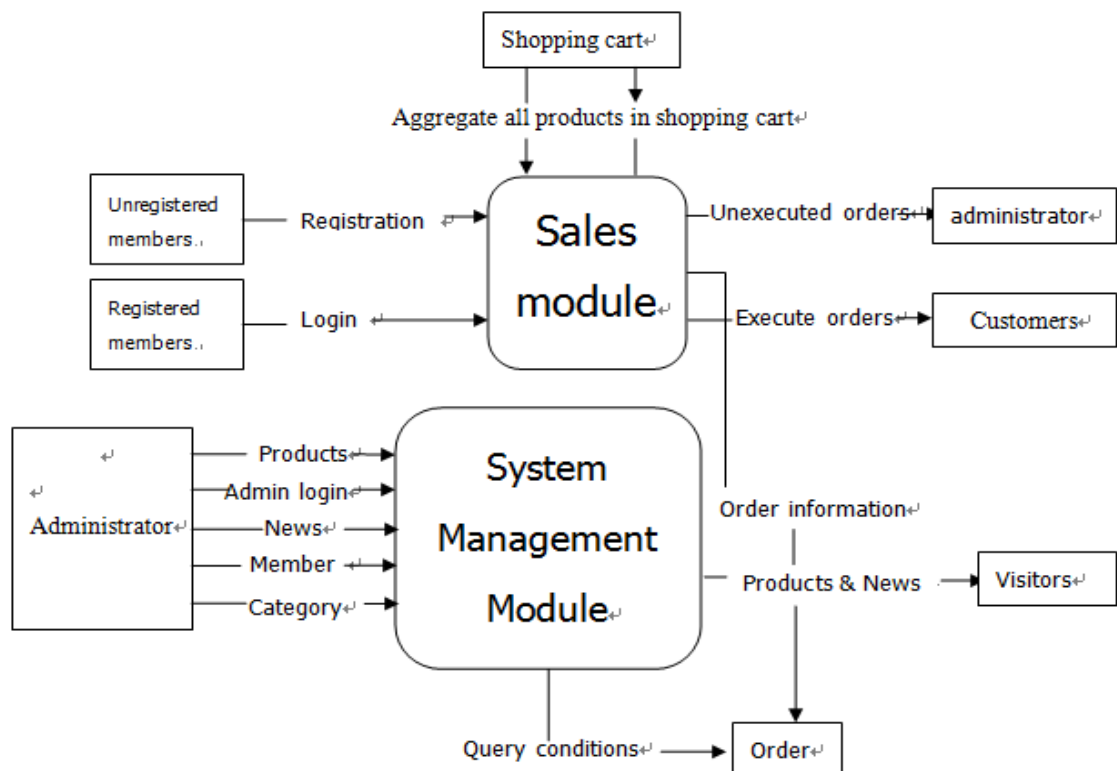


Figure 6 Entirety data flow diagram

4 System design

The objective of this chapter is to convert the logical model from the requirement analyse in previous chapter, into a physical model of the target system. Specifically the aspects of system structure design and database design are explained. This simply means that the results of the requirement analysis in the previous chapter, on “what to do”, are used to determine "how to do".

4.1 System structure design

The system structure and function is the core part in the system design. The structure can be clearly seemed in the diagram. Each structural module is analysed, in order to lay the foundation for design and implementation in the future. According to the functional requirements, the system was divided into two sections: sales module and management module. The sales module is used by customers. The management module is used by administrators. The entire structure of the system is shown in Figure 7.

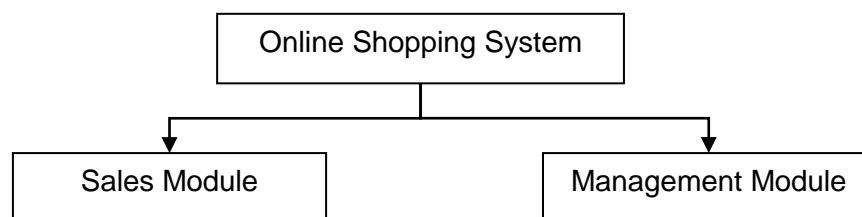


Figure 7 System overall structure diagram

4.2 Module function design

The system is divided in the sales module and system management module. Each module has several sub-modules. The sales module includes: the special columns, shopping cart, membership centre, news, login and other sub-modules. The system management module includes: product management, order management, membership management, news management, administrator login and other sub-modules. The design of a specific module is explained in the following sections.

4.2.1 Sales module design

Sales modules are used by customers to browse and order all kinds of products. Figure 8 shows the structure of the system sales module.

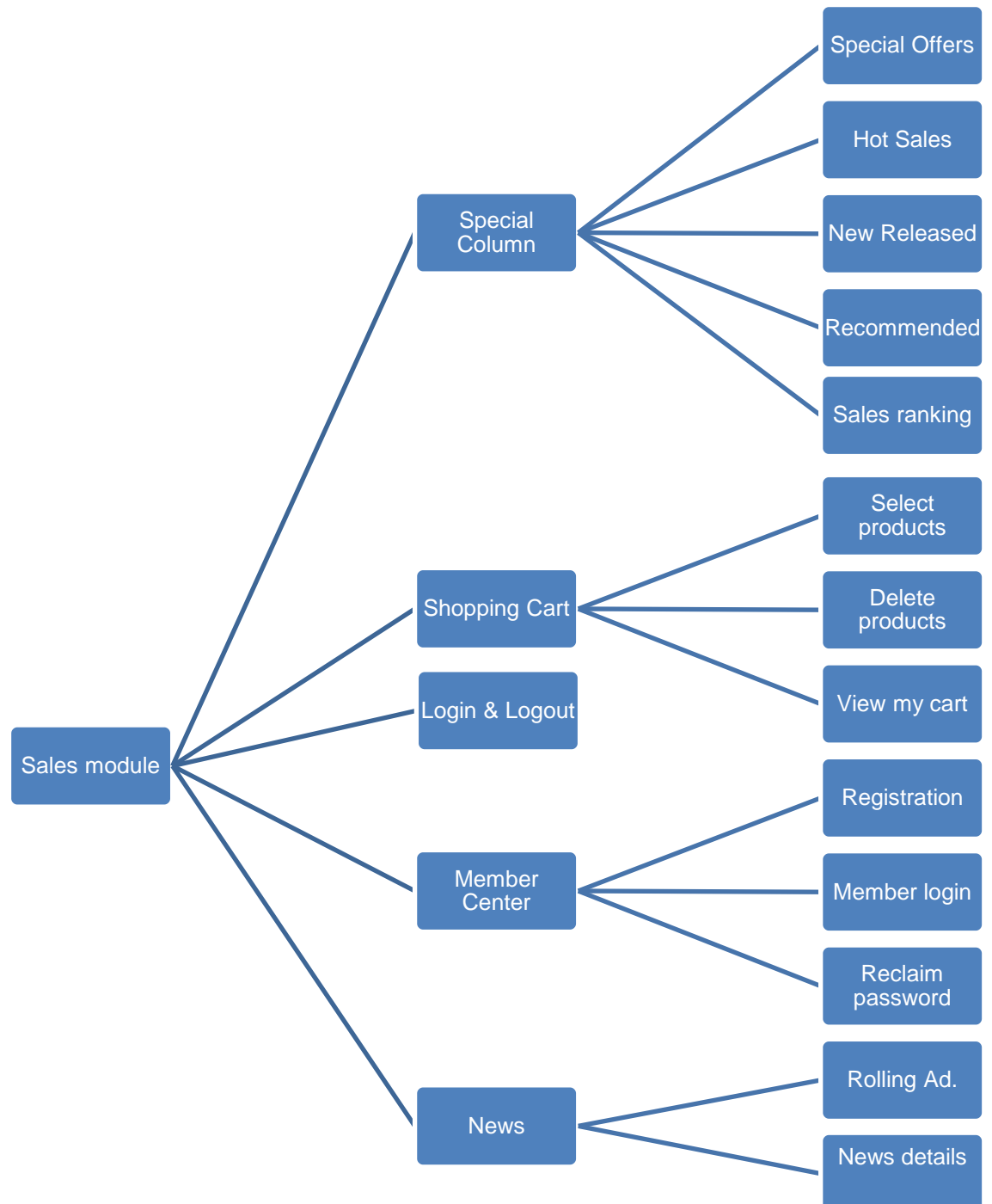


Figure 8 Sales module function structure diagram

Navigation is a fundamental component of any website. Although it is easy enough to transfer the user from one page to another, creating a unified system of navigation that works across an entire website takes more effort. For the Asian Online Website, the special columns and functions design of the navigation bar in sales module is as explained below:

1. Product special columns displays new arrivals, special offers, hot sales, sales ranking and recommended. Each column is divided according to the product information in a particular field of database table. For example, the products displayed in special offers column are those with discounts of more than 20%. New arrivals are products released within the previous three days or one week. Sales ranking is organized according to the number of orders.
2. Shopping cart functions display the select item, view, and empty the cart. Before the customer submits an order, information about all the selected products is stored in the dataset of the implementation class file of the shopping cart. When the order is submitted, the dataset is written into the database. The user cannot use the submit function before they log in. If the user adds an item into the shopping cart, the system prompts user login.
3. Membership centre displays registration, login, and reclaim password. For registration function, the system requires the user to enter information depending on the field of the database membership information in the data table. Parity is achieved through various types of validation controls. Log in and reclaim the password functions are also required data on the membership information data sheet.
4. News management functions display news in the database on the home page, while allowing the user to click on a specific news headline for more information.
5. Login and registration: The system is to be emptied of the members' login information after they logout.

4.2.2 Background management system design

The background system management module is used by the administrators. It consists of product information, orders, news, main category, secondary category, comment management, member management and administrator management. The system management module is shown in Figure 9.

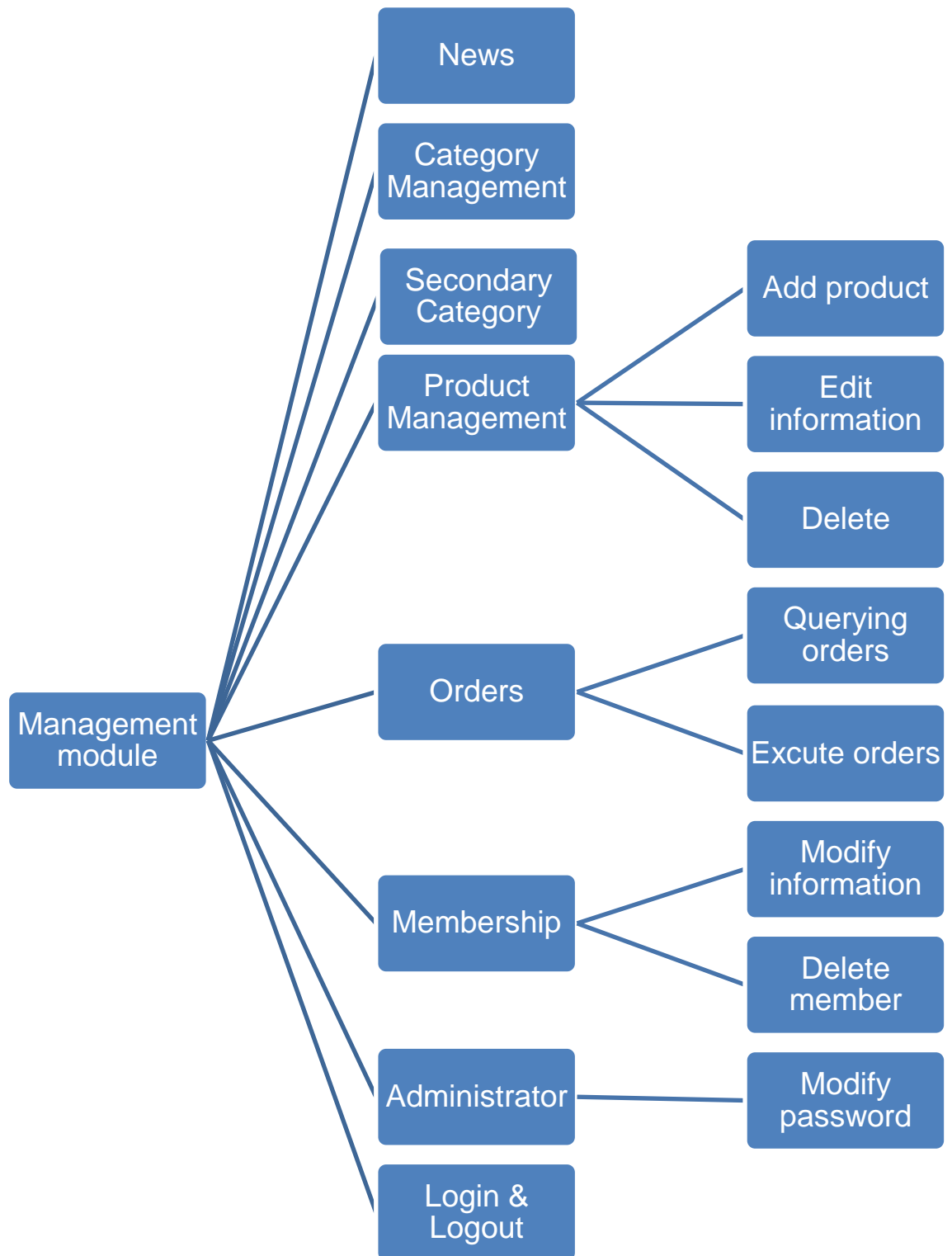


Figure 9 Management module function structure diagram

Specific function design for the management module is explained as below:

1. Product management function consists of the operations add, edit, delete and others for products. System allows pictures to be uploaded for visitors to view.
2. Order management function consists of the operations view order information, deliver the products, and delete.
3. Membership management function consists of the operation manually edit, delete, and modify membership information.
4. News management function consists of the operation delete, edit, and publish news.
5. Login and logout: After the administrator exits, the system will delete information stored during login, such as session information.

4.3 Database design

After the completion of the system analysis it is time to step into the design stage. Once the data are analyzed, and the relationships between the data understood, the E-R model is established, and then the concept structure and logic structure of database designed. Because SQL Server 2008 can be completed with high efficiency to a variety of database queries, and can facilitate the use of stored procedures, and its graphical user interface allows intuitive and simple system and database, it was used for storage management and maintenance in this project. In addition, due to the support of web technology, SQL Server 2008 allows users to easily publish data in the database on the Web page.

4.3.1 Concept structure design

The concept design means that abstracting the user requirements depends on the analysis of information. This step is the key to database design. Generally the bottom-to-up method for data abstraction and structural design is used. The entities involved in this system are as follows:

1. Administrator (Administrator ID, login account, password, permission level)
2. Member (Member ID, login account, real name, password, city, address, zip code, , telephone number, mobile, E-mail, password question and answer)
3. Products (Product ID, category, product names, units, market price, price, purchase quantity, inventory, pictures, publish time, whether recommended)
4. Orders (Order ID, payment method, release date, status, order description)

5. News (News ID, news headings, content, publish time)
6. Main Categories (L-categories ID, L-categories name)
7. Subcategories (S-category ID, S-category name, relations in L-categories ID)

In this system, the relationship between the various entities is one to many: one administrator can manage members, products, orders, news, category, and other physical objects. A member may issue many order entities. One order entity correspond to many order details entities. One order detail consists of only one item entity. The main categories have several sub-category information entities. One sub-category entity has more than one item of physical products.

4.3.2 Database table design

The advantages and disadvantages of the system database design affect the website data connection speed and the complexity of an update query directly. This section describes the design of a system from the point of view of the overall structure of the database and relationship of database table.

The database design of the system follows the system function analysis, according to the objectives of system requirements. The online shopping system is based on ASP.NET and SQL Server which stores the most important data tables, such as product details table, registered members table, category information table, and order information table.

Primary key and foreign key in each data table exists their corresponding relationships, generally the relationships are the product ID, member ID, category ID, order ID, and administrator ID. The primary key of the elements linked diagram is shown in Figure 10. And data tables are listed in the appendix.

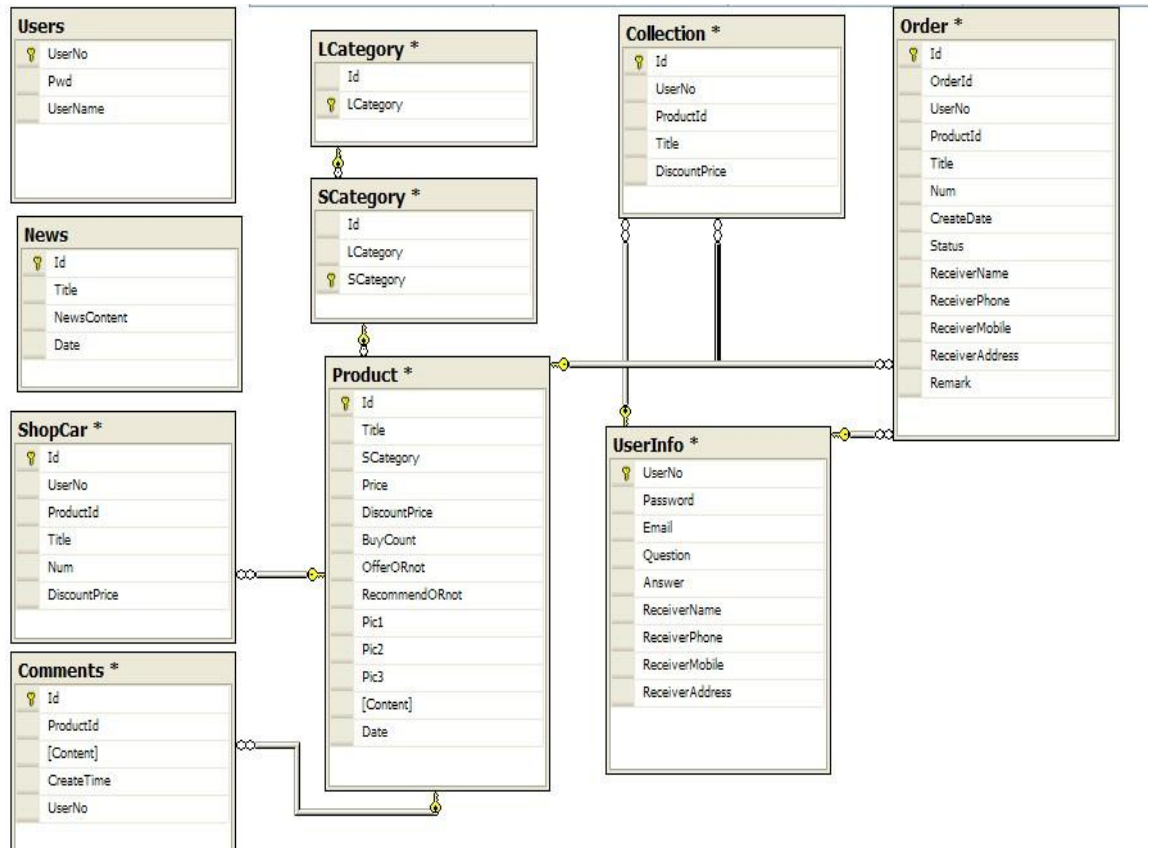


Figure 10 The primary key of the elements linked diagram

5 System Implementation

The system structure design is completed in the overall design phase. This phase is divided into modules, and provides the function of each module and the links between them. After this phase, according to the viewpoint of the software development, the project will step into the detailed design phase, i.e. the system implementation. The fundamental goal of this stage is to determine how to achieve the required system, and give an internal process description of each module. This chapter will give a presentation of the sub-modules of the system implementation.

5.1 Public class implementation

This section will describe the system that uses the public classes, such as the generic class of database access, which is used for returns of a dataset, object, and numbers of affected rows, and the function class which is used to complete the shopping process. The preparation of public classes in other pages directly calls the methods, properties, and avoids duplication of code writing, which is convenient to the maintenance of the system code and future system upgrades.

The database operations class depends on the requirements of the system function, returns a data set, and an object, such as return to the first row and the first column; number of rows affected (for CRUD operations in the database); and the SqlDataReader. To achieve these functions, there are four static functions. Each of the static functions depends on whether the imported SqlParameter is overloaded. Because the static function members cannot act on a specific instance, when call these methods can be directly used the class name plus the name of the function.

Customers can purchase items on different pages, and these items are ultimately collected into the same shopping cart. Therefore the system needs a shopping cart class for the customer's shopping process, in order to avoid unnecessary duplication of code writing, which is convenient to the maintenance and function expansion. When the user clicks on the "Purchase" button in the shopping page, the product ID is imported to the class. The product is determined by the item ID. The system will use the Hashtable class to store this information. Before the user submits the data, the data in

Hashtable will be temporarily stored in session variables. After the submission of the cart, the data will be written to the database.

5.2 System implementation

Websites are more sophisticated than ever. Nowadays it is not enough if a website has a great look and feel. It has to be easy to use and must present exactly the information that users want to see. In addition, users want websites to present the information in a specific way based on their individual preferences. Furthermore, users want to be able to customize the website's user interface to fit their requirements, in order to the information they need for their demand as soon as they are logged in. Therefore, user profiles have become more important in web development.[2;1215]

5.2.1 Home page design

In a personalized environment, users want specific information stored in a profile and want to be able to customize most of the website's appearance and the information it displays. The .NET framework consists of controls and components that perform the following tasks for a developer: defining customizable sections, offering components for item selection, customizing the web page, and saving the customized appearance.

When creating a web part page, firstly the layout is structured using HTML tables; for example, the user login area, website logo area, navigation area, category area on the left side, the main area in the middle area, news and best-selling area on the right side. The system uses controls to maintain consistency of style on each page. Figure 11 is the portal page with a consistent look and feel.



Figure 11 Website home page interface

The home page mainly displays a dynamically updated website, categories, product information, the latest news, product search and the entire site navigation menu.

As the second step, a Web Part Manager control must be added, available in the Web Parts toolbox of Visual Studio. This is an invisible control that knows about all the available web parts on a page, and manages personalization. Every other web part-related control depends on it so it needs to be the first control created on a web part page, and then a Web Part Zone control is added on every section of the page. After these steps are completed, the web part page is ready to be used. For this system, the Web sections in the sales module and functions are discussed in chapter 3 and chapter 4. The following code snippet shows the modified portion of the web page.

```
<div style="width: 181px; height: 22px; margin-top: 93px; margin-left: 241px;">
<asp:TextBox ID="txtUserNo" runat="server" Width="181px" Height="21px">
</asp:TextBox></div>
<div style="width: 220px; height: 22px; margin-top: 15px; margin-left: 241px;">
<asp:TextBox ID="txtPwd" runat="server" Width="120px" Height="21px" Text-
Mode="Password"> </asp:TextBox>
```

5.2.2 Product purchasing and view

Administrators log in to the management module and click “Category Manage” to publish and update the classification of product information. Category management includes the main categories and sub-categories. The sub-category interface is shown in Figure 12:

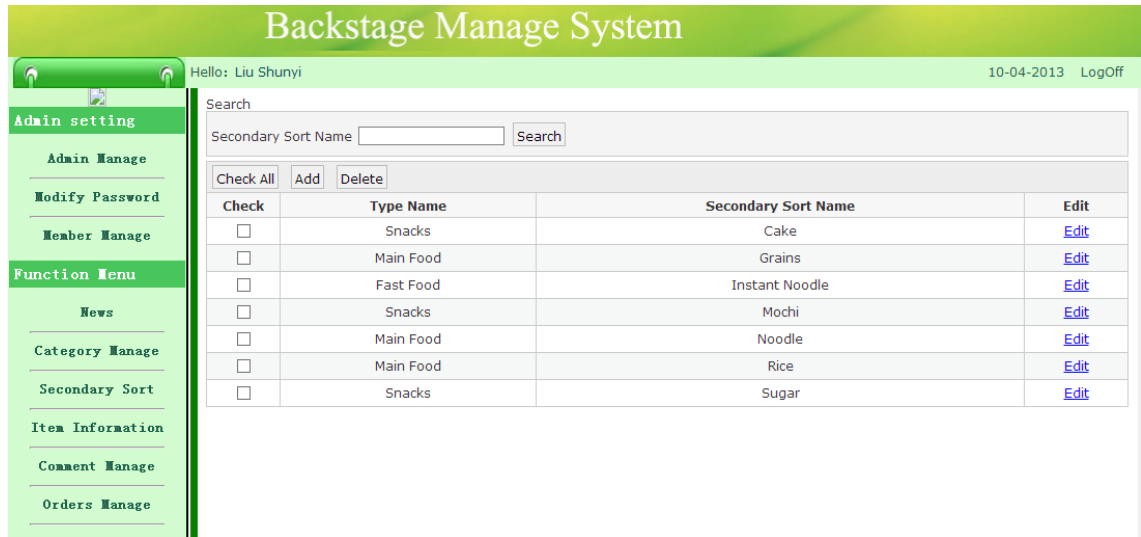


Figure 12 Sub-Category interface

Through “item information”, an administrator can add, modify, delete, and update the product information, and also, select whether this product will be displayed in “On Sale” and “Recommend” columns or not. The design interface is as follows:

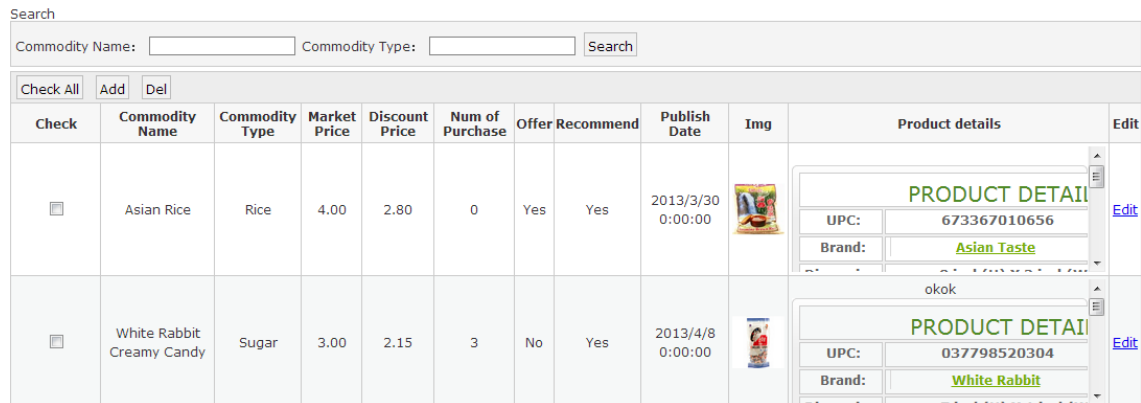


Figure 13 Product information management interface

After a successful release, customers can view and purchase the products in the front-end website. Clients can view a list of different products from the website in the differ-

ent columns “On Sale”, “Hot Sale”, “New Release”, and “Recommend”. Categories can also help clients to view the list of products corresponding to a classification. Product Search by keyword corresponds to the product information. For example, the “On Sale” column displays special offers on products. The design of the interface is as follows:



Figure 14 On Sale Colum interface

Through the above product list interface, the customer can click the picture on the name of a product to get product details, including product names, brands, category and prices, on the screen. The product details information design is as follows:

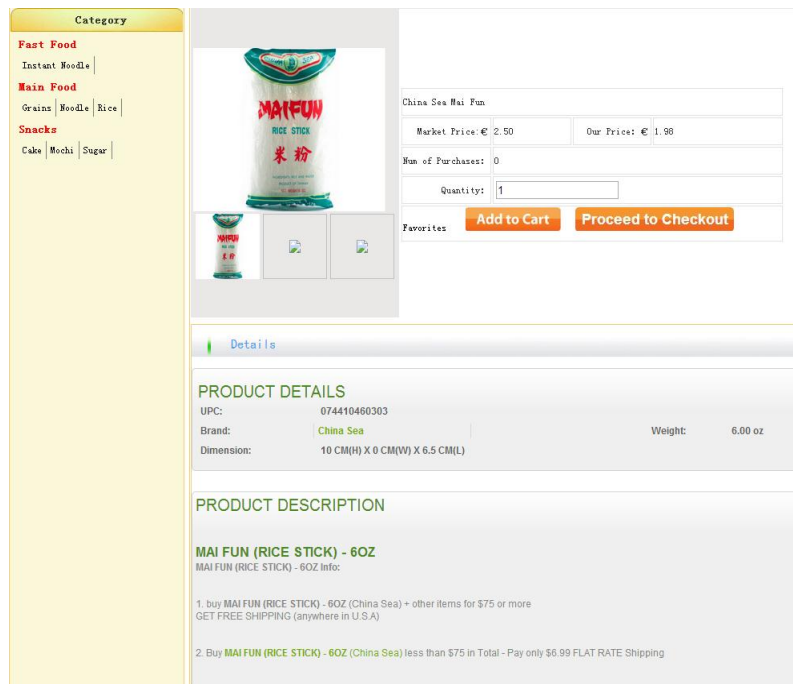


Figure 15 Product details information interface

The shopping cart collects all the users' purchase information and can also modify the quantity of the items or delete any purchases. The web page will display the price and purchase quantity of each item. After clicking the fill order button, the customer needs to fill the name, address, phone and other information of the receiver. Finally the customer clicks "Check Out" to confirm the order. The design interface of shopping cart is as follows:

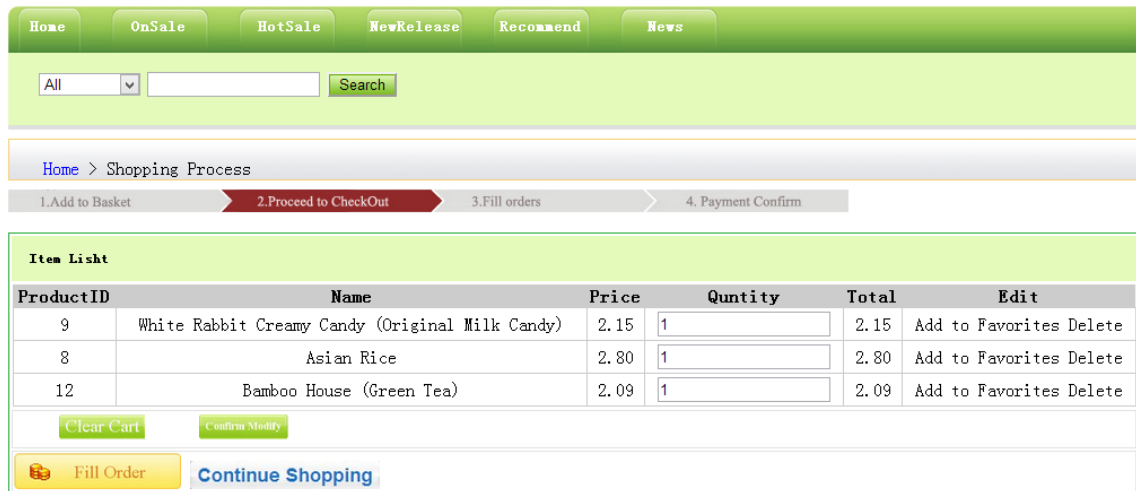


Figure 16 Shopping Cart interface

When an order is successfully submitted, the administrator will see the order details in the Order Management, and then make the corresponding processing operations.

The design interface of the background order management is as follows:

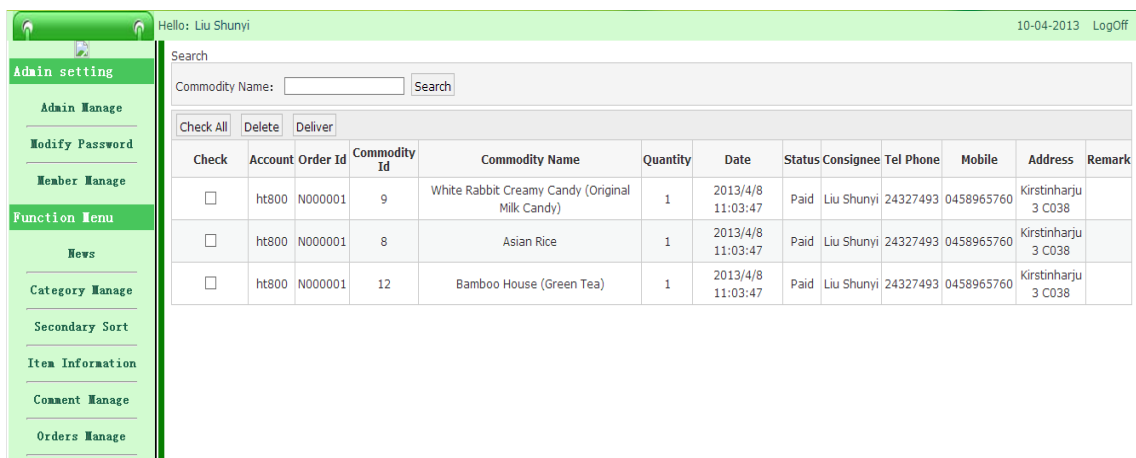


Figure 17 Background order management interface

5.2.3 My Account Module

After log in, users can view their orders in “My Order” column. This module lists the order history of customers, both paid and unpaid orders. The user can also delete an unpaid order. The design of the interface is as follows:

Local [Home](#) > My Account

My Orders

Order Number	Order Time	Item	Status	Edit
N000001	2013/4/8 11:03:47	White Rabbit Creamy Candy (Original Milk Candy)	Paid	Delete
N000001	2013/4/8 11:03:47	Asian Rice	Paid	Delete
N000001	2013/4/8 11:03:47	Bamboo House (Green Tea)	Paid	Delete
N000002	2013/4/10 12:50:20	White Rabbit Creamy Candy (Original Milk Candy)	Not pay	Delete
N000002	2013/4/10 12:50:20	Asian Rice	Not pay	Delete
N000002	2013/4/10 12:50:20	Bamboo House (Green Tea)	Not pay	Delete

Figure 18 My Order interface

In the user centre, the client can also manage the information on his/her own favourites. The design of the interface as follows:

Local [Home](#) > My Account

My Favorites

Items	Price	Edit
White Rabbit Creamy Candy (Original Milk Candy)	2.15	Add to Cart Delete

Figure 19 My Favorite interface

Users can edit their own information and modify their login password in the “User Info” column. If the user forgets the login password, he/she can answer the security question to retrieve the password:

The screenshot shows a web application interface for user information management. At the top, there is a navigation bar with links: Home, OnSale, HotSale, NewRelease, Recommend, and News. Below this is a search bar with a dropdown menu set to 'All' and a 'Search' button. The main content area is titled 'Local Home > My Account'. On the left, there is a sidebar menu with options: User Infor, My Order, Shipping Address, My Favorite, and a red 'Logout' button. The main area displays a 'Personal Information' form with the following fields and values:

Personal Information	
Account:	ht800
Email:	liushunyi123@gmail.com
Question:	1+1=?
Answer:	2
Consignee Name:	Liu Shunyi
Phone:	24327493
Mobile:	0458965760
Address:	Kirstinharju 3 C038
<input type="button" value="CONFIRM"/>	
Old Password:	<input type="text"/>
New Password:	<input type="text"/>
Confirm:	<input type="text"/>
<input type="button" value="CONFIRM"/>	

Figure 20 User Info interface

5.2.4 News module

After the administrator logs in to the background, news management module can be used to release, delete or update news information. With the release function, the latest news are updated on the front-end site and displayed. The news management design interface is as follows:

The screenshot shows the 'Backstage Manage System' interface. The top header displays 'Hello: Liu Shunyi' and '17-04-2013 LogOff'. The left sidebar contains a menu with 'Admin setting' (Admin Manage, Modify Password, Member Manage) and 'Function Menu' (News, Category Manage, Secondary Sort, Item Information, Comment Manage, Orders Manage). The main content area features a search bar and a table for news management:

Check	Title	Date	Content	Edit
<input type="checkbox"/>	Welcome to Asian Online	08-04-2013		Edit

Figure 21 News modules in back-end

Home page scrolling displays the latest news. A list of all of the news details of the website can be viewed by clicking the news on the navigation menu. The design of the interface is as follows:

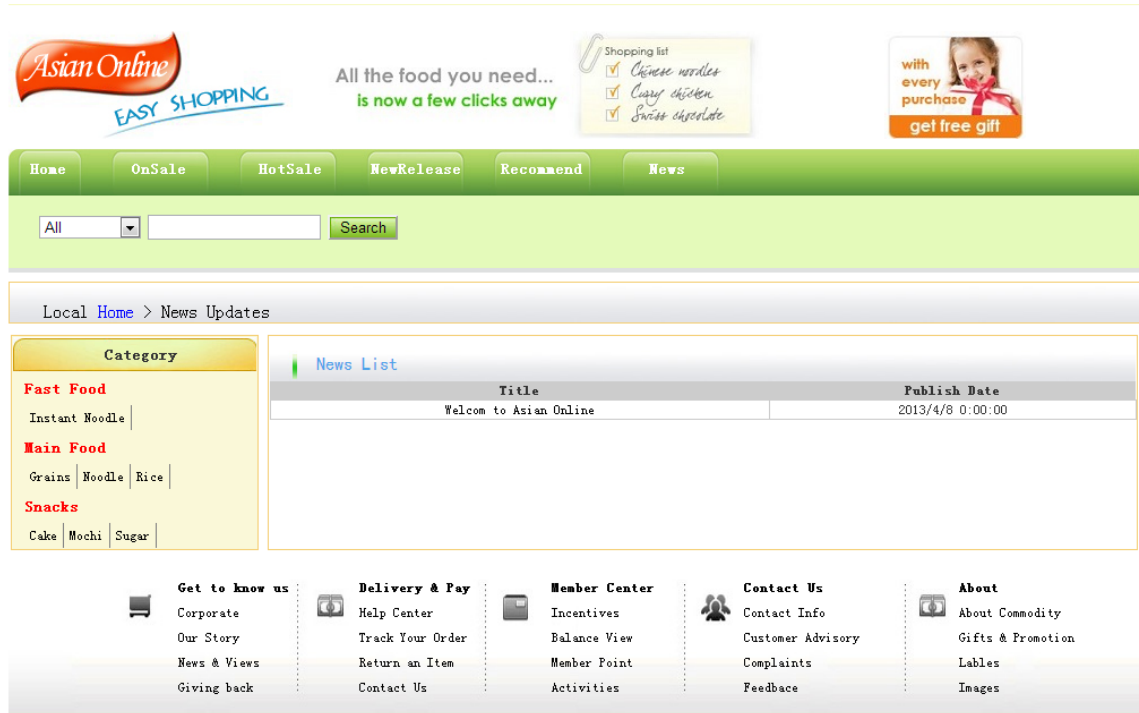


Figure 22 News list interface

Users can view the news titles, content and author in this interface by clicking the news title. Once the news title is clicked, a page with the news details is displayed.



Figure 23 News details interface

5.2.5 Comments Module

Through the product information page, users can give comments after they are logged in,. The design of the interface is as follows:

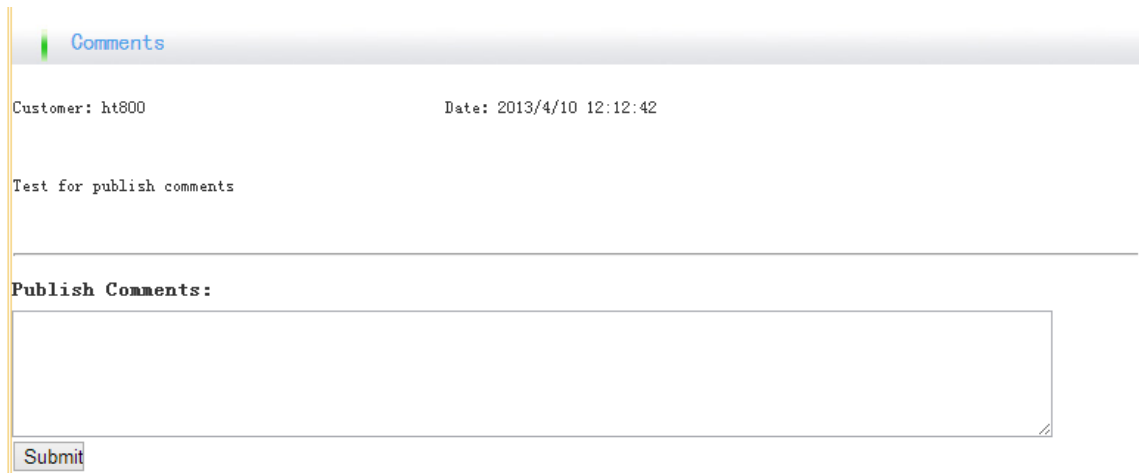


Figure 24 News details interface

After a comment is submitted, the administrator can view the comment.

5.2.6 Management system interface implementation

When the administrator enters a password, the system will determine whether this password is correct and match, as well as to determine user permissions. The system can check each user's permissions, using user permission control specific functional modules. The user permission can be set in the admin management module. If the password matches, the system displays the corresponding permission in the main interface of background; an incorrect password will give the user a friendly prompt.



Figure 25 Background login interface

Figure 26 is the beginning of all the operations of the entire back-end systems interface, divided into three parts: the top module, the left-hand menu and the function display area. After the administrator logs in, the system will decide to either display or hide the function menu on the left. The design of the interface is as follows:



Figure 26 Backstage manage system interface

Only administrators can use the admin manage function. The administrator can add, delete, and modify their information. Through the search function a query in the user record and operations are carried out quickly. After user has added the corresponding information and submitted it, the system will determine whether the account and user name exist. Password cannot be empty before save. If some information is missing, the system will give a friendly reminder. The design of the interface is as follow:

Figure 27 News details interface

5.3 Testing and Debugging

After the system development is completed, the final step is debugging and testing. For example, in the background the administrator could set a main category and subcategory, and then place a product in the item manage module, and the system will prompt whether this product upload is successful or not. If in the front-end website displays normally, it means this product has been successfully uploaded, and the client can

browse this product in the corresponding category. Table 1 illustrates the different module tests for expected and real result.

Test Module	Case	Expected	Actual	Result
Administrator management	Add new Admin	Able to query, modify, delete login normally	Consistent with expected results	Pass
Category management	Add a new category	Able to query, modify, delete. Home page can display	Consistent with expected results	Pass
Product info. management	Realease a new product	Able to query, modify, delete. Home page can display	Consistent with expected results	Pass
Shopping function	Submit a new order after login	Background can display and edit orders	Consistent with expected results	Pass
News management	Release the news and content	Home page displays and click to view contents	Consistent with expected results	Pass
Comments	Submit a feedback after login	Background can display and edit feedbacks	Consistent with expected results	Pass
Member	Sign up for a member	login normall; Background can manage	Consistent with expected results	Pass

Table 1 Module test and debugging

6 Discussion

6.1 Problems and Solutions

At the beginning, I was a novice of ASP.NET and during this project I came across many problems. There is not a systemic module to study ASP.NET and MS SQL in the school. I was reading a lot of books and studying from online tutorials, then summed up some experience from doing this project. After studying and analysing some famous B2C and C2C website designs, such as ebay.com, amazon.com, walmart.com, I was inspired and began to design the layout of this website. While doing the development, the biggest problem was the design of database table and schema. Finally, I successfully configured the connection with ASP.NET and SQL Server.

The details of the problems encountered in the process of system development were as follows: When adding static control to dynamic pages, the required information could not be obtained. Each time a request was submitted to the server, the client page would be reloaded. If this situation had been ignored, the expected data could not have been submitted to the server. The solution was to add breakpoints in the behind-code of the page, and single-step debugging, which eventually resolved the problem. During the process of solutions, I recognized the importance of the debugging method.

6.2 Further Development

The Asian Online website can run on the local host successfully. However, compared with other famous shopping websites, there still are shortages to be improved by further development. First of all, the payment function is not an actual link to the bank. Considering the security and authentication, it is huge work to implement an integral online payment system, although I could only develop an API to the bank. Secondly, according to discussions with some friends, it would be better to add some dynamic graphic and use GDI+ in ASP.NET to give a good user experience. Thirdly, if a chat function for transactions were developed, it would not be limited to chat. Merchants and customers could also quickly query about and modify their information.

7 Conclusion

The system implemented the basic functions of an ASP.NET-based online shopping system, and completed the original intention of an initial system design: a sales module was designed to browse products and use the shopping cart as the main function, the system management module was designed with product information management as the main function. In addition, the system also implemented the various resources (such as product information, product category information, membership information, etc.) management before shopping process, and post order records query. At the completion of the current system, most of the features have been achieved. But some features have yet to be modified, such as the search function in the sales module to enable search by category.

From this system development process, I learned a lot. Previously, I was mostly learning conceptual information, and also had done some piecemeal exercises, which were very different compared to this system design. This project gave me a great opportunity, and finally joined together conceptual expertise with practice. Through design of this system, I summed up the following experience: First of all, I recognized the importance of the code standard. Especially in some large-scale projects, there would be hundreds or thousands of functions. If codes were written unstandardized, a series of troubles would appear in the debugging and checking stage. Furthermore, a complete code-test is very important. Some errors will not be found until much later. Secondly, I realized the importance of software design. The projects I developed before were mostly rapid works, usually designing the next step while developing; they did not require too much time on the logical design of the software. But with this project, I recognized that if I did not pay attention to the original design, large areas of code had to be rewritten. Finally, I recognized the importance of the debugging method. System debugging process is more complex than the development process. In fact, each operation and each submitting a request to the server includes a lot of small pieces of code execution. If the programmer do not use an appropriate debugging method, he/she will be difficult to identify errors in the program.

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Database table design

Admin User

Field Name	Type	Note	Remark
User No	Varchar(50)	User ID	PK, Self-add
Password	Varchar(50)	Login Password	
UserName	Varchar(50)	Username	

Table 1 Background user table

UserInfo(Site Member Register Table)

Field Name	Type	Note	Remark
Userld	Int	ID	PK
PassWord	Varchar(50)	PassWord	
UserName	Varchar(50)	UserName	
Email	Varchar(100)	EMAIL	
Qustion	Varchar(100)	Password Protection	
Answer	Varchar(100)	Password Protection	
Consignee	Varchar(50)	Receiver Name	
Phone	Varchar(50)	Receiver Phone	
Mobile	Varchar(50)	ReceiverMobile	
Address	Varchar(500)	Receive rAddress	
Name	Varchar(50)	ReceiverName	
Phone	Varchar(50)	ReceiverPhone	

Table 2 Site registered member table

Product

Field Name	Type	Note	Remark
ID	int	ID	PK
Title	Varchar(50)	Product Name	
SCategory	Varchar(50)	Sub Category	
Date	Datetime	Publish Date	
Pirce	Decimal(18, 2)	Market Price	
DiscountPirce	Decimal(18, 2)	DiscountPirce	
BuyCount	Int	Purchase Count	

OfferORnot	Varchar(2)	Special Offer	
RecommendORt	Varchar(2)	Recommend	
Pic1	Varchar(200)	Pic1	
Pic2	Varchar(200)	Pic2	
Pic3	Varchar(200)	Pic3	
Content	Text	Product Details	

Table 3 Product Information Table

NEWS

Field Name	Type	Note	Remark
ID	int	ID	PK
Title	Varchar(50)	News Title	
PublishTime	Datetime	Publish Time	
Content	Text	Detailed Content	

Table 4 News table

Comments

Field Name	Type	Note	Remark
ID	int	ID	PK
ProductId	Int	Product ID	
CreateDate	Datetime	Publish Time	
[Content]	Text	Detailed Content	
UserNo	Varchar(50)	User ID	

Table 5 Site registered user table

ShopCart

Field Name	Type	Note	Remark
ID	int	ID	PK
UserID	int	Shopping User ID	
ProductId	Int	ProductID	
Num	Int	Number of Products	

Table 6 Shopping cart information table

Order

Field Name	Type	Note	Remark
ID	int	ID	PK
UserID	int	Shopping User ID	
ProductID	Int	ProductID	
Num	Int	Number of Products	
CreateDate	Datetime	Create Date	
Deal	Varchar(50)	Processing status	
ReceiptName	Varchar(50)	Receipt Name	
ReceiptPhone	Varchar(20)	Receipt Phone	
Address	Varchar (200)	Receipt Address	
Remark	Varchar(1000)	Order Remark	

Table 7 Order information table