

Ajax Based T-Shirt Customization Using OSS

by

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Dissertation submitted in partial fulfilment of
the requirements for the
Bachelor of Information and Communication Technology (Hons)

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CERTIFICATION OF APPROVAL

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**A project dissertation submitted to the
Information Communication Technology Programme
Universiti Teknologi PETRONAS**

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Approved by,

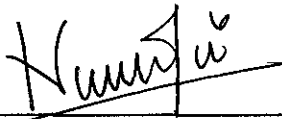
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January 2008

CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and that the original work contained herein have not been undertaken or done by unspecified sources or persons.



NURUL AIN BINTI MOHD YUSOF

ABSTRACT

‘Ajax Based T-Shirt Customization System’

The development of the system will create an interactive website using Ajax technology. The purpose of this report is to provide a proper documentation and establish appropriate steps to make this project a success. The scope will emphasize on Ajax technology and how to use it upon on creating the system. This report contains six chapters which are introduction, literature review – mainly focus on the study on AJAX technology and Open Source Software, methodology – focus on the study of the method that will be used during developing the application, discussion – will discuss about the output of the system, testing and recommendations provided by user and conclusion. Each chapter will have several subjects inside to make it easier to discuss. For example in Chapter 5, Discussion, will have two subtopic which are testing and recommendation. Several recommendation and developers point of view while developing the system will be adhere at the end of this report.

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Alhamdulillah,

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CHAPTER 1

INTRODUCTION

1.1 Project Overview

The world of T-shirt design is changing quickly. From a sketch on a notebook, now people could design their T-shirt online which provide faster and easier way to make T-shirt. *There are designers and illustrators creating T-shirt purely for themselves and anyone who might be interested in their work. In recent years, more and more of these creative have realized that by printing their own T-shirt can reach a whole new audience with their work.* [Helen Walters, 200% Cotton: New T-Shirt Graphics]. From a study of one of the most successful t-shirt design website, customavenue.com, the minimum order for producing custom t-shirts has dropped from thirty-six pieces per design to one due to new developments in digital printing and advanced online design applications.

This project focuses on developing a website for T-shirt customization as e-commerce form. T-shirt customization is meaningful for T-shirt designer who have problems on promoting their product trough network. The delivery of this project is a website that user can choose and create their own T-shirt design. The browser will have a tool to make their design by selecting T-shirt types, pattern and color.

By using AJAX technologies, user can create the design at the client side, eliminating the slow updating from server. User may drag and drop the tools provided, for example T-shirt pattern. For users who interested with the design that they had made, they can buy the T-shirt and start ordering them. It also will show some quick demo for user who didn't know how to use the tools given.

1.2 Problem Statements

Unlike many other T-shirt businesses, users usually see the T-shirt that has been design. They only can choose the template they have and add some words according to their needs. The T-shirt sometimes been custom made and the product is there when they want to buy it. By having an online T-shirt customization, user can create and design the T-shirt by them self and the business person have to print according to user specification.

The problems that may arise while developing this website are:

1. How to built users confidence?
2. How user can go back to the previous steps?

1.2.1 User confidence

Usually user bought an item based on their experience. The thought of 'What you see is what you will not get' have been user mind setting these days. This is major problems to all online business. User wouldn't feel satisfied with the T-shirt unless they had bought them. Due to this problem, the developer have to convince the user that the T-shirt that will be delivered have quality and the same with the expectations.

1.2.2 Back button

By the fact that the dynamically created page does not register itself with the browser history engine, it is hard for user to use Back button. When user start designing the T-shirt, the may do several steps by clicking the tool panels. But when they want to return to the previous task, they have to click the back button. When serving normal HTML pages like this works great. In an AJAX application however, the back button is essentially rendered useless.

1.3 Possible Solutions

As e-commerce starts to grow, people keep clicking their fingers to the mouse and start buying rather than start the car and go to the malls. Nowadays, people are more intellectual and appreciate technologies much before the past days. Therefore, by providing testimonials from previous users, might attract new users to use the website and start to order the T-shirt. Some user might want to give a try with the online product. Therefore, developer could provide some feedback space for users to submit their opinion on the T-shirt that they had received. It will give improved user confidence in the products.

For browser integration problems due to unused Back button, developer could use invisible IFrame. IFrame is an abbreviation from inline frame that is one of HTML elements. It can invoke changes that populate the history used by a browser's back button. From Wikipedia, IFrame acts like an inline image where user can scroll to view which it can be independent where it contains its own scroll bar.

1.4 Project Objectives

The main objective of this project is to develop a tool for creating a T-shirt. Other objectives that engage with this project are:

- to create secured design page for user to make their T-shirt and ordering
- to identify the significant of user experience in the designing process
- to develop a prototype to meet the user requirements by enabling user to be involved more in the designing process.

The goal is to create an interactive site using AJAX programming on T-shirt Customization. It is been considered to be a designing page for user to create their own T-shirt according to their requirement

1.5 Scope of Study

This project is under e-commerce issue because of the involving business trade between customer and supplier in customizing a T-shirt. A depth study on this matter will be done to have better understanding and optimized business skills trough network. This project also wills emphasize the use of AJAX tools, Flex and Open Laszlo. A study will be conducted on the research of each technology to be applied in the site. Open source software is the major aspect to be considered since all the technologies been outline is open source software. Thus a study about open source software also will be conducted due to the necessities of this project.

1.6 Project Timeline

This project will be conducted under supervisors' requirement where the final product of this should be delivered on the second part of Final Year Project in Final Year Final Semester. In this semester, the first submission is on the Literature Review followed by Introduction and Methodology. Literature review should be submitted on the week 5 of Semester 1 in students' Final Year. Later, submission of Introduction will be done on week 11 and chapter on Methodology will be submitted on week 14.

On the second semester for Final Year students, submission on each topic: Implementation, Discussion and Conclusion will be done every two or three weeks within 14 weeks of semester. At the end of the semester, the final product will be delivered and oral presentation regarding this project will be carrying out.

CHAPTER 2

LITERATURE REVIEW

T-shirt Customization is another alternative to make a business for those who have the talents and interest in designing. Online T-shirt customization could be another business transaction through Internet. It is more efficient where user can choose type of t-shirt (long sleeve or long sleeve) and choose the color and design the t-shirt according to user preference. Developer could make their own site to start the business in online t-shirt customization. One of the technologies could be used is Web 2.0 where developer can utilize open source software, AJAX tools, to create an interactive web page. This chapter will discuss about related work on e-commerce, open source software technologies and human computer interaction in developing the website.

2.1 Open Source Software

Open source software had been widely used in developing a website or software. It is software where developer can see the underlying programming code and can make an adjustment to build another version of improved software. From domains magazine.com, Web developers nowadays prefer open source software because of the availability of the source code and the right to modify it. Web developer, especially programmer can change and study the code to make it better software. They can increase their understanding in programming and find the bug in the code where it is unlikely that software could be 100% reliable. According to Frank Scavo (2007), an organization wouldn't depend on the software developers, where they didn't have to pay the license of the software. But for business purposes, an organization didn't prefer OSS because of greater exposure to security problems where it could compromise the system, Dmitri Rotow (2005).

Security is another issue when an organization uses OSS for their online business. Despite its' commercial counterparts, open source software may currently less secured. Other programmers may look at the source code and intended to improve the software and change it for their own specific needs. But for some people, they might study the source code so that they can get their benefit from the website that uses open source software. They know where the holes or problems with the software and may done something bad that may effect the data been stored in the software.

In the meantime, plenty of commercial and governmental organizations are still concerned that open source software is usually less secure than proprietary software. They are worried that open source developers are too much "hacker" and too little "engineer," cobbling together solutions without going through a structured software engineering process (such as requirements, specification, and analysis).

"The apparent paradox that openness about your methods leads to better security is not unique to computer software -- military and diplomatic cryptographers have known for a century that it is folly to depend on the secrecy of your encoding method rather than the secrecy of your keys,"

Eric S. Raymond (1996).

Companies which require a high level of security, for example, might do a code review as part of a security audit. This could be done for any software product where the source is available, of course, regardless of whether it's open source or produced commercially. For the view purposes, open source software is compatible to use for online business because of no confidential data or information would affect the system. Open source software is safe for website that uses data that don't have high security problems. For T-shirt Customization for example, may use open source software because it would only involve in designing the T-shirt.

2.2 Web 2.0

Web 2.0 has been developed and been improved from Web 1.0 based from the principles of web as a platform, Tim O'Reilly. It is term often applied to an alleged ongoing transition of the World Wide Web from a collection of websites to a full-fledged computing platform serving web applications to end users. It also been referred as technologies that enable user to deliver a better-than-browser user experience without install code on client machines manually, Sam Thompson. Web 2.0 can make websites machine readable so that the content can squirt seamlessly between unrelated sites. Based on a study from Japan, rich user interface is a part of Web 2.0 where technologies like AJAX, Flex and OpenLaszlo can be used.

2.3 AJAX

Google is a good example of a website that used AJAX approaches. AJAX is an abbreviation for Asynchronous Javascript and XML where is use a mixture of programming languages. According to Jesse James Garret (2002), AJAX uses the combination of XHTML and CSS, Document Object Model (DOM), XMLHttpRequest object and Javascript.

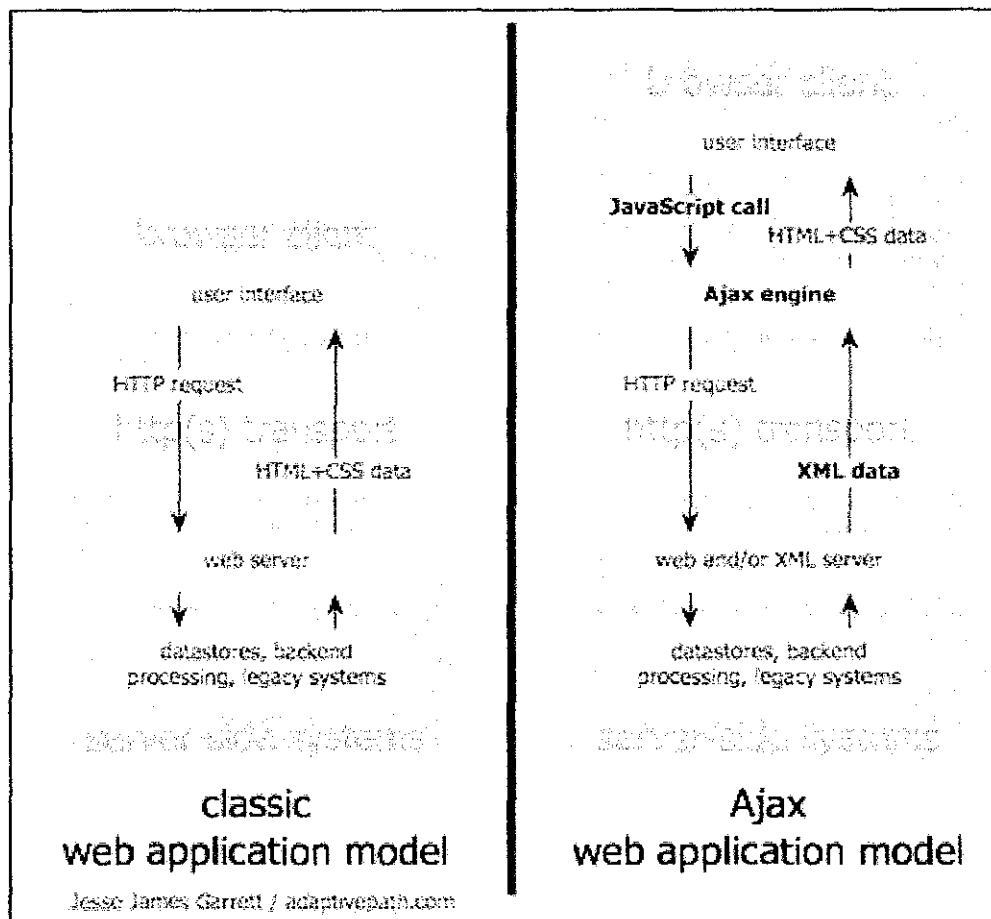
The website can communicate with server-side scripts by using XMLHttpRequest object. It can send as well as receive information in a variety of formats, including XML, HTML, and even text files. AJAX's can do all of this without having to refresh the page since it is asynchronous nature. This allows you to update portions of a page based upon user events.

Two main important features that give meaningful benefits are user can make requests to the server without reloading the page and parse and work with XML documents. Reloading page become a problems when user trying to explore the website, therefore AJAX is suitable for any website that needs high human computer interaction.

Advantages

By using DOM, it allows for information to be presented dynamically and in a manner that allows interaction. XMLHttpRequest objects enable asynchronous data retrieval with web servers. XML (Extensible Markup Language) provides the format for interchange and manipulation data between server and client. The most important detail for formatting data in AJAX is server-side scripting. Server-side scripting allows user requests to be processed by running the script directly on the server to make dynamic and interactive HTML (Hypertext Markup Language) web pages. It is used to format and present the interface between a web page and a database.

Unlike classic web application model AJAX web application model have a better and faster response towards user, Jesse James Garrett. User will send HTTP request using Javascript call through AJAX engine in the browser client. When the server receive the request, it will return the response using XML data and go through the AJAX engine and give HTML and CSS data to the user interface. User will don't have to wait for the browser to load the whole page when they click on any response link. Figure 1 shows the traditional model for web applications (left) compared to the AJAX model (right).



*Source: www.adaptivepath.com

Figure 1: Traditional model for web applications and AJAX model.

AJAX's primary contribution to web pages is user-experience improvement. According to Andre Charland (1998), AJAX is based on open standard supported by many browsers which means there are no worries for user to use certain browser that support AJAX. Either Firefox or Internet explorer, both use the same asynchronous data transfer between client and server. AJAX makes web application usable by allowing small request bit of data whenever needed. Rather than refresh the whole page, AJAX only update part of the page that has been rendered. The page will be load quickly since it separates the data, format, style and function. It cuts down the bandwidth by using techniques that load stubs of event handlers and then loads the functions on the fly.

Disadvantages

Despite all the advantages, AJAX still has the drawbacks. Even though it based open standard, there are several limitations in browser integration. The webpage cannot connect with the browser history engine because of the data and format in the page need to be specific. This results in inconveniences and delays in searching. For example, if user clicks 'back' to return to previous page, there will no page displayed on user browser. Because of the dynamic web pages updates, it is also difficult to do book marking. The webpage are automatically updated where when user returns to page before, it might not contain the desired information. Time delay is another concern to be considered before using AJAX because user might experience delays in interface of the page.

2.4 Flex

Flex is Web 2.0 technologies based on Sam Thompson (2007) but it is a product from Adobe/Macromedia. Developers have to get a licensed in order to use these technologies. Flex works when server communicates with the client running in the Flash Player plug-in. Since it is fully supported from Adobe/Macromedia, therefore the software is secure and more promising rather than open source software. Because of the licensing, developer or usually the companies have to incur cost to license the Flex Data Service Server. It also requires Flash Player plug in Version 9 in order to work.

2.5 Open Laszlo

The major difference between Flex and Open Laszlo is they both came from different company. As been mention before, flex comes from Adobe but Open Laszlo is a product from Laszlo Systems Inc. Open Laszlo is open source software and it can didn't depend on other software. It can run without the Adobe/Macromedia Flash Player plug-in. The advantage of using Open Laszlo technologies is it offer support subscriptions since it is open source software. The drawbacks is it may become an issue to the company that against open source software.

CHAPTER 3

METHODOLOGY

In developing this project, two types of methodology will be used which are waterfall model and spiral model. This project will combine these two types of methodology to complete the final product on this project.

3.1 System Development Life Cycle: Waterfall model

This traditional method will start from planning, analysis, design and implementation. According to John December [1], the key to this methodology is a view of the Web as a medium with unique characteristics and qualities. Each stage will be followed according to Figure 2 below.

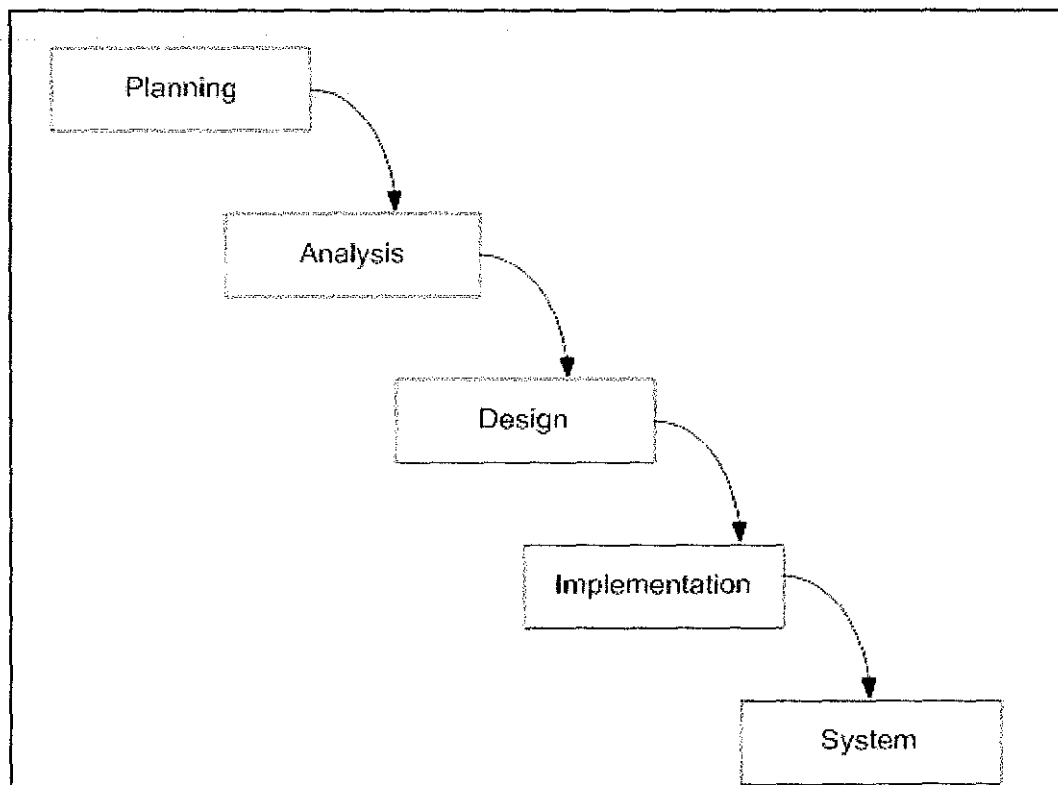


Figure 2: Waterfall model

3.1.1 Planning

In the planning stage, information gathering will be conducted by fulfilling the requirements needed in the website. Based on this project, the prototype user will be normal user who used a website. The user requirement is needed to find the actual data and user needed in the website. Other than user requirements, system requirements also needed to ensure the website is fulfilling all the necessary necessities in the system.

3.1.2 Analysis

After conducting information gathering, the results will be analyzed to produce user requirements. The user requirements then need to be analyzing to create detail functional requirements documents. It relates directly to a process the system has to perform or information it needs to contain in a website. For example, the requirements may states that the system must have the ability to design a pattern for the T-shirt. Thus, the functional requirements will have the flow for the steps of analysis because it defined the function that the systems need to have.

Then, the decision on the tools and language to use in implementing the system will be done. Based on the research and study that have been conducted, the website will be developed using AJAX tools with Java as the programming language. Defining the scope or boundary of the concept also been done in this stage to make sure that the website within its border line. This may help the developer to know where the areas are they work in.

3.1.3 Design

In design stage, the user requirements then been transformed into complete detail system. This stage focused on how to deliver the required functionality. This is where a prototype will be created. A number of template pages without graphics will be developed to show the client how the site layout will work. Then the process goes by graphic design using all gathered content, maps, and layout to create the graphics for the site.

3.1.4 Implementation

After designing the overview of the website, the process will go for a coding process and compiling to refine the programs. After the actual website been created, a testing will be done to demonstrate that the develop system are confirmed fulfilling the requirement specified. The website will be tested by several users that have been done the surveys. The outcomes of this stage are the test analysis report and also the final product.

In this project, there is no user acceptance and maintenance because the actual environment cannot be implemented. The system need to have a customer in order to work and maintain the data and information system. Even though there is no user acceptance and maintenance, an improvement on the website may be conducted after user sees the outcome and test the product by themselves.

3.2 System development life cycle: Spiral model

This project involve spiral model in developing the website because there is a prototype of the website before the actual product been delivered in design stage of waterfall model. Spiral model can overcome the cons of Waterfall Model where it ensures the success of developing a system, according to Nilesh Parekh [2]. That's why it is suitable for the developer to combine these two models in producing good software. In Figure 3 below, its shows that Spiral Model have also four cycle which are planning, risk analysis, engineering and customer evaluation.

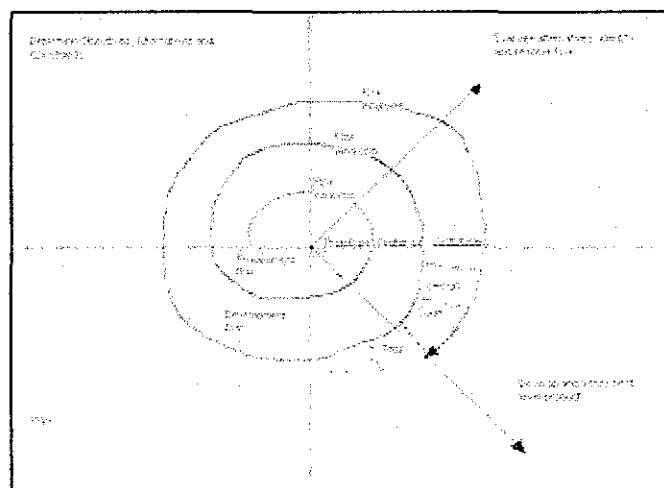


Figure 3: Spiral model [2]

As been elaborate on Waterfall model, spiral model will be used in the designing part where it collaborate the risk analysis and engineering phase.

3.2.1 Risk analysis

A prototype of the site will be developing to show the user current progress and requirements been satisfied. If any uncertainty requirements occur, those prototyping may be used to proceed with the available data and find out possible solution in order to deal with the potential changes in the requirements. In risk analysis phase, all possible risk could be identified and been resolved before the real site has been developed.

3.2.2. Engineering

Engineering phase of Spiral model will occur in Waterfall model in Implementation phase. In this phase, the actual development of the project is carried out. The process will be progressively carried out as the real product been implemented. The output of this phase is passed through all the phases iteratively in order to obtain improvements in the same.

3.3 Process Flow

In the process flow, there is a set of process steps and order of designing the T-shirt in the website. User would follow the steps in order to design the desired T-shirt. Figure 4 shows the Flowchart.

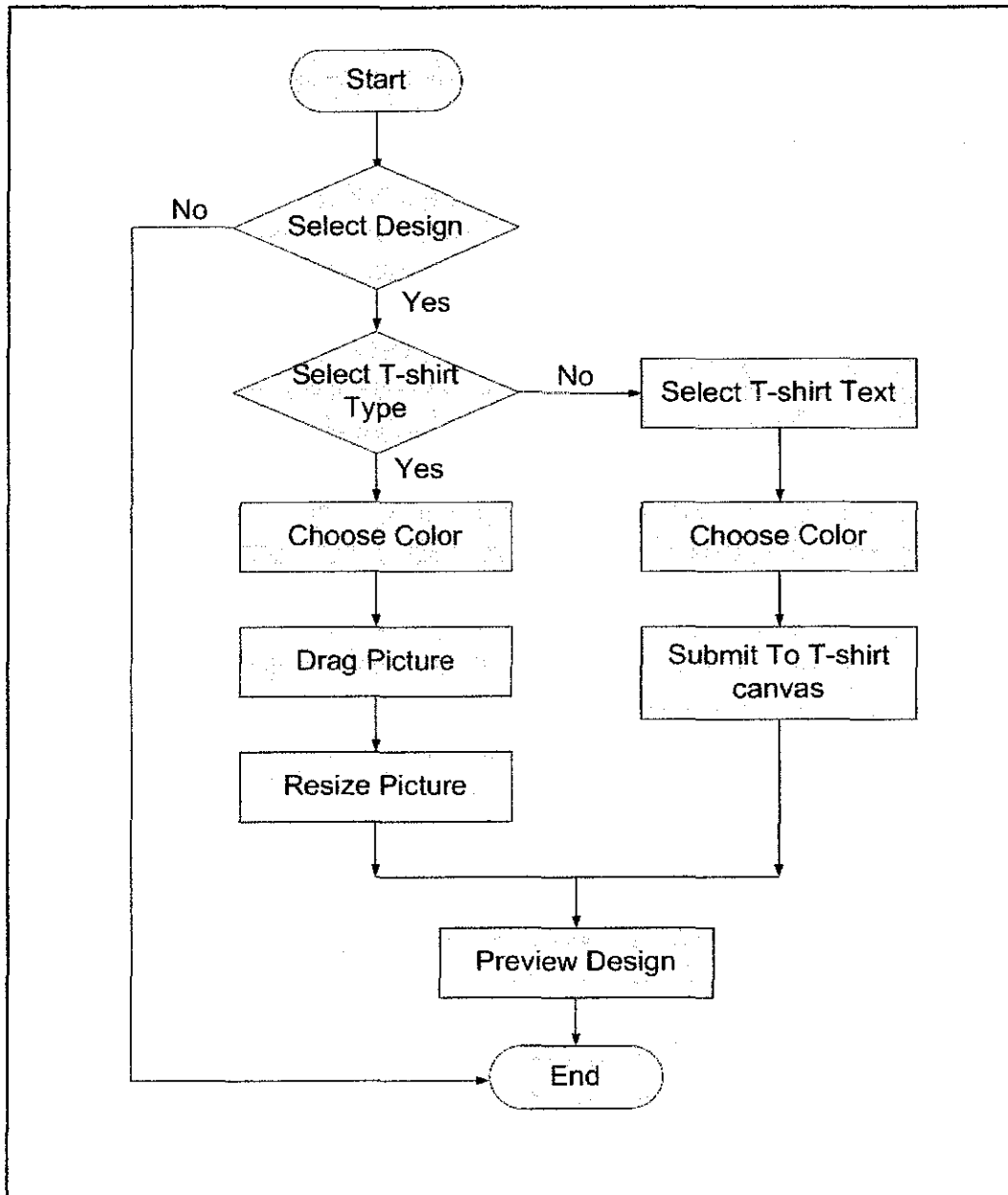


Figure 4: Flow chart

3.4 Data models

3.4.1 Use Case

Use case diagram would capture the functional requirements for the website. The system would have only the user as the actor and several functions in the system where user can interact with such as selecting the T-shirt types, pattern and color. Figure 5 shows the use case diagram.

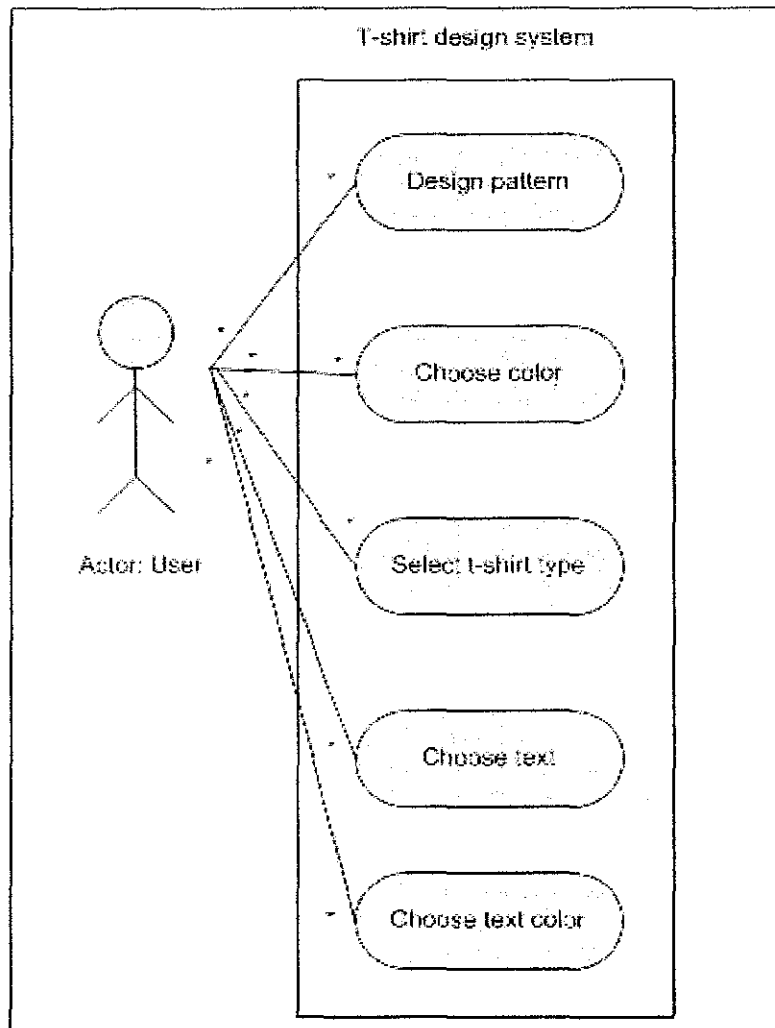


Figure 5: Use case diagram

3.4.2 Data flow diagram

The way of the design T-shirt travels around the system will be shown in the data flow diagram. It would have a user as the entity and single database to save the functions in the system. Figure 6 shows the data flow diagram.

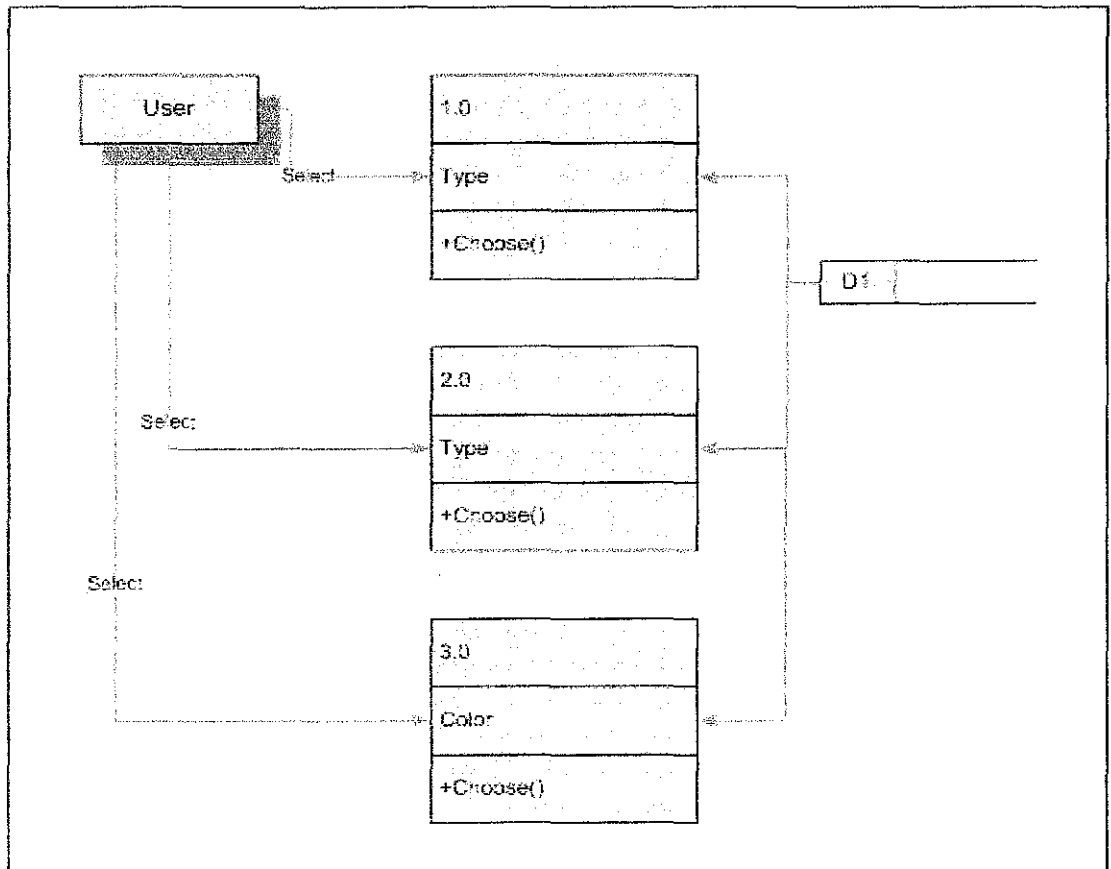


Figure 6: Data flow diagram

3.4.3 System framework

Ideally, the framework consists of entity which is user, system where user would use web interface to interact and a database to store design that had been created. Figure 7 shows system framework.

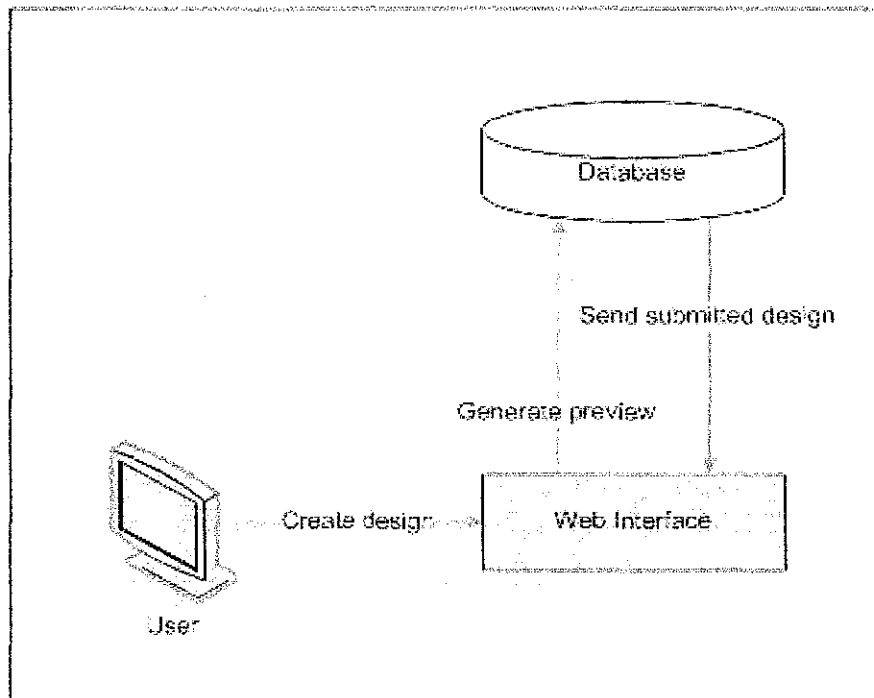


Figure 7: System framework

3.5 Tools used

Other than software development implementation, process flow, data models, several tools are needed in creating the website. Based on the research, the tools that been used for this project are AJAX technologies and MySQL. Tools that been used has the components that allow easy access to information stored in the database.

3.5.1 AJAX

AJAX is the Web 2.0 technology that suitable for business application. Therefore for T-shirt customization, AJAX tools been used in developing the system. Using Macromedia Dreamweaver, AJAX tools been imported into the php for drag and drop functions in designing the T-shirt. For example, the functions `canDragReposition` had been written into the program for dragging the pattern from the toolbox.

3.5.2 MySQL

MySQL is suitable for this type of application because it provides an easier way to explore and maintain existing databases, design compound SQL statements, query and manipulate data in different ways. The design that been created may have various number of submission, therefore MySQL could provide the large amount of data for T-shirt customization website.

3.6 Screen design

The website has three main pages which are home tab, design tab and demo tab. Figure 8 illustrates the page that will be created. It portrays the home page where it has the introduction about the website and the sample of T-shirt design that has been made.

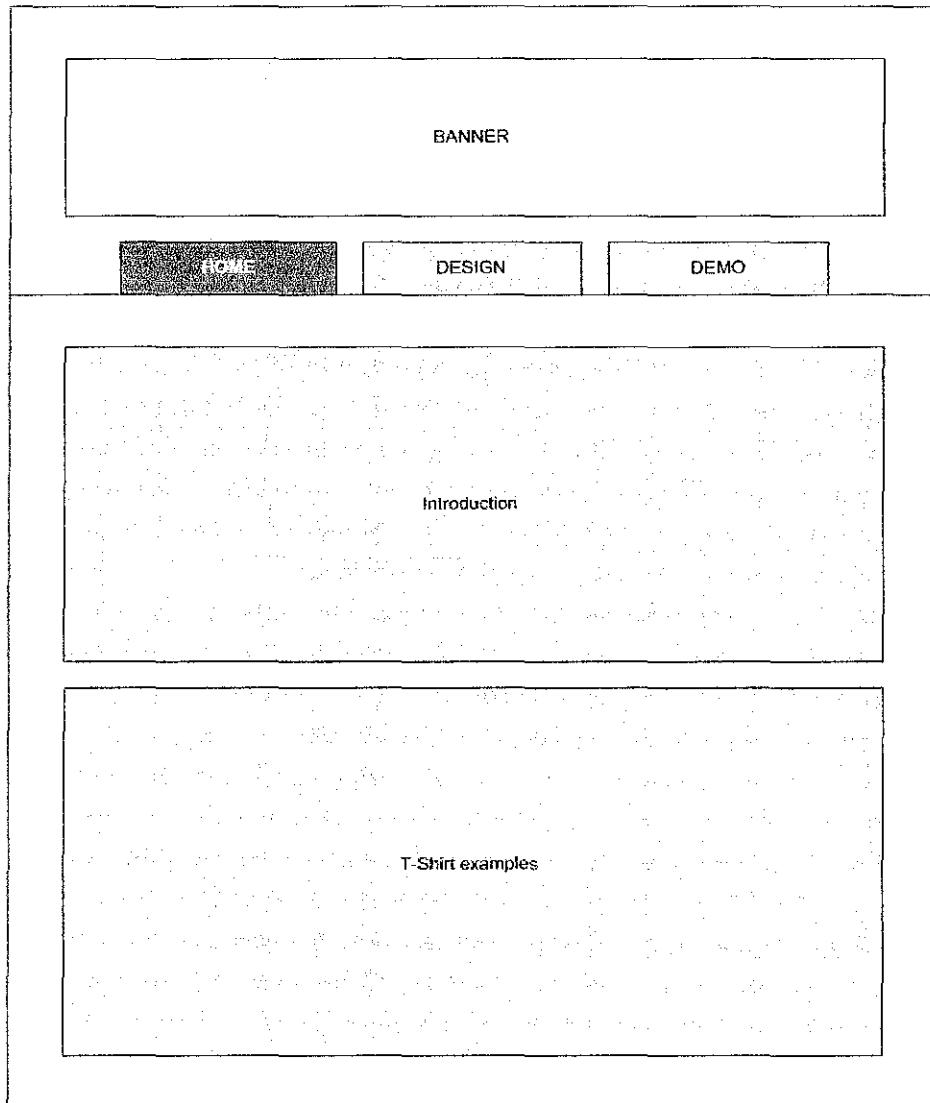


Figure 8: Home page

The tools for designing the T-shirt are placed at the design page. The page have tool box that consist the type of T-shirt, pattern that can be drag and drop and color that could be filled in. The canvas been placed at the middle side of the page. Other than sent the designed T-shirt, user also could choose t-shirt type for their t-shirt Figure 9 shows the design page.

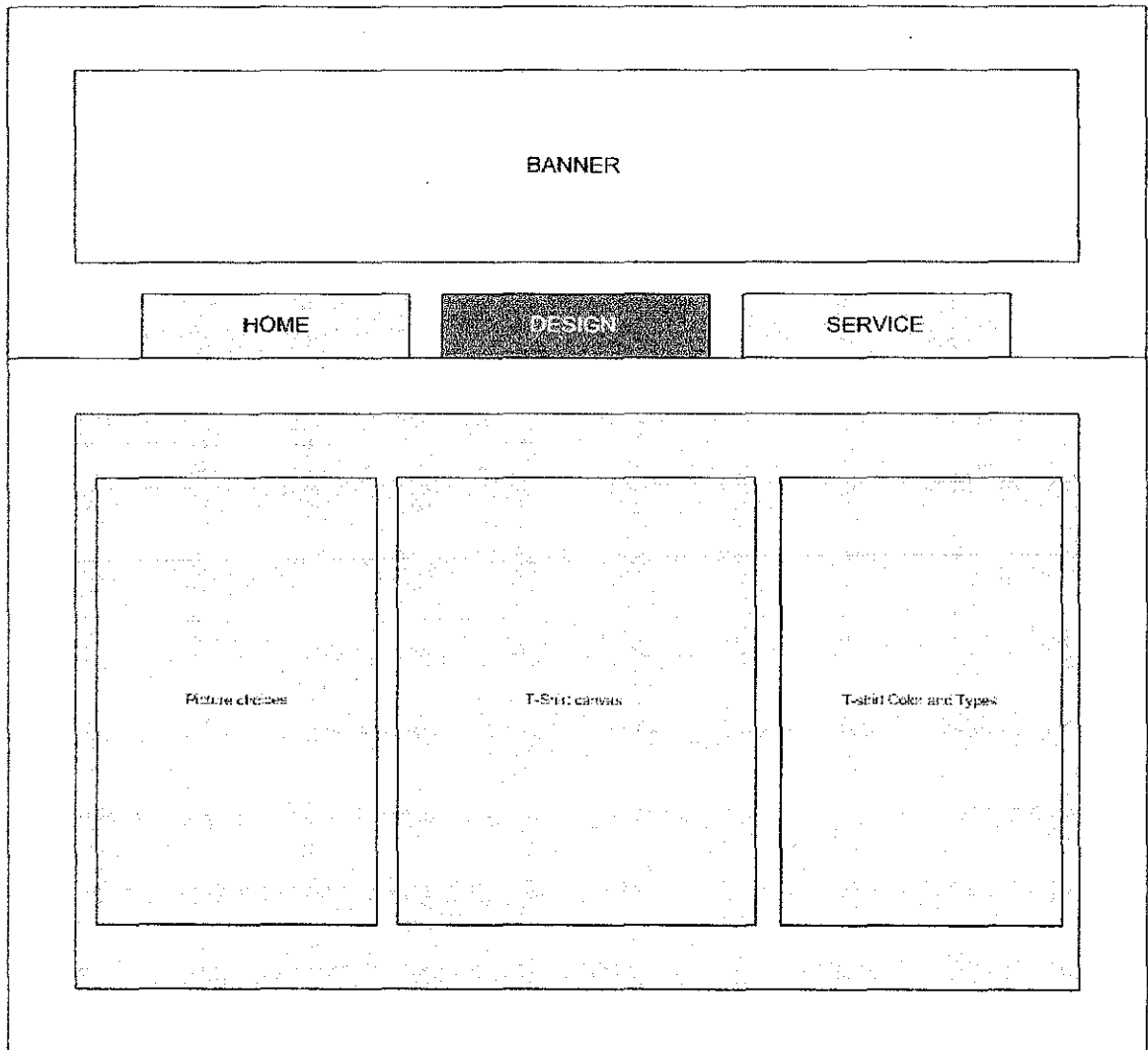


Figure 9: Design page

Service page will show the user how to contact the developer and it will include several frequently asked questions (FAQ). It has the contact number and address so that user can contact them if they have any inquiries. Figure 10 shows the Service page.

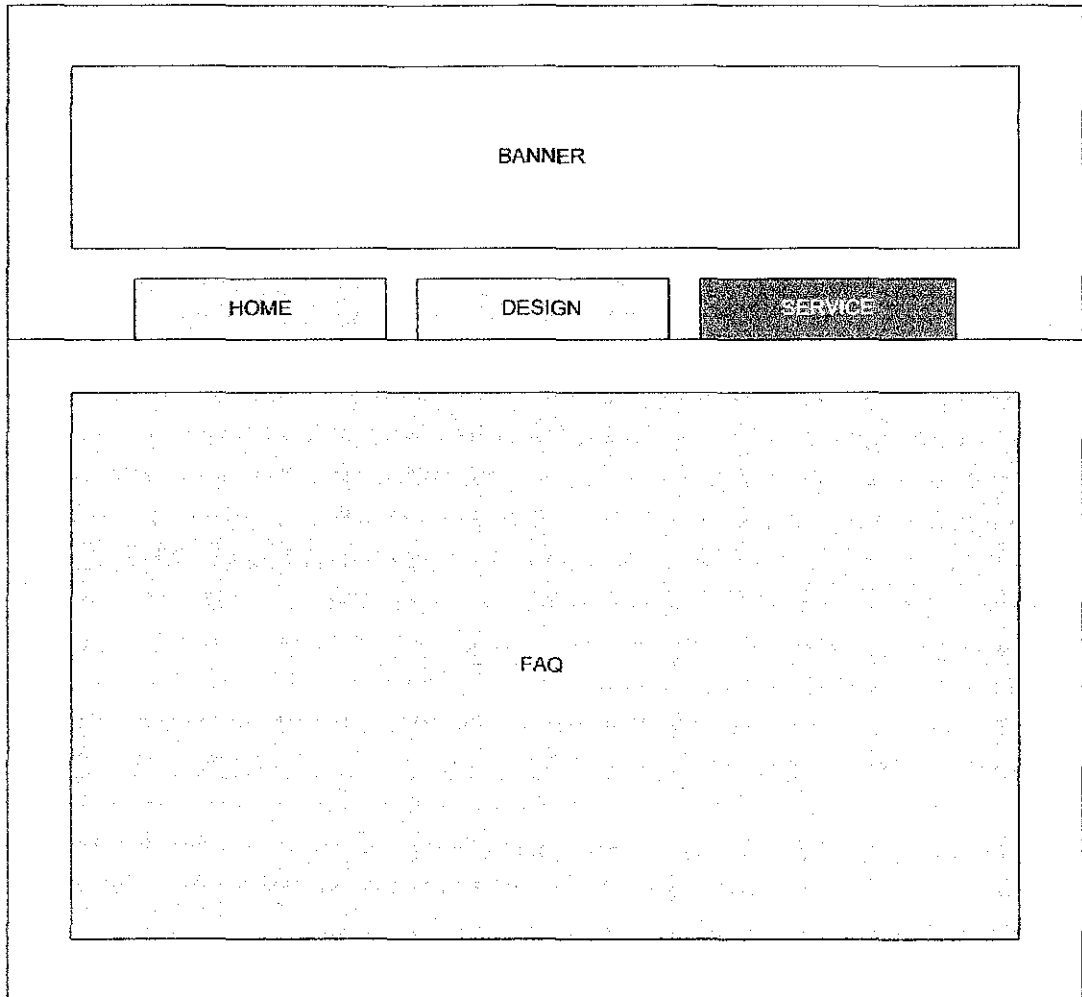


Figure 10: Service page

CHAPTER 4

SOFTWARE DEVELOPMENT

Software development involves the structure imposed on the development of the system. Synonyms include software life cycle and software process. There are several models for such processes, each describing approaches to a variety of tasks or activities that take place during the process. In developing the system, there are several main issues regarding AJAX development which are:

1. tabbing
2. drag and drop
3. XMLHttpRequest Object

4.1 Tabbng

The picture in Figure 11 shows that there are 3 main tabs in the page. This tab had implemented scriptaculous script which had used Web 2.0 style JavaScript libraries that help web developers to easily add visual and AJAX effects to projects. This entire management tool is completely AJAXified and contained on a single page, making it is easy and fast to manage the tabbing that has been developed.

The tab animatedly drop down whenever new tab been clicked. There are two main functions for this tab which are *toggleDisp* and *toggleTab*, shown in Figure 12, Figure 13 and Figure 14.



Figure 11: Tab screen shot

```

function toggleDisp() {
    for (var i=0;i<arguments.length;i++){
        var d = $(arguments[i]);
        if (d.style.display == 'none')
            d.style.display = 'block';
        else
            d.style.display = 'none';
    }
}

```

Figure 12: *toggleDisp* function

toggleDisp function will close any open tabs, and then open current tab. It is a simple function in which developers can pass multiple element ids or the element object and switches the display mode of the element from 'block' to 'none' and vice-versa. The input for this function would be the number of the current tab, the number of tabs, the number of the tab to leave open and to pass in true or false whether or not to animate the open/close of the tabs.

```

function toggleTab(num,numelems,opennum,animate) {
    if ($('#tabContent'+num).style.display == 'none'){
        for (var i=1;i<=numelems;i++){
            if ((opennum == null) || (opennum != i)){
                var tempH = 'tabHeader'+i;
                var h = $(tempH);
                if (h){
                    var h = $('#tabHeaderActive');
                    h.id = tempH;
                }
                var tempC = 'tabContent'+i;
                var c = $(tempC);
                if(c.style.display != 'none'){
                    if (animate || typeof animate == 'undefined')
                        Effect.toggle(tempC, 'blind',
                            {duration:0.5, queue:{scope:'manus', limit: 3}});
                    else
                        toggleDisp(tempC);
                }
            }
        }
    }
}

```

Figure 13: *toggleTab* Function (1)

```

var h = $('tabHeader'+num);
if (h)
    h.id = 'tabHeaderActive';
h.blur();
var c = $('tabContent'+num);
c.style.marginTop = '2px';
if (animate || typeof animate == 'undefined'){
    Effect.toggle('tabContent'+num, 'blind',
        {duration:0.5, queue:{scope:'menus', position:'end', limit: 3}});
}else{
    toggleDisp('tabContent'+num);
}
}
)

```

Figure 14: *toggleTab* Function (2)

In this *toggleTab* function, does all the work of actually opening and closing the tabs. There are two main inputs for this function which are:

- The number of the current tab
- The number of tabs
- (optional)The number of the tab to leave open
- (optional)Pass in true or false whether or not to animate the open/close of the tabs

The first argument (num) means the total number of tabs which could add some additional logic to automatically get the tab elements and count them. The second argument (numelems) needed for the number of the tabs. Third argument and fourth argument are optional where developer want the opening and closing of the tabs to be animated or not. This was added to allow for ability to turn off the scroll up/down animation of the tab contents when it is not desired, and is specified for each tab.

4.2 Drag and drop elements

In customize page, user could drag the picture available in the right panel and drop at t-shirt panel on the right page. The drag-able pictures being supported by function *dropItems*, function *onDragFunction* and variable *dragDropObj*, Figure 15 shows the exact customization page and the pictures available in the prototype.

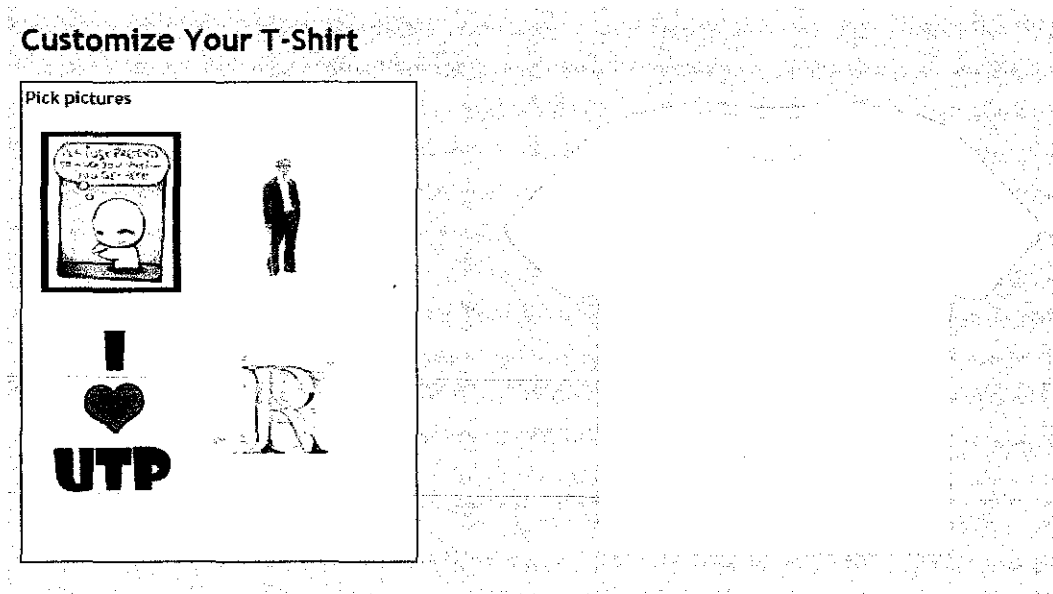


Figure 15: Picture Customization Page

One of the main three functions for drag and drop picture shown in Figure 16 which is function *dropItems*. Function *dropItems* will custom drop actions for division with id "dropBox" and "leftColumn" customization body in html. The function will check each division id and append the dragged element as child of target box.

```

function dropItems(idOfDraggedItem,targetId,x,y)
{
  if(targetId=='dropBox'){
    var obj = document.getElementById(idOfDraggedItem);
    if(obj.parentNode.id=='dropContent2')return;
    document.getElementById('dropContent2').appendChild(obj);
  }
  if(targetId=='leftColumn'){ |
    var obj = document.getElementById(idOfDraggedItem);
    if(obj.parentNode.id=='dropContent')return;
    document.getElementById('dropContent').appendChild(obj);
  }
}

```

Figure 16: *dropItems* Function

onDragFunction have two arguments which are *cloneId* and *origId* to get the picture element from the left menu and drop it at the t-shirt division. *dragDropObj* later will make each division id draggable and slide item back into original position after drop either in the left panel (picture menu) or right panel (t-shirt panel). Figure 17 shows the code.

```

function onDragFunction(cloneId,origId)
{
  self.status = 'Started dragging element with id ' + cloneId;

  var obj = document.getElementById(cloneId);
  obj.style.border='1px solid #F00';
}

var dragDropObj = new DHTMLgoodies_dragDrop();
dragDropObj.addSource('imageBox6',true,true,true,false,'onDragFunction');
dragDropObj.addSource('imageBox1',true,true,true,false,'onDragFunction');
dragDropObj.addSource('imageBox2',true,true,true,false,'onDragFunction');
dragDropObj.addSource('imageBox3',true,true,true,false,'onDragFunction');
dragDropObj.addTarget('dropBox','dropItems');
dragDropObj.addTarget('leftColumn','dropItems');
dragDropObj.init();

```

Figure 17: *onDragFunction* and variable *dragDropObj*

4.3 XMLHttpRequest Object

Ajax uses a programming model with display and events. These events are user actions which call functions associated to elements of the web page. The developer uses **new XMLHttpRequest()** constructor to support any other browser including Firefox.

From Denis Sureau, to get data on the server, XMLHttpRequest provides two methods which are open (create a connection) and send (send a request to the server). The data furnished by the server will be found in the attributes of the XMLHttpRequest object:

- responseXml for an XML file
- responseText for a plain text

Its attributes and methods allow interacting with the servers. Tables below show the attributes and methods that had been used in this site development.

readyState	the code successively changes value from 0 to 4 that means for "ready".
status	200 is OK 404 if the page is not found.
responseText	holds loaded data as a string of characters.
responseXml	holds an XML loaded file, DOM's method allows to extract data.
onreadystatechange	property that takes a function as value that is invoked when the readystatechange event is dispatched.

Table 1: Attributes*

open(mode, url, boolean)	mode: type of request, GET or POST url: the location of the file, with a path. boolean: true (asynchronous) / false (synchronous). optionally, a login and a password may be added to arguments.
send("string")	null for a GET command.

Table 2: Methods*

Below is the code showing how to step by step building a request using XMLHttpRequest class.

*source from <http://www.xul.fr>

```

function ahah(url, target) {
    document.getElementById(target).innerHTML = ' Fetching data...';
    if (window.XMLHttpRequest) {
        req = new XMLHttpRequest();
    } else if (window.ActiveXObject) {
        req = new ActiveXObject("Microsoft.XMLHTTP");
    }
    if (req != undefined) {
        req.onreadystatechange = function() {ahahDone(url, target)};
        req.open("GET", url, true);
        req.send("");
    }
}

function ahahDone(url, target) {
    if (req.readyState == 4) {
        if (req.status == 200) {
            document.getElementById(target).innerHTML = req.responseText;
        } else {
            document.getElementById(target).innerHTML=" AJAX Error:\n"+ req.status + "\n"+req.statusText;
        }
    }
}
}

```

Figure 18: Creating a request using XMLHttpRequest class.

While developing this site, developer had found one drawbacks to it - it will only work in Internet Explorer 6 if ActiveX is enabled. To ensure its compatibility, developer had add function IFrameRequest() where it handles IE6 without ActiveX.

```

var Ajax = {
    getTransport: function() {
        return Try.these(
            function() {return new XMLHttpRequest()},
            function() {return new ActiveXObject('Msxml2.XMLHTTP')},
            function() {return new ActiveXObject('Microsoft.XMLHTTP')},
            function() {return new IFrameRequest()}
        ) || false;
    },
    activeRequestCount: 0
};

```

Figure 19: The make use of IFrameRequest()

CHAPTER 5

DISCUSSION

This topic will discuss the outcome of the system that has been developed. The core part of the system is on the design site. The developer had achieved its goal which is to create an interactive site using AJAX programming on T-shirt Customization. The discussion will covers three main aspects which are testing part and recommendation for room of improvement.

5.1 Testing

Testing will take into consideration on user involvement where user will test and make use the site. From there developer could seek answers on questions such as “Does the page provide an interactive design?” or “Is there any problems while accessing on design page? Maybe slow performance and lagging while dragging the pictures?”. Here testing is very helpful to seek user point of view on the site.

5.1.1 Design Page

On the design site, there are two options that user could choose either including pictures or text. Figure 20 below shows an example that user could drag one of the pictures available on the left side of the page and drop it on the t-shirt canvas. User also could select any color from choose color content. They could understand how to use the color chooser by looking at the box under the blue track. The first two character of the box implies on color red. The next two characters will show effect on green track and the last two will show for color blue track. User also could choose two different types of t-shirt either work t-shirt or plain t-shirt. All the preview of their design will show at the t-shirt canvas on the middle page.

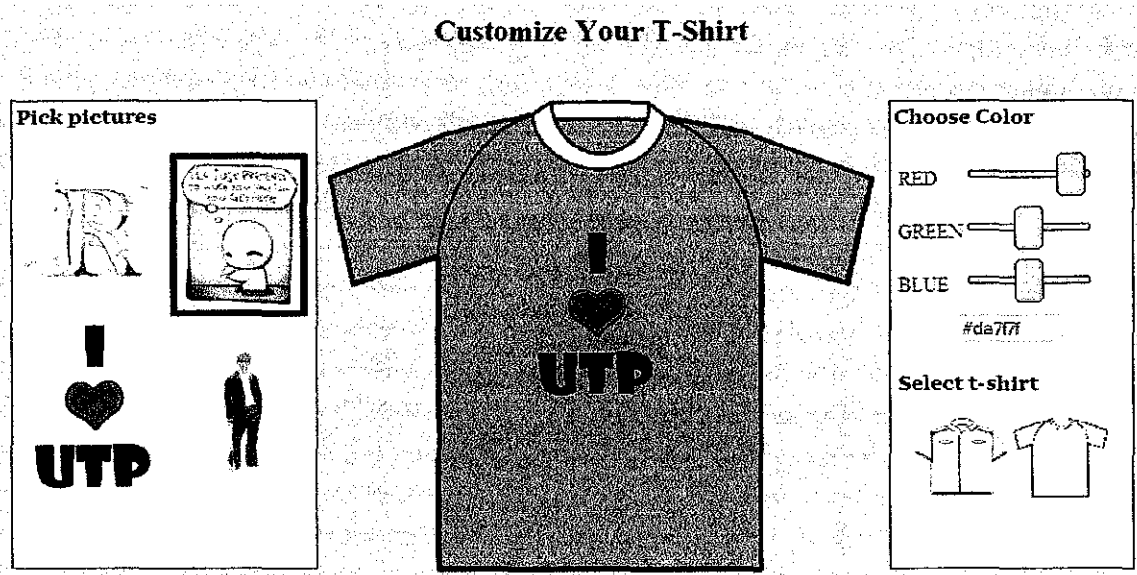


Figure 20: Picture Design

5.1.2 Text

On the second choice, user could include text only on the t-shirt by input text for example in the figure below, 'I LOVE UTP'. User also could choose the color and submit to the t-shirt canvas. There are three colors that user could choose which are black, yellow and red. Through clicking the submit button, user could see the text been already placed at the center of the t-shirt by default.

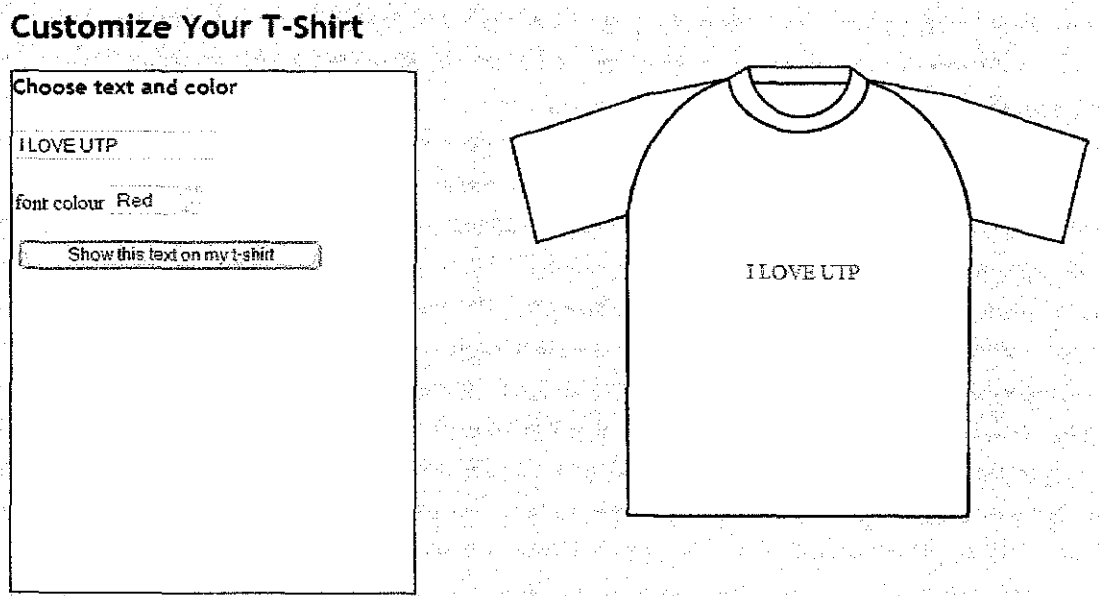


Figure 21: Text design

The testing only emphasize on customizing part where it doesn't cover the database element for user to save the t-shirt that they had created. For room of improvement, there are several recommendation that user had suggested to the developer.

5.2 Comments and Recommendation

There is positive feedback from user that had tested the website. User had comment that the toggle tab had put an interesting interface for the site, make it fun to use when it is animated. The use of AJAX technologies had helped the site more efficient without having any interval during design process. Therefore, the developer had proves to achieve its goal.

After the testing part has been done, user had give several recommendation to make the website is more user friendly. One of the suggestions is to add more color or choose bright color to make it livelier. There is also a suggestion on the adding the text where user would like to have more options such as text font and size. Use also recommend that the customize page could be only in one page so that user can add both picture and text on the same t-shirt template. Suggestion on the demo page that contains on how to use the function provided had stated that it will help user to be easy on exploring the site.

User also had compared the site with the function from Adobe Photoshop, thus require more function. These may help the site to be act like Adobe Photoshop where user could have more choices on its function. This site been told that it have faster interaction between user and the website that several online t-shirt customizations such as Custom Ink. For example, Custom Ink also provided drag and drop function but it had take users time to wait for the site to load. It is different from this site that has no performance delay due the use of AJAX technology.

CHAPTER 6

CONCLUSION

AJAX based t-shirt customization application is especially developed to ease user on customizing their t-shirt without having delaying performance while designing the t-shirt. It is hope that by using this system, it will help user to design their desired t-shirt by providing faster interaction between user and the site in order that user won't have to wait the page to be loading every time they dragging or choosing color in customizing the t-shirt. The function consist in the system are easy to navigate and user friendly.

The system had achieved the goal to create web application using AJAX technology. Upon enhancing the system in the future, developer may include the use of database in order user could save and submit the design. Another future implementation is by adding another function on the design page where user could browse and add their pictures on the t-shirt canvas. After been evaluate by several evaluators, including the supervisor of this project itself, the developer had several recommendation such as making the interface livelier to increase user interest while customizing the t-shirt. Other than that, developer also could make the t-shirt in 3D version so that user could see from the front, the back and the side of the t-shirt.

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