Developing an E-Commerce Website

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***Abstract*— In this era of internet, e-commerce is growing by leaps and bounds keeping the growth of brick-and-mortar businesses in the dust. In many cases, brick-and-mortar businesses are resorting to having a counterpart which is internet or e-commerce driven. People in the developed world and a growing number of people in the developing world now use e-commerce websites on a daily basis to make their everyday purchases. Still the proliferation of e-commerce in the under-developed world is not that great and there is a lot to desire for. This paper outlines different aspects of developing an e-commerce website and the optimum solution to the challenges involved in developing one. It consists of the planning process, which starts with determining the use case, domain modeling and architectural pattern of the web application. The entire development process is primarily divided into two parts: the front-end development and the back end development. The database design is also discussed with an emphasis on its relational connectivity. This no-nonsense method of developing an e-commerce website can be easily replicated and followed in developing e-commerce websites in the developing and under-developed countries where computing resources are scarce and expensive because of their socio-economic condition.**

Keywords— domain modeling; e-commerce; model view controller; object oriented programming; online shop

I. INTRODUCTION

Electronic commerce or e-commerce refers to a wide range of online business activities for products and services. It is usually associated with online buying and selling over the internet or conducting any transaction involving the transfer of ownership or rights to use goods or services through a computer mediated network. In our eyes we see it as a new dimension to the varied use of the internet and our purpose is to make it trendy in our country where its use is particularly very low. Because of the high context culture it is very important to develop trust among the people interested in a transaction. E-commerce in Bangladesh actually started in the year of 1999 based in USA with some non-resident Bangladeshis. Our motto is to develop an enriched e-commerce website in our country that should be largely accepted by the customers.

II. FEATURES

The main features of our website are: an end user can perform free online registration. Can search a specific product of his/her interest. Can order online the payment method is currently the "Cash on delivery" method. The administrator possesses the only right to add any product, update its price or delete any product. Can promote small or big advertisements and delete any specific advertise as well. Customers can update their personal information at any time. After logging in to the system the customers can order whatever they want without giving their billing information again and again. In this website products are organized based on categories and brands. Customer can enjoy the detail view of any product by just panning cursor over the product image in the product details section. The website also inherits automated inventory system. So, whenever a customer buys a product it is automatically being deducted from the inventory system & if any product becomes less than five in quantity then automatically e-mail should be delivered to the admin and supplier. Moreover if any product becomes out of stock then no customer would be able to buy that product.

III. THE PLANNING PROCESS

Our goal was to develop a web application that would be attractive enough, have a professional look and user friendly. So that people of all age groups would be its end users. Our job started with subdividing the entire task and setting milestones. The milestones would be a marker of percentage of the work actually accomplished and success story. The entire planning process took the following steps.

A. Defining Use Case Models

Writing use cases or stories of using a system – an excellent technique to understand and describe requirements. An end user with internet browsing facility enabled registers into our site and logs into our site. Finds products of his interest using the search option.

Adds them into the shopping cart and finally orders the products online when the electronic copy of the bill is automatically generated. So, from the stated use case model we found out the following to be the primary requirements:

- A registration page
- Search option
- Shopping cart
- Billing system

978-1-4673-6621-2/16/$31.00 © 2016 IEEE

B. Domain Modeling

As with most of the web applications developed using the Object Oriented Programming (OOP) we followed the same. So we moved forward for Object Oriented (OO) analysis. Which emphasizes on finding and describing the objects – or concepts – in the problem domain. For example a product in our system is an object.

C. Architectural Pattern

Our application has been developed using the standard "Model-View-Controller" pattern. Model view controller (MVC) is an application architectural pattern for implementing user interfaces. It divides the application into three interconnected parts; so as to separate internal representations of information from the ways that information is presented to accept from the user. 'Codeigniter' is an open source web development framework that provided us with the support to build our application using PHP following MVC pattern.

Hence view works as the user interface. Controller has the essential class files to manipulate the data stored in the back-end i.e. the database. It actually works as a traffic between the model and view. But it doesn't have the access to directly interact with the database.

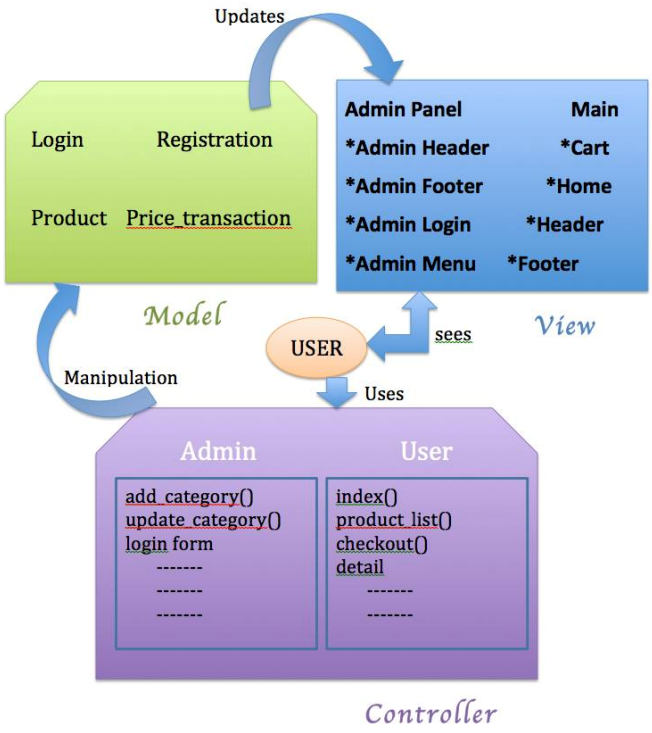

Fig. 1. Diagram of model, view and controller of the application.

It can only pass information from the view and updated information to the view. Finally, the model has the only access to our database it updates any information login, registration pages also prices and products entered by the administrator or the end-user.

IV. Development Tools

The entire development process has been subdivided into two: the front end development and the backend development. The front end comprises of the visually visible parts such as the home page, admin panel, contact page, shopping cart page. The back end contains the database and its interaction with the front-end.

A. Front End Development

The front end was initially raw coded using JavaScript. JavaScript is a client side scripting language which is a dedicated language for web development. JavaScript code was simply mixed with the Hypertext Mark-up Language (HTML) code. Hypertext mark-up language is the language used to design the web pages of an application. A static page is an HTML document that is stored on the web server and does not change.

This was performed by Cascading Style Sheet (CSS). CSS is a style sheet language used for describing the look and formatting a document written in a mark-up language. These CSS files are linked with the class files with .php extensions to put the panels in order, the text with correct font, size and colour. We introduced JavaScript in our application. JavaScript is a client side scripting language most commonly used as part of web browsers and its implementations allow client side scripts to interact with the user, control the browser, communicate asynchronously and alter the document content that is displayed.

For example, in our website the clients while registering are asked to provide their specifications which contains their name, email address, age, etc. If they miss any of the criteria then immediately the browser asks him for filling the particular field. This is implemented by a JavaScript.
We also introduced bootstrap program in our application which supports creation of animations.

B. Backend Development

The Database Management System (DBMS) provides support for the back end. The database management system is essentially software where we can create the database, add, drop, alter and update tables. The tables can hold different types of data for example: integer, variable characters etc. in our application we have chosen the MySQL DBMS to hold the database. MySQL is a relational database management system. The main reason is MySQL development project has made its source code available under the terms of the General Public License (GNU) which is an open source web application.

C. *Database Design*

One of the most important and challenging task is the database design. The information passed by the customer while registering in the website is stored in the database. The products with their identification, description and image is stored in the database. Moreover, if we update any of the featured products the update takes place in the database. So the program has a lot to do with the database.

Any query is run on the database by Structured Query Language (SQL). As stated earlier that PHP has some useful features one of them is the support to connect the database and run queries. The following diagram explains the details the database design.

We will have six tables in the database namely: advertise, brand, category, product, small_add and registration. The formation of three tables are shown in the diagram. The table entitled "product" has the attributes namely:product_id, product_rate, category_id, brand_id, and product_rate. Where product_id is the primary key for this table i.e. each product will have a unique identity.

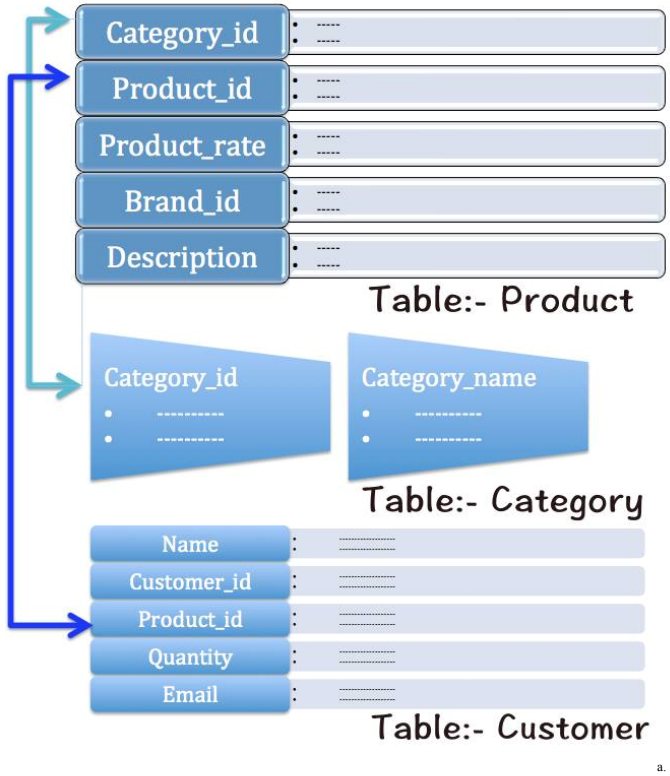

Fig. 1 . Table of product, category and customer database.

The attribute category_id plays as a foreign key for this table i.e. this foreign key creates a link with table category having two attributes: category_id and category_name. When a customer registers into our website his information will be stored in the customer table with the attributes- name, customer_id, product_id, quantity and email.Again customer_id is the unique key for this table and prduct_id is the foreign key to link with the product table.

V. How The Web Application Works

Our application comprises of dynamic web pages which has been created both client and server side scripts. A dynamic web page is a web page that is generated by a server-side program or script. For the testing purpose we have hosted it on our local hosts i.e. our personal computers later we hope to host it on hosting sites to use it professionally. So when we run the program on our local computer the web server is the local web server.

The browser like Google Chrome, Mozilla Firefox or Safari executes this program. The browser makes a Hypertext Transfer Protocol (HTTP) request to the web server for a specific dynamic web page, the web server then looks up the extension of the requested file to find out which application server should process the request. When the application server receives a request, it runs the specified script. Often, this script uses the data that it gets from the web browser to get the appropriate data from a database server. This script can also store the data that it receives in the database. When the application server finishes processing the data, it generates the HTML for a web page and returns to the web server. Then, the web server returns the HTML to the web browser as part of an HTTP response.

VI. Coding

Our application has been developed using Model-View-Controller format as standard. We have separate files containing several functions to implement the proposed functionalities. View is a separate folder holding all the required files with .php extension containing HTML tags and codes that creates the actual webpages. These files have links to other files in the file holder entitled "Controller" which has necessary functions to correspond to the database. The database accessing codes are written in php files residing in the folder entitled "Model". For example : 'home.php' file has the necessary code to display the products and has the following line.

```
<a href="<? echo
base_url().'user/product_detail/'.$p['p_id'] ?>" class="btn btn-
default add-to-cart"><i class="fa fa-shopping-
cart"></i>Detail</a>
```

To retrieve the products this line of code corresponds to the product_detail function under user.php file in Controller. The function as follows.

```
public function product_detail($id)
    {
      $this->load->model("pagetransition");

      $catagory = $this->pagetransition->catagory();
      $brand = $this->pagetransition->brand();
```

```
        $this->load->view("main/head");
        $this->load->view("main/top_menu");
    }
```

This piece of code corresponds to the pagetransition.php file in Model to access the database and retrieve necessary information and pass it to the php files available in folder View.

A pseudo-code function to calculate the price of products:

```
CALCULATE PRICE (int id, float amount)

    String query = SELECT product id, product name,
product price FROM product table WHERE product id =id

if (number of rows retrieved >0)
        Row Array [ ] = query results
Row Array [ 'product amount'] = amount

 float total= Row Array ['product amount'] X Row Array
['product price' ]

return total
```

VII. Testing and Bug Fixing

Testing an application is an investigation to provide stakeholders with information about the quality of the product under test. Our testing technique included the process of executing the application with the intent of finding bugs (errors or other defects). It involved execution of the most important application components to evaluate the properties of interest. Among the several testing methods White-box testing was preferred. White-box testing also known as clear box testing, tests internal structures or workings of a program, as opposed to the functionality exposed to the end user. In white box testing an internal perspective of the system as well as programming skills are used to design test cases. The tester chooses inputs to exercise paths through the code and determine the appropriate outputs. This is analogous to testing nodes in a circuit. So based on the above test we can state that our web application is perfectly working. There were few bugs later fixed and now it is a full functioning website.

Now we have our web application ready and hosted by our own domain. Our domain name is www.kroykorun.com. The hosting clients have their server computers to perform the task of a web server, application server and database server. We have ensured the security issues by using cryptographic hash functions like SHA-1 during the implementation of the functions wherever the application asks the user for a password.

The SHA-1 is a cryptographic hash function producing a 160-bit hash value, known as message digest. SHA-1 is the most widely used hash function for its enhanced security. No successful attacks has yet been reported on SHA-1.0.

VIII. Conclusion

E-Commerce has changed our life styles entirely because we do not have to spend time and money travelling to the market. One can pick up the pace of his online business with the help of e-commerce application development and web development solutions. It is one of the cheapest means of doing business as it is e-commerce development that has made it possible to reduce cost of promotion of products and services.

There is no time barriers in selling the products. One can log on the internet even at midnight and can sell products at a single click of mouse. An interactive user friendly and focused website in the form of online shop can generate good business.

So we are of the opinion that big companies should invest more on research and development for e-commerce.

Acknowledgment

We would like to start by expressing my sincere gratitude to the Almighty, the most Beneficent and the most Merciful for giving us the chance to complete the Capstone Design Project. We would like to take this opportunity to express sincere thanks to the department and the University for this Course where we have such an opportunity to express our ideas and put our learning all the way into practice. We would specially thank and express our gratitude to our supervisor Dr. Hasan Uz Zaman, for his tremendous support and encouragement from the beginning till the completion of the project.

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