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Blocks Identification and Implementation for E-commerce Development Tool

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Abstract: E-commerce is a process of buying, selling, transferring or exchanging products or services using computer network. Small businesses are now encouraged to explore the use of e-commerce in order to expand their market. However, studies shows that the use of e-commerce among small businesses is still in the early stage. The main barrier to the e-commerce adoption amongst these businesses is the complexity and cost of e-commerce development. In order to solve the problem, there is a need to develop a software tool that can help small businesses to develop their own e-commerce application. This study describes the concept of a block-based e-commerce development tool. By using this approach, an end-user can develop an application by integrating available software blocks. In order for these software tool to be utilized, sufficient number of software blocks need to be identified and developed. The block identification process is done by using the use case analysis technique. From the result of the analysis, 16 software blocks needed for the development of e-commerce applications have been identified. These blocks are then implemented by using the Java programming language.

Key words: Web application, block based, e-commerce, programming language, applications, computer network

INTRODUCTION

In recent years, a number of End-User Development (EUD) tools have been developed. The main aim of these tools is to enable ordinary users to do computing activities that is normally done by professional programmers (Nardi, 1993). According to Costabile *et al.* (2004), it has been argued that end-user development can help to develop software that meets the actual requirement of the user.

There are several end-user development paradigms that have been developed such as wiring, programming by example or Programming by Demonstration (PBD), spreadsheets and widgets (Fischer and Nauerz, 2009). Wiring paradigm is where end-users wire or connect together the selected modules or widgets or connectors or blocks that support particular functions. PBD also known as also called Programming by Example (PBE) is a EUD paradigm that let the users demonstrate the desired task going through several steps as actions that should be performed on the data (Spahn *et al*., 2008). The system records these actions and concludes a generalized program that can be used upon new data. In spreadsheet paradigm, a spreadsheet-like table is used to display the data. Cell in the table is referring by its column and row coordinates and users manipulate their data directly using drag and drop fashion. Widget paradigm has gained wide popularity because it allows end users to create applications easily. Each widget represents a particular function (Spahn and Wulf, 2009). User just needs to select the widget and use it.

Block Based Programming approach (BBSD) is an end-user programming approach that allows users to develop application by combining several programming blocks together (Zin, 2011). The main aim of this approach is to allow the end users who normally do not have sufficient programming skill to develop applications simply by combining several selected blocks. In order to achieve this aim, the block-based programming system can be described as follows:

- It should support software development in many problem domains
- Many blocks will be made available for each problem domain
- Each block supports a certain task or function
- End-users are allowed to customize blocks and to build applications adapting to their needs
- Application software development can be done by integrating these blocks

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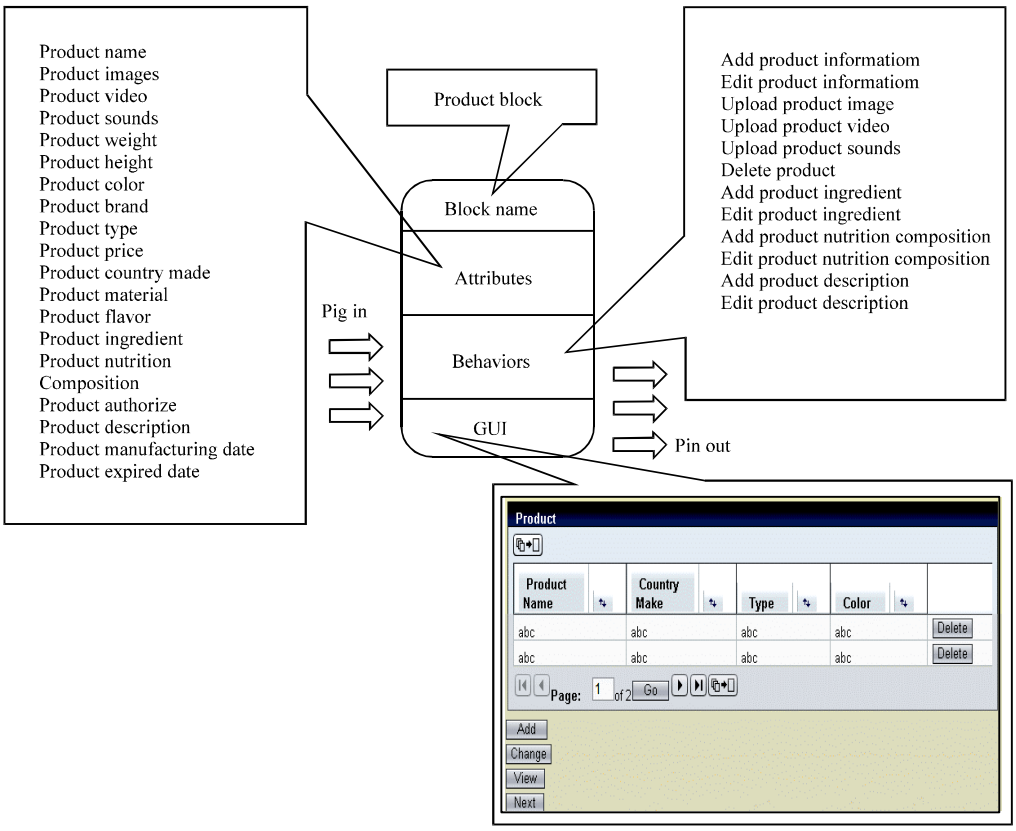

Fig. 1: Four elements of a block

The above description implies that in order to enable end-users to develop programs for a particular application domain, blocks that are required for that domain need to be provided. In this study, researchers describe a study that has been carried out in order to provide all of the blocks required for small businesses e-commerce applications development. E-commerce application development tool is a software tool that enables small business owners to develop their own e-commerce application by combining suitable blocks.

METHODS

In BBSD, a block is defined as a single layer program component. A single layer implies that a block cannot be used as a sub-component of other blocks. Users are allowed to customize blocks before integrating these blocks into a required application. A block consists of four elements as shown in Fig. 1.

- Pin-in and pin-out interface is like a communication contract between the blocks
- Attribute is a characteristic of the block
- Behavior is a set of functions for the block to perform
- GUI elements are features for building graphical user interfaces

In order to support a block-based e-commerce development tool, researchers need to develop sufficient number of blocks for this particular domain.

This task is carried out in three stages as follows Identify the programming blocks required for e-commerce application development; describe the specification and design the blocks and implement of the blocks.

BLOCK IDENTIFICATION FOR E-COMMERCE APPLICATION

Block identification starts with the domain analysis. In this analysis, a number of requirement specifications are being collected from different individual or companies that work in the same domain.

Functional view will be plotted using use case diagram in order to establish precisely the boundaries of the domain (Roques, 2004).

E-commerce or electronic commerce is a process of buying, selling, transferring or exchanging products or services via computer network (Turban *et al*., 2010).

E-commerce applications can be divided into a three categories, Business to Business (B2B), Business to Customers (B2C) and Customers to Customers (C2C). Business to Customers (B2C) is a type of e-commerce that involves business transaction between business organizations and individual customers.

There are a number of B2C e-commerce such as electronic retailing (or e-retailing) or online shopping that enables customers to buy products online through electronic storefronts or electronic malls, electronic banking that offered various banking activities through online and travel services that allows customers to purchase airline ticket, reserve hotel rooms and rent cars.

Online shopping is an e-commerce application that involves two parties: customers and sellers. The seller is a person who owns and maintains an e-commerce website while the customer is a person who visits the website to view and to purchase any of them items or services provided by the seller (Rawi *et al*., 2011). A typical requirement for sellers can be stated as follows (Treese and Stewart, 2003):

- The seller shall accept orders over the internet
- The seller shall maintain a list of accounts of customers
- The seller shall provide password protection for all accounts
- The seller shall provide the ability to search the products
- The seller shall provide a number of search methods on that product including search by brand, search by name and search by keyword
- The seller shall provide a secure means of allowing customers to pay by credit card, bank and cheque
- The seller shall provide a secure means of allowing customers to pay via purchase order
- The seller shall provide a special kind of account that is preauthorized to pay via purchase order
- The seller shall provide electronic links between the web and database and the shipping fulfillment system
- The seller shall provide electronic links between the web and database and the inventory management system
- The seller shall maintain reviews of products and allow anyone to upload review comments
- The online shop shall maintain ratings on products based on customer inputs

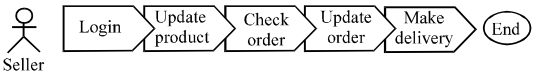

Fig. 2: Basic task for sellers

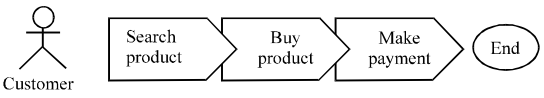

Fig. 3: Basic task for customer

Based on the requirement, basic tasks for sellers in an e-commerce environment are shown in Fig. 2. A typical requirement for online customers can be stated as follows (Treese and Stewart, 2003):

- The online customers when enter the mall have to authenticate themselves on a central server
- The online customer shall allocate a shopping cart and can enter a particular online-shop of his/her choice for shopping
- The online customer can browse through the products available in the online shop can select some of them and put into the shopping cart
- The online customer can anytime change the items in the cart either by adding new items or by removing existing items
- The online customer shall authenticate themselves on a central server before proceeds towards the payment counter. Finalize product list of items he finally wish to buy and make the final payment
- The online customer shall leaves the online-shop and can either enter another online-shop or leave the online shopping mall
- The online customer shall plan their budget by listing all items that they want to buy without checking the product is available or not

Based on the requirement, basic tasks for online customers in an e-commerce environment are shown in Fig. 3. To identify the possible blocks for the e-commerce application, the UML diagram is used to describe e-commerce framework.

The use case and class diagrams (Fig. 4 and 5) are used to visualize interaction between the customer and the seller. Each of the use case can be further refined. For example, Fig. 6 shows a use case for search and show product inside use case diagram.

Initially, there are two candidate blocks browse product and perform product search. However, after analyzing the use case diagram in Fig. 6, researchers can

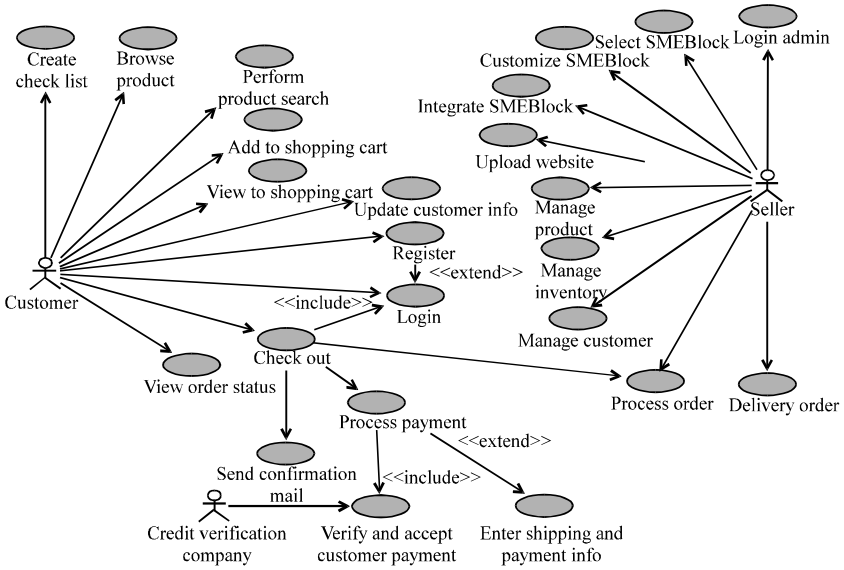

Fig. 4: Use case diagram for online shopping

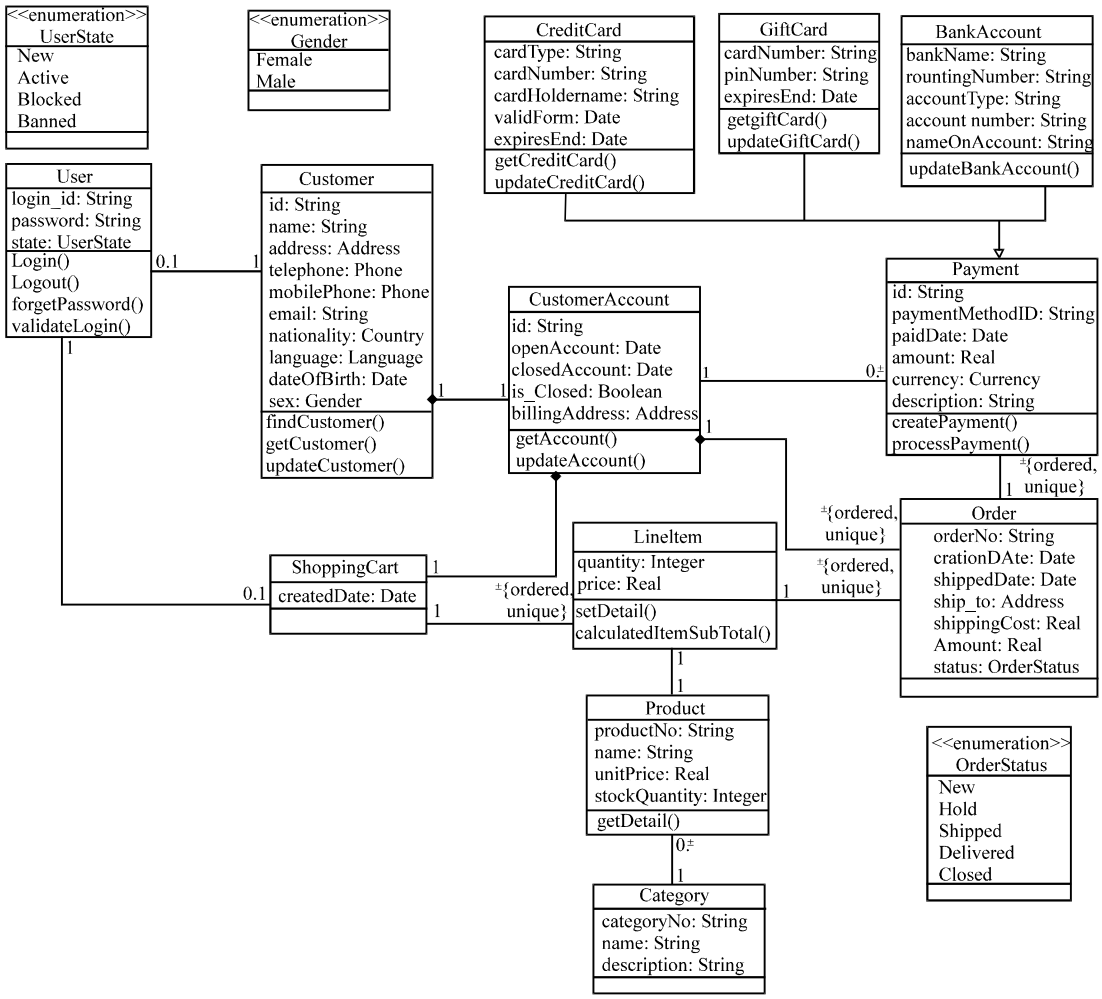

Fig. 5: Class diagram for online shopping

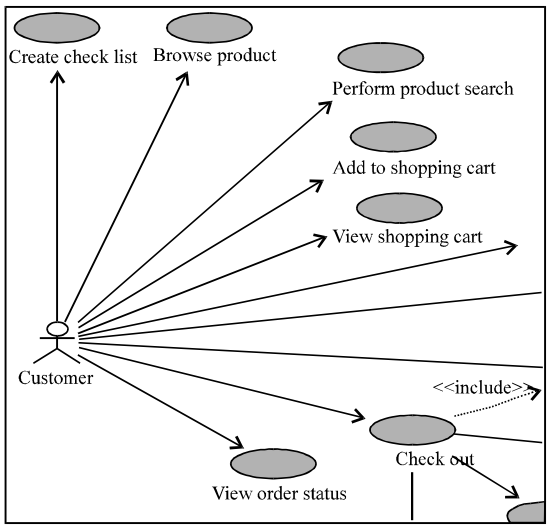

Fig. 6: Use case diagram

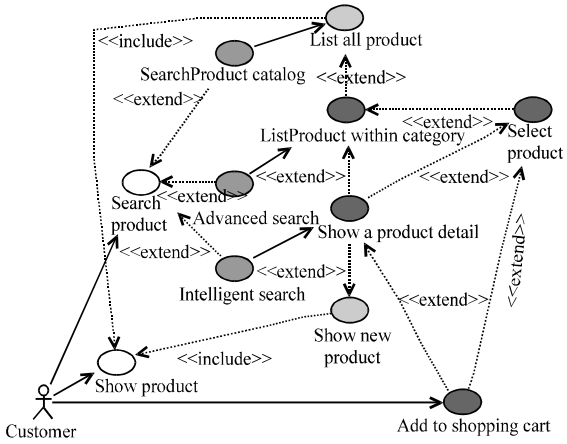

Fig. 7: Identify new blocks from initial candidate blocks

see that browse product can be divided into two blocks: list all product and show new product. Perform product search can actually be divided into three possible blocks: search product catalog, advanced search and intelligent search.

So altogether, there are five blocks that have been identified from the use case diagram for perform search product and browse product as shown in Fig. 7.

THE SPECIFICATION AND DESIGN OF BLOCKS

Based on the block identification process that has been carried out, a number of blocks have been identified. A brief description of some of the blocks is shown in Table 1. The detail description for some of the blocks is given:

Splash block: Splash block is normally used for creating the first page of an e-commerce application. The main purpose of splash block is for e-commerce developer to set what the first information they want from their user or to set their first expression page before user continuing to the main content. Splash page can be used to promote a company, service or product or to get little information about the user such as which country they live, what language they use and what currency they prefer to use. An example of a splash block is shown in Fig. 8.

Fig. 8: A splash page for Malaysia Airlines (http://www.malaysiaairlines.com)

Table 1: List and description of several possible blocks for e-commerce application

Blocks name	Description
Splash block	Use to set the first page for user to see before continue to the main content of the site
Login block	Use to set customer authentication
Product block	Use to manage the product information and display it to the customer
Add shopping cart block	Use to provide facility for customer to browse and select product that they want to buy
View shopping cart block	Use for customer to view their shopping cart items
Search product catalog block	Use to perform finding action and display a collection of products that being group into specific categories
Advanced search block	Use to perform item searching that match very specific criteria. The search options will apply only to the current search
Intelligent search block	Use to perform item searching that match combination of multiple criteria. Specific agent search will be use in this block
List all product block	Use to display all products
Show new product block	Use to display new and current products
Process online cash payment block	Use for customer make the payment using online banking
Process credit card using credit	Use for customer make the payment payment block payment blockcard
Process cheque	Use for customer make the payment by cheque
Process account for money off vouchers	Use to give discounts and vouchers for items
Process check out block	Use for customer to finalize product list of items to buy and make the final payment
Blog block	Use for the owner to update news of their product and create forum environment for their customer
Advertisement block	Use for the owner to advertise their product
Profile block	Use for the owner to manage their company profile and display it to customer
Server connection block	Use to setup server for the owner
Shipping block	Use to process product delivery

Table 2: Splash block specification

	Splash block
Input	Null
Output	Currency, language, country
Properties	Title text Title font type Title font size Title font color Logo Media content Motto text Motto font type Motto font size Motto font color Default font type Default font size Default font color
Behaviors	Set currency Set language Set country Enter

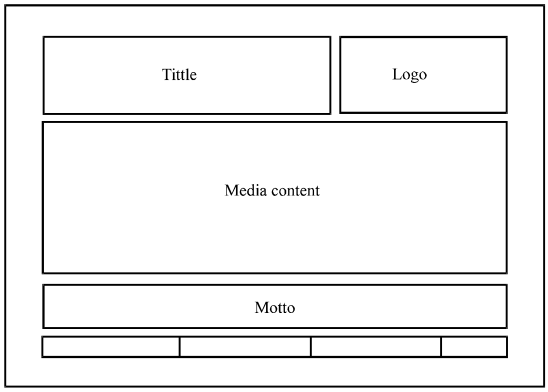

Fig. 9: Basic splash page user interface design

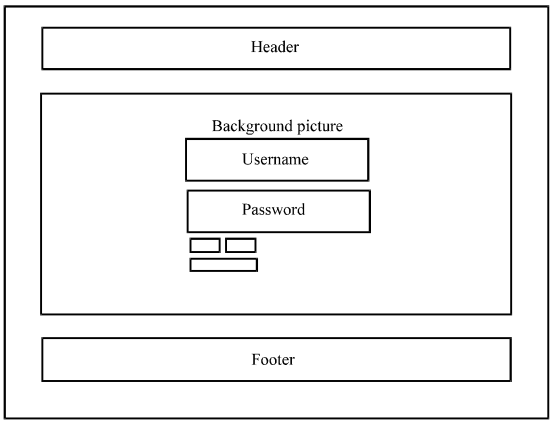

Fig. 10: Basic login block user interface design

Usually in the middle of splash page, there is area where developer will put some image, video clips or flash file that show overall about the website. To continue to the main content there were be a button to push or based on time display limit exceed. Figure 9 shows the basic user interface design for a splash page. Table 2 shows the specification for this block.

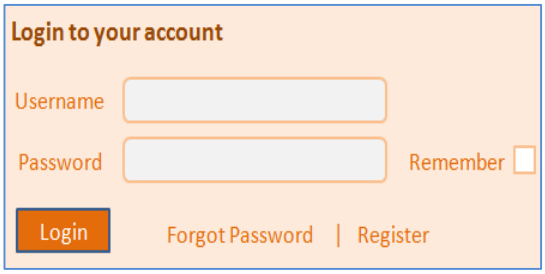

Fig. 11: Login01 block

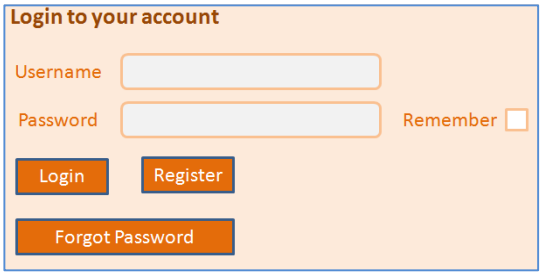

Fig. 12: Login02 block

Login block: Login block is used to allow members to log into the system. In most of e-commerce applications, customers who are not members can still do the business transaction but for member will normally get some special advantages such as coupons, discounts, tournaments, lucky draw or updated news of the web site through email.

The main purpose of login block is for developer to restrict only registered user can access the website content. It also can be used to differentiate between the register user and guest. Usually standard login page will contain username and password field, remember password option, registered button, forgot password button and login button. Basic user interface are shown in Fig. 10-12 while login block specification is shown in Table 3. There are several types of user interfaces for login block as shown in Fig. 11-13. Each one of the design is implemented as a block.

Shopping cart block: Shopping cart block is used by the developer to allow customers to browse and select product that they want to buy. In real life shopping behavior, shopping cart act as a trolley, a shopping bag carriage or a buggy.

Table 3: Login block specification

	Login block
Input	Language
Output	Member/guest, username
Properties	Background picture position; Username label; Username font type; Username font size; Username font color; Password label; Password font type; Password font size; Password font color; Button color; Button shape; Default font type; Default font size; Default font color
Behaviors	Login validation; Create registration; Remember password; Forgot password; Enter

Table 4: Shopping cart block specification

	Shopping cart block
Input	Language, currency, member/guest, username, list of product to be added
Output	List of product to be buy total amount of payment
Properties	Background picture; Background picture position; Title text; Title font type; Title font size; Title font color; Total item text; Total item font type; Total item font size; Total item font color; Total payment text; Total payment type; Total payment size; Total payment color; View shopping bag text; View shopping bag type; View shopping bag size; View shopping ag color; Checkout text; Checkout font type; Checkout font size; Checkout font color
Behaviors	Show number of shopping bags; Show number of product items; Show total payment; View shopping bag; Checkout; View account; Customer services; Sign up

Table 5: Product block specification

	Product block
Input	Language, currency
Output	List of product
Properties	Product name; Product category; Product images; Product video; Product sound; Product weight; Product height; Product color; Product brand; Product type; Product price; Product country made; Product material; Product flavor; Product ingredient; Product nutrition composition; Product authorize; Product description; Product manufacturing date; Product expired date; Product code; Product quantity; Product title font type; Product title font size; Product title font color; Product info font type; Product info font size; Product Info font color
Behaviors	Add product ; Edit product; Delete product; Search product; Clear product information; Sort list; Clear list; Preview report; Print report; Save; Cancel; Exit

The specification for the block is shown in Table 4 while an example of the user interface is shown in Fig. 14. A user interface for this block is shown in Fig. 14.

Product block: Product block is used by the developer to manage products information. This block is used for categorizing the products. The specification of this block is shown in Table 5. A user interface for this block is shown in Fig. 15.

Fig. 13: Login03 block

Fig. 14: Example of shopping cart

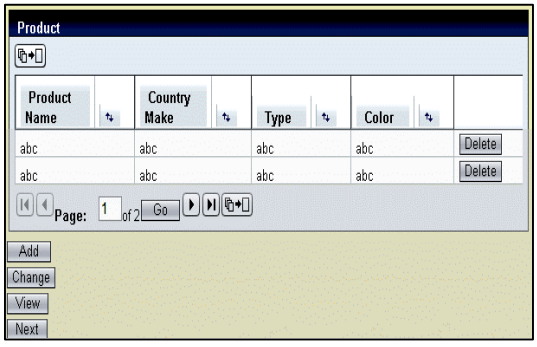

Fig. 15: Example of end user interface for product block

BLOCK IMPLEMENTATION

Blocks are implemented by using the Java programming language. A block is then packaged as a JAR (Java Archive) file. Java Archive (JAR) files provide a standard mechanism to compress and package a set of files for distribution to users. The following files may be packaged into one JAR file: The class files, any supporting class files, data files and html files that provide help to the user, static images, audio and video clips, configuration data and any other files required for the

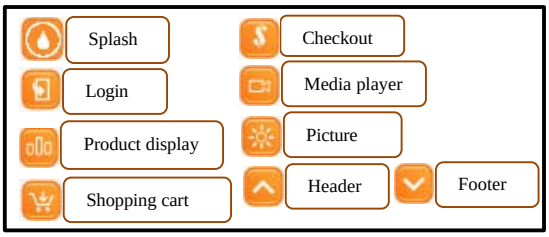

Fig. 16: Example of blocks

software to operate (Ismail *et al*., 2009). A list of blocks that have been implemented is shown in Fig. 16. Each block contains at least three important files; block interface description, block properties, block XML file. Block interface description file contains the design the interface of the block written in the Java programming language. Block properties file contains all properties and behavior of the block that can be customize by the block user. Block XML file is the data file that contains the value of the properties and behavior of the block.

CONCLUSION

In order to increase sales volume and hence increase the profits, SMEs need to expand their markets. However, in most cases, most of the SMEs, especially that fall under small or micro categories, face a lot of marketing problems and most of their products are limited to the domestic market. This study help to describe a technique for identifying blocks needed in developing a small business e-commerce application. The design specifications for these blocks are also given.

These blocks can be used by end-users to develop e-commerce applications directly by using an environment which is currently being developed. The availability of these blocks as well as the proposed environment will make the process of developing e-commerce applications easier and hence will encourage more small businesses to venture into e-commerce.

The technique for identifying blocks can still be improved. Researchers are going to carry out a few more case studies before a technique can be properly established. The design and implementation of more blocks and the environment is still ongoing and researchers hope to be able to come up with a demonstration application soon.

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