

Design and Development of Real-Time Communication Content Management System for E-Commerce

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Abstract- E-commerce is very efficient and effective, but it needs programming knowledge to create and manage. Many small organizations do not have human resource for this task and cannot support cost for hiring programmers. Thus, many application providers create content management system applications to enable the e-commerce website to be created and managed through friendly user interface. However, existing content management system applications for e-commerce is lack of real-time communication feature, even it is an important feature for e-commerce. Although e-commerce feature can be manually coded and added, lack of programming knowledge problem occurs. Therefore, this project solve this problem by designing and developing content management system for e-commerce which concentrated on real-time communication feature using instant messaging and short message sending. It covers e-commerce feature and content management system feature. The system is divided into two styles, front office and back office style and seven subsystems. It is developed using HTML, CSS, and PHP language along with Ajax technique. This system is tested by ten subjects.

I. INTRODUCTION

Many firms are planning and conducting e-commerce business because firms' value is increased with less significant in type of products sold and e-commerce are likely to have significant future benefits for firms. To conducting an e-commerce business, web-programming knowledge is required. However, another possible solution for these firms is to create e-commerce website using website content management system applications. These applications provides friendly interface with necessary e-commerce functions to create their own e-commerce website. The real-time communication channels become significant in e-commerce website. Although these features are important to e-commerce website in customer relationship management aspect, they are not included in any current content management system applications. However, firms can add these features by coding directly into webpage or put the code into provided space in content management system application. In either case, the firms must have programming knowledge in order to successfully modify website which is contrast with the main goal of content management system applications. This becomes problem to small and medium firms which do not have much capital.

Thus, this project creates the website content management system that emphasizing on real-time communications which are instant message and short message system. This system help firms build their own e-commerce website without any coding related and improve customer relationship management efficiency. It provides every necessary modifiable e-commerce features and also modifiable real-time communication channels.

II. BACKGROUND KNOWLEDGE

There is some background knowledge that should be understood before proceeding into this project's detail. Since this project's goal is to create e-commerce's content management system that emphasizes on real-time communication features, the important topics that need to be described are electric commerce, content management system, instant message, and short message service.

A. Electronic Commerce

From Reference [4], e-commerce is business that is conducting online. This paper also describes that this framework shows that the e-commerce consists of three meta-levels which are Infrastructure, Services, and Products and structures. The example of famous e-commerce website is Amazon.com. This website sells many products online. Customers add products to the cart and check out to make an order. Customers can pay through several kinds of paying service and the products are then delivered to the customers' homes directly.

B. Content Management System (CMS)

From Reference [5], content management system or CMS is the tool used to ease the process of creating, publishing, and updating web site content. The most CMS applications have features that user can create the whole web site with limited web programming knowledge. Moreover, from Reference [6], this paper suggests that the core features of CMS should be versioning, workflow, and integration. These features from Reference [6] are Version, Workflow, and Integration. The example of famous e-commerce is PrestaShop. PrestaShop is an open source e-commerce CMS that enables users to establish the shop and control the

content of the website. This CMS provides various features to facilitate users in managing their store such as product tags, search, top-seller page, and payment methods.

C. Instant messaging

From Reference [7], the instant message applications maintain the list of people to contact. When these people are online, user can send messages to and receive messages from these people instantly. This article also describes the features that instant message should have. These features are Instant message, Chat, Web links, Images, Sounds, Files, Talk, and Streaming content. The example of popular instant message that has every features suggested in this article is Windows Live Messenger. This application maintains the list of user's contact. User can send messages to any people in the contact individually or send messages to a group of people. It also allows user to send web links, images, sounds, and files directly to people in the contact list. Moreover, it can initiate the video conference between two users that has each other in the contact list.

D. Short message service

From Reference [8], short message service is a system that can send the short message from user to another user through the network. Moreover, from this paper Reference [9], there are two types of SMS. One is broadcast and other is point-to-point. For broadcast SMS, the SMS is sent to every subscribed device that can received SMS. For point-to-point SMS, it can be from one mobile to another, from PC to mobile, or mobile to PC. This kind of SMS's messages are maintained and sent by a short message service centre. This centre acts similarly to the electronic postal that transmit any point-to-point messages to destination.

III. LITERATURE REVIEW

In this section, the popular open-source CMS for e-commerce, PrestaShop, is discussed and compared with this project's system. Moreover, the open-source instant message application that is used in this project, LiveZilla, is discussed and compared with other instant message applications.

A. PrestaShop

PrestaShop from Reference[10] is the name of an open-source CMS for e-commerce website. This software provide friendly graphic user interface to create, modify, and maintain e-commerce website such that user is required little to none web site programming knowledge. PrestaShop divides its software into two main parts, front office and back office. The front office is for the customers to buy and search for products, while the back office is for administrator to maintain the website. Although PrestaShop has many features supporting its users and e-commerce website, it lacks of an important feature such as real-time communication feature. If users wish to have this real-time communication feature, they need to implement it themselves. This is inconvenient to users who do not have web programming knowledge.

B. LiveZilla

LiveZilla from Reference [11] is open-source instant message software that provides communication between website's administrator in window-based and website's viewer in web-based. This software also provides administrator friendly user interface to modify many aspects of the software such that not much programming knowledge is required. In addition, since it is open-source, this software can be modified as programmers want. In contrast, other instant message applications such as Window live messenger provides only window-based to window-based communication. This is not corresponded with this project's requirement. This project requires that firms' customers do not need to install any software before communicate with firms. Therefore, the instant message has to provide communication between window-based for web site's administrator and web-based for customers.

IV. OBJECTIVES

The main objective of this project is to design and develop content management system for e-commerce that emphasizes on real-time communication. This project is intended to apply to small and medium firm which have small number of staffs and customers.

A. Scope

1) Firms must have their own web servers or rented web server to let this project's system create firms' e-commerce websites in those web servers.

2) This project's system only connects with One Moby's bulk SMS system to provide SMS sending feature.

3) This project's system does not provide payment service features, such as credit card or PayPal, through e-commerce websites created from this project's system. The firms and their customers are encourages to do transactions via bank transferring.

4) This project's system does not connect with postal tracking service. Firms' website administrator must change tracking status manually.

B. Plan and Schedule

This project develops the system using incremental process model to be our software process model. The phases in one release of this project's incremental process model are ordered from requirement, design, implementation, test, to maintenance. This project is divided into two releases. Before starting the first release, the feasibility study is done in order to access the possibility in doing this project and gathering information. Then the first release starts after it is certain that this project is possible and worth to be done. The first release delivers the basic features of e-commerce website content management system that is product management system, member management system, and website management system. This first release is then tested and the feedbacks are gathered. These feedbacks are analyzed and used to improve this project's system in the second release. Apart from improving the delivered system, the second release also delivers further systems. These added systems are news

management system, instant message system, and tracking system. The second release is then integrated with the first release and become the finish system. This finish system is then tested by subjects who are interested in having their own e-commerce website to ensure that every requirement is met. Finally, the final document is made to report the result of this project.

V. PROPOSED METHODS

This project's goal is to create CMS for e-commerce website which has real-time communication features. The web site created from this project's CMS covers every required e-commerce features and CMS itself covers every required CMS features. For real-time communication features, this project uses instant message and short message service to enhance real-time communication in created web site. Instant message feature is implemented into e-commerce website such that administrators can have this feature by setting through user interface without programming knowledge required. Firstly, the project's methods are described in detail. The order of explanation starts from requirement gathering, design of this project's system, and ends on how to implement this project's system.

A. Requirement Gathering

In this requirement gathering section, the method used to gather requirement is described. In this project, a survey and observation is used to gather requirements

1) Survey

An idea of this project came from complaining about existing content management system for e-commerce from Mr. Supanut Viniyakul's employers. They complained that they have hard time implementing real-time communication feature such as instant message applications or short message service. This is because this feature is not included in any existing content management system available in the market. As a result, we conducted an interview with 20 interviewees who use content management system to create e-commerce website. These interviewees have either small firms or new firms.

2) Observation

After conducting an interview, we research on what basic requirements are in e-commerce website by observing e-commerce websites and content management system applications for e-commerce. The examples are Amazon.com and eBay.com. We conclude that e-commerce website should have basic requirements; be able to buy products, be able to show products, and have member systems with customers profile to prevent deceiving transaction. Apart from these basic requirements, we decide to add more additional requirements to be at the same standard with other e-commerce website such as comment system, website system, and tracking system. In addition, this project will add another additional feature that never included in any existing content management system to respond requirements from small and new firms. This feature is real-time communication feature.

B. Design

In this design section, the concept of project is described. This includes system architecture, system's functions, user interface, system security, and system database.

1) System Architecture

This project system can be divided two ways. One way is divided according to users and other way is divided according to the feature groups. In the first way, the system is divided into front office and back office. The front office is for customers to search and buy products, while the back office is for administrator to maintain the web site. From Fig. 2, front office's functions are used by customers. Customers can retrieve data from database through front office such as front web page, products' detail, news, and their own recorded profile in member section. Customers can also modify data in the database such as buying products, modifying their own profile, and posting comments through front office. For the back office, administrator can modify and retrieve data in database through back office's functions. The administrator can retrieve recorded products' detail, customers' profile, and web site's appearance setting. For modifying data, the administrator can modify web site's appearance, products, members, and news in the database through back office.

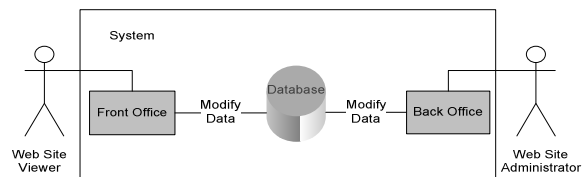


Fig. 2 Relationship of Back office, front office, and database.

The other way to divide this system is to divide according to features group. According to Fig. 3, functions in this system can be group into seven groups. They are website system, product system, member system, news system, instant message system, comment system, and tracking system. Each system has its own responsibility, but they retrieve and modify data from the same database. This is to synchronize data for the whole system. Administrator and customers both interact with these seven systems. The description of each system is provided as follow.

1. Website system is responsible for website appearance modification related functions such as changing font and colors of each website sections, changing logo picture, and changing banner picture.

2. Member system is responsible for member related functions such as creating member, managing member, and editing member profile.

3. Product system is responsible for product related

functions such as adding product, editing product, and removing product.

4. Instant message system is responsible for instant message modification functions such as changing instant message icon appearance.

5. Comment system is responsible for comment and SMS modification functions such as changing company's mobile phone number, disabling and enabling SMS functions, and deleting comments.

6. News system is responsible for news related functions such as adding news, editing news, and removing news.

7. Tracking system is responsible for transaction status related functions such as setting transaction status of members.

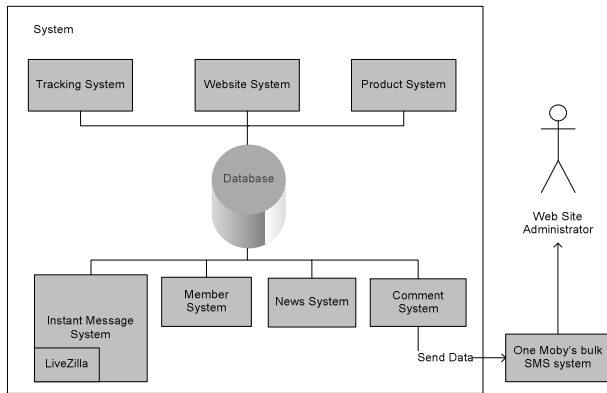


Fig. 3 Seven Systems

2) System Function

From system architecture, the functions in this project's system then can be categorized based on both ways of division. The functions are categorized and listed below.

1. Website System

1.1. Front Office

- Able to view firm's profile

1.2. Back Office

- Easily upload and update website.
- Easily modify website appearance such as theme, banner picture, logo picture, and color and font of every section.

2. Member System

2.1. Front Office

- Able to create account to receive special discount and use special features of the website.
- Able to use basic member function, such as changing account's password, editing the profile, using forget password function.
- Able to receive special discount from member's message inbox or instant message system and use special features.

2.2. Back Office

- Able to manage member account such as adding new account, viewing member list, editing member profile, removing account,

and suspending account.

- Able to use administrator's basic account function such as changing administrator account's password.
- Able to edit company's profile.

3. Product System

3.1. Front Office

- Easily drag and drop products to electronic basket.
- Able to command electronic basket to display products in it.
- Automatically summing up the current cost of products in basket.
- Able to view product's detail.
- Able to view product category's detail.
- Able to search products using keyword.

3.2. Back Office

- Able to arrange the display of highlight products on the front page.
- Able to categorize products.
- Able to add, edit, or remove products.
- Able to add, edit, or remove product category.
- Able to specially discount for specific customer on specific products.

4. News System

4.1. Front Office

- Able to read recently news messages from the company at the front page.
- Able to read other old event messages from the company in the news page.

4.2. Back Office

- Able to add, edit, or remove news messages which appear in news page.

5. Instant Message System

5.1. Front Office

- Able to know if administrator is online.
- Able to send instant message to the firm via web-based instant message program.

5.2. Back Office

- Automatically and instantly display instant messages from customers in window-based instant message application.
- Able to response instant message of customers on the webpage via window-based instant message application.
- Able to show administrator's status

6. Comment System

6.1. Front Office

- Able to leave a comment on website which instantly sent as SMS to the administrator's mobile phone.

6.2. Back Office

- Able to receive comments from website via

mobile phone's SMS system.

7. Tracking System

7.1. Front Office

- Able to know customer's every own transaction status.
- Able to see recent customers' transaction status.

7.2. Back Office

- Able to set the status of every transaction

3) User Interface

In this section, the user interface of this system is displayed and discussed. The explanation is divided into two sections, that is, front office and back office. The front office is shown in Fig. 9.



Fig. 9 Front Office

For back office, it is shown in Fig. 10.

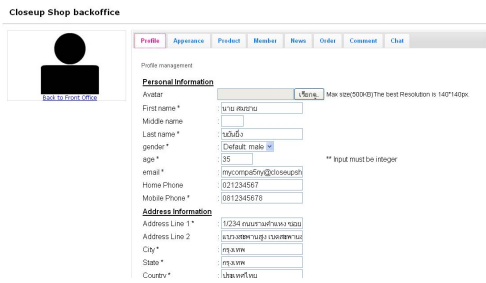


Fig. 10 Back Office

4) System Security

First, the database is protected by username and password. Website administrator must enter username and password both correctly to be able to enter to the database. Moreover, in the database, the important information such as members' passwords is encrypted using MD5 before keeping in the database. This MD5 is standard encryption that is used to convert password into specific string characters. If the database is compromised, members' passwords remain

unreadable and cannot be used. Thus, members' private information is safe because the bad guy cannot log into any accounts. This encryption is also used for administrator to protect data that can be modified through back office's functions.

5) System Database

After gathering requirements, the database of this project's system was designed. There is one database in this project in order to synchronize data. The system database is illustrated as ER diagram shown in Fig 11.

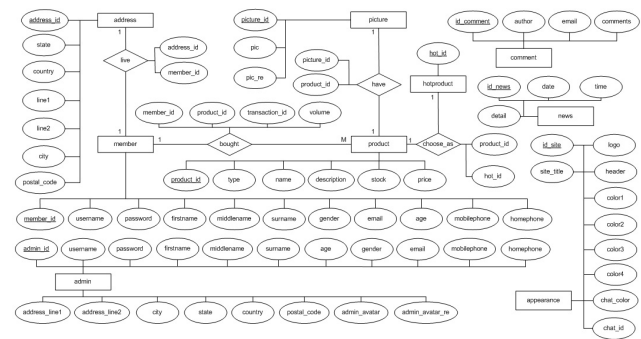


Fig. 11 ER Diagram

B. Implementation

This project's system is developed using HTML, CSS, and PHP language. HTML language is used to develop the appearance of the website, both front office and back office. CSS language is used to organize the style of the front office appearance. PHP language is used to create and control the functions of every subsystem. In the back office, Ajax technique is used to enable data exchanging asynchronously between browser and server to avoid full page reloads. The programming tools used is Eclipse PDT and Adobe Dreamweaver CS4. The tools used to create the multimedia are Adobe Photoshop CS4 and Adobe Flash CS4.

C. Testing

Testing is conducted in three different levels that is unit testing, integration testing, and system testing. The unit testing is conducted when the class is created or modified. This is to ensure the new or modified class works correctly. In unit testing, white-box testing and black-box testing are used. The integration testing is conducted when a function finishes. This is to ensure that the integrated classes work correctly to provide function. The system testing is conducted when a subsystem finishes and when connecting one subsystem with another.

All subsystems are tested to ensure it meets the e-commerce and content management system requirements. After all three levels testing, this project can provide every requirement in e-commerce website and content management system.

VI. EXPERIMENTAL DETAIL

After finished implementing the project, experiment was conducted to ensure that this project meets the objectives. In this experiment, two groups of subjects were used. One group

was content management system's users, and other group was website viewers. These two groups were experimented separately, but the method of experiment was the same. Each subject was given a list of tasks to complete. These tasks were about using functions of this project's system. In this experiment, five subjects were used per group according to [12]. Each subject was timed on how long the subject could complete each task. After completing the experiment, subjects were asked to give comment and suggestion on this project's system. For content management system's users group, the experiment had two sections. First section was to initialize newly created e-commerce website, and second section was to maintain e-commerce website. Before starting second section, we added information about buying products to these newly created e-commerce website to prepare for maintenance purpose and sent comments to subject's mobile phone as SMS via subject's e-commerce website.

The stopwatch was used to measure the time for each task. This could measure how easy to use this project's system. However, due to time constraint, we could not conduct experiment on how much this system helps improving firms' marketing. Nevertheless, we believe that if this project's system is easy to use for website viewers, especially real-time communication feature, it ensures that customers can contact firms via our system easily as well. For this reason, we also conducted experiment on website viewers along with content management system's users.

VII. RESULTS AND DISCUSSION

From the result, some website viewer took longer time than others. This is because they were confused with drag-and-drop feature. Thus, the result time from these subjects. This indicates that drag-and-drop ordering system may be not familiar to some users. The solution is to improve user interface to provide user more recognizable that it is drag-and-drop method. Another time waste issue from content management system's users group is decision time. Some subjects from this group wasted their time more than others on choosing appearance such as adjusting their theme color for the website. From this experiment, there are best, average, and worst cases from each group as shown in Table 1.

Case	Best Case	Average Case	Worst Case
CMS Subject: Total Time (First Section)	17:24	19:48	24:25
CMS Subject: Total Time (Second Section)	01:36	02:18	02:50
Web Viewer: Total Time	05:10	06:19	07:49

Table 1 The best, average, and worst cases from each group of subjects

VIII. CONCLUSION AND FUTURE WORKS

From the results and test subjects' feedbacks, it can be

concluded that this project is successful. The results were as expectation. Content management system's subject group could easily set up their web sites using this project's system within half an hour and website viewer group were be able to familiar with this system with couple of click.

The feedbacks from both content management system and web viewer subjects were that this project's system is easy to use, understandable, and satisfied. However, some subjects suggested that this system should provide options on which features to be used in the web sites similarly to comment-to-SMS feature. In addition, they suggested that each system in the front office should be able to be moved and arranged to any place users would like to place it. For example, users might want to move "Tracking Status" to center column on top of "Product" instead of its current place.

The future work of this system should cover on freedom for administrator. The example is the option to choose if administrator wants to use that system. Another example is to be able to move system on the front page around and place anywhere the administrator wishes. Moreover, this project needs to continue implementing in freely customization. This customization includes changing font type, size, and color at any objects in the web site. In addition, this project should implement theme system to make this project more interesting. This feature could help user to change style of their web site to be more unique. Apart from improvement in appearance, this project should also focus on implement options for administrator to choose whether to use drag-and-drop feature or ordinary button for web site viewer to order products.

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