Validation Tool for E-government Portals in Malaysia Based on MAMPU Guideline

By

Hilman Syazwan bin Shukor

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31750 Tronoh

Perak Darul Ridzuan

CERTIFICATION OF APPROVAL

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A project dissertation submitted to the

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Approved by,

_____

(Ms. Emy Elyanee Mustafa)

UNIVERSITI TEKNOLOGI PETRONAS

TRONOH, PERAK

DECEMBER 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 acknowledgements, and that the original work contained herein have not been undertaken or done by unspecified sources or persons.

_____

HILMAN SYAZWAN BIN SHUKOR

ABSTRACT

The importance of web usability in the new age of World Wide Web cannot be denied. World Wide Web Consortium (W3C) organization has come out with guideline on how the web should be to convenience of all the people including the disable. However, web usability problem still be a pressing problem. Tons of website published on the web does not comply with the W3C standard. In this new era, Government is going paperless. This is the concept of E-government. It is a concept where Government made contacts with their customers (citizens) online. With website being the main source of communication on the web and to make sure that this concept runs well, it is important that the E-Government websites are convenient to the users.

Usability testing has become an important aspect of website development currently, but most of the companies do not include usability testing in their website iteration time whether because of the cost of hiring usability professional or the time just does not allow them to hold a usability testing session. Thus, come the idea of automated testing using web tools. In this study, the author will develop an automated web usability tools specifically for Malaysia's E-government website. The rules of usability are referred to guideline created by Malaysian Administration, Modernisation and Management Planning Unit (MAMPU) an organization responsible for the modernisation of the country.

The study will help the E-government portals to achieve user friendly website hence improving Malaysia's position in Global E-Government ranking. The method use in this project is rapid programming where all small functions are developed first and at the end, the system will be combined.

The result will be the website showing all the errors in usability contained in the website and it is up to the developer to fix the error and to maintain the website. Finally, this project is hoped to be the first of many other evaluation tools with greater functions ahead.

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In the name of ALLAH, The Most Gracious and Most Merciful

Greatest pleasure goes to acknowledge the efforts of many people who directly or indirectly gave their support, guidance, motivation, cooperation, understanding and friendship toward the accomplishment of this project. Without their support, completing this project would be difficult.

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ABBREVIATIONS

UTP	Universiti Teknologi Petronas
MAMPU	Malaysian Administration, Modernisation and Management Planning Unit
SQL	Structured Query Language
PHP	Hypertext Pre-processor
URL	Uniform Resource Language
CSS	Cascaded Style Sheet
HTML	Hypertext Mark-up Language
W3C	World Wide Web Consortium
ICT	Information & Communication Technology
MSC	Malaysia Super Corridor
FAQ	Frequently Asked Questions

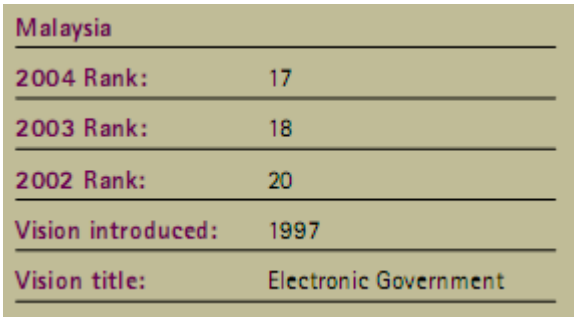
CHAPTER 1

INTRODUCTION

1.1 Background Study

The Internet has become the important means for communicating and presenting information on a broad scale. Shortly after the commercialization of the Internet, the multimedia component of the Internet, the World Wide Web experienced phenomenal growth. Rapid advances in technology and the advent of the Internet have redefined public expectations of the government and its services. In the recent years, web technology gradually becomes an inevitable tool for many government agencies and business enterprises to provide information and services at any times and to anyone. With this kind of services, it seems to be a convenient technology which would benefit many people. People literally do not have to queue to submit their driving license renewal form. They can instead just submit their form online, for example [1].

However, website usability and accessibility are still a problem. An estimated 90% of sites provide inadequate usability [2], and an estimated 66% of sites are inaccessible to users with disabilities [3]. Website usability and accessibility here simply means the ease-of-use of the website or the user-friendliness of the website. When user is browsing the website, how easy it is for them to locate the information they seek for? How many ‘mouse-clicks’ do they need in order to get to the desired page from the first page? If the answer is ‘easy’ and ‘not many’, then the page is good enough in term of usability and accessibility.



Malaysia	
2004 Rank:	17
2003 Rank:	18
2002 Rank:	20
Vision introduced:	1997
Vision title:	Electronic Government

Figure 1.1: Malaysian E-Government Ranking according to Accenture [4].

Figure above shows Malaysia's current rank in the E-Government ranking published by Accenture. Various organizations namely Brown University, Waseda University, and United Nations have conducted surveys on the E-Government ranking of nations in the world. One of the focal areas that they evaluate is the *homepage or web portal of the government*. The indicators and measurement criteria has a major focus on '*Electronic service delivery maturity'*. Electronic service delivery maturity measures the level to which a government has developed an online presence and the extent to which government agencies manage interactions with their customers (citizens and businesses) and deliver service in an integrated way. The customer service score considers how well governments have addressed the four dimensions of leadership in customer service citizen-centered, multi-channel, cross-government service delivery, and proactive communication and education [5].

E-government's web portal is the main source of information through the internet, so it is important to make sure that the web portal is accessible and usable. Malaysia has its own official web portal called myGovernment (http://www.gov.my/). Since web portal is one of the main criteria in determining the ranking, improving myGovernment portal is a strategy to increase the 'E-Government maturity level', hence improving the E-Government ranking of Malaysia. To make sure that the portals are up to standard and to produce a world class portal, Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) has come out with a guideline for the developer of myGovernment and other government agencies portal to abide by.

MAMPU guideline contains twenty-two mandatory characteristics that myGovernment portal and other government agencies' portal need to put up with,

such as stating “Official Portal”, displaying sitemap, including “search function” and using “.gov.my” domain (refer Chapter 1.4). Even though all portals followed the MAMPU guideline, most of these criteria are reviewed infrequently with no automated tools to rely on.

Numerous automated, evaluation and transformation tools are available to help Web developers build better sites for users with diverse needs. Web accessibility evaluation tools are software programs or online services that help determine if a Web site meets accessibility guidelines [6]. Web usability tools scan the source code of a web page using interpretations of either the United States Rehabilitation Act Section 508 standards [7] and/or the World Wide Web Consortium's Web Content Accessibility Guidelines 1.0 (WCAG) [8]. These tools can help individuals spot obvious accessibility errors and remind users of accessibility issues that require manual checks. Using accessibility tools is really just one of the first steps toward web accessibility. While no tool can fully determine the accessibility of web sites, web accessibility evaluation tools can significantly reduce the time and effort to evaluate web sites.

This project will focus on producing a web usability evaluation tools based on MAMPU guideline, specifically for myGovernment and other government agencies portal. This tool will help the developer on validating the myGovernment and other government agencies’ portal that they follow the mandatory criteria prearranged.

1.2 Problem Statements

1.2.1 Problem Identification

A lot of government agencies portals including myGovernment portal are not W3C compliant. Either they failed the W3C hyperlink test, HTML test or both. There are a lot of broken links and web standards failure. Only the Malaysia Ministry of Education’s portal passed the W3C tests. Despite the abundance of design recommendations and guidelines for building effective sites, website usability and accessibility continues to be a pressing problem.

Normally, budget constraints prohibit the developer from hiring a usability professional to test their web usability and accessibility. Manual validation which includes cognitive walkthrough, usability inspection and heuristic evaluation are taking a lot of time and it is even costly. Usually, typical website budget proposal does not include hiring website testers and usability professional.

Furthermore, the schedule for portal development may not include usability testing and iterative design [9]. Manual validation requires testers and specialist to run through the website before it is made available and after that, few adjustments need to be done which extends the officiate time of the website. It is also a tedious work for a human evaluator to look precisely at every twenty two mandatory characteristics that are set by MAMPU on the portals.

Most online available tools are HTML validators and not accessibility evaluators. These HTML, CSS validators are useful, but not useful enough to satisfy the 'mandatory characteristics' specified in the MAMPU guideline.

1.2.2 Significant of the Project

This web usability evaluation tool is able to validate the 'mandatory characteristics' specified in the MAMPU Guidelines for the myGovernment portal and Government agencies' portals. A lot of time is expected to be saved and the next step of evaluation which is manual validation is made easier as the automated evaluation tools has already made the first step and reducing the scope that the human evaluator needs to check. This includes the cost saving of managing and maintaining the government agencies' web portals and myGovernment Portal.

By having the twenty two characteristics (refer Chapter 1.4) passed the test, correspondingly making the content of the web pages more mature and ready. Maturity level and e-readiness are some of the areas to look for in a successful E-government establishment. Hence, having this automated web usability evaluation tool will improve the ranking of Malaysia's E-government position in the world.

1.3 Objectives

The objective is to automate the process of validating the portal. By automating the process, it will reduce the workload during the scheduled maintenance of the web portals. The workload here means the amount of work that the human evaluator needs to do which includes having to evaluate each criterion one by one and correspondingly to reduce the time being allocated for maintenance and testing.

1.4 Scope of Study

This study will focus on making an automated web usability evaluation tool specifically for myGovernment portal and other government agencies' portals. The usability rules are referred to MAMPU guideline. This tool will focus on the twenty two 'Mandatory Characteristics' specified in the guideline.

The twenty two mandatory characteristics are [10]:

1. Clearly declare the Official Portal/Web Site.

or

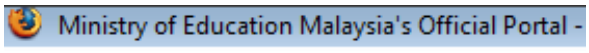


Figure 1.2 Declaring the Official Portal/Web Site

2. Displaying the Malaysia Government Crest at least at the front page or other pages.

Figure 1.3 Displaying the Malaysia Government Crest

3. Placing the Agency's official logo if exists.

Figure 1.4 Agency's Official Logo

4. Introducing the agency.

   e.g: location, introduction about the agency.

Figure 1.5 Introduction about the Ministry, Client's Charter and Agency's Policy

5. Displaying the agency's policy. [Refer Figure 1.5]

6. Displaying the agency's Client's Charter. [Refer Figure 1.5]

7. Stating the services provided by agency.

Figure 1.6 Services Provided

8. Include the contact info (phone number, facsimile, address and email address). The condition is, the email addresses must be in static state and not in hyperlink state to prevent spamming.

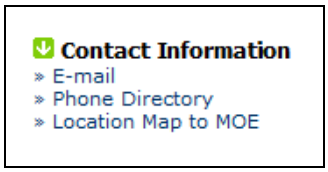


Figure 1.7 Contact Information

9. Include the Frequency Asked Question (FAQ) about the agency.

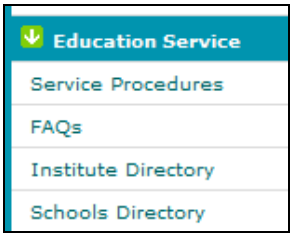


Figure 1.8 FAQ

10. Include the Disclaimer.

Figure 1.9 Privacy Policies, Security Policy, Copyright Notice, Disclaimer (Notices)

11. Include the Privacy Policy. [Refer Figure 1.9]

12. Include the Security Policy. [Refer Figure 1.9]

13. Include the Copyright Notice. [Refer Figure 1.9]

14. Include services where visitors can ask inquiries, give feedbacks, comments and suggestions. Reply must be within 3 working days.

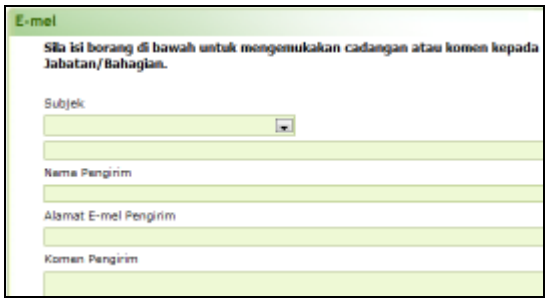


Figure 1.10 Feedback Form

15. Auto expires for information that has expiry date.

    e.g: tender submission date, service/event advertisement

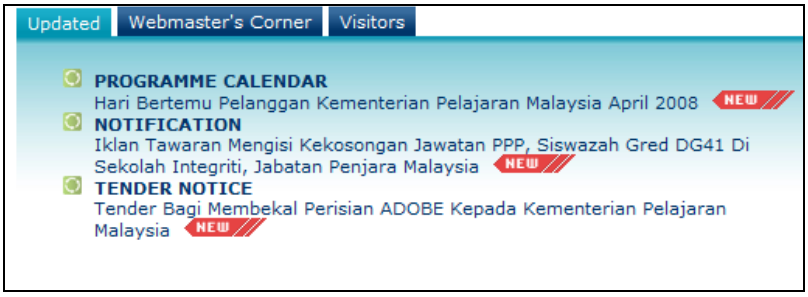


Figure 1.11 Updated Links

16. Include downloading of files, forms, video/audio clips, and others services.

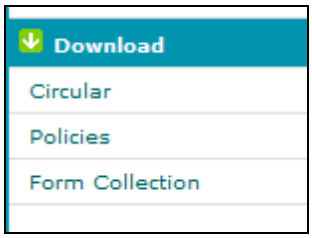


Figure 1.12 Download Service

17. Including the search engine service.

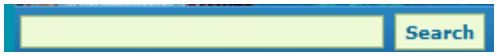


Figure 1.13 Search Engine

18. At least in two languages, English and Bahasa Malaysia. Other languages are optional whichever suits.

Figure 1.14 Dual Languages

19. Link myGovernment website from the agency's website with myGovernment Logo and link to other agencies within the ministry.

Figure 1.15 Link to MSC and myGovernment Portal

20. Include MSC logo for MSC involved agencies. [Refer Figure 1.15]

21. Include Sitemap for the website.

Figure 1.16 Sitemap

22. Using the ".gov.my" domain.

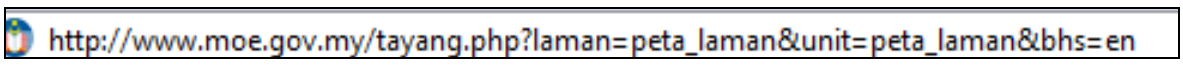


Figure 1.17 '.gov.my' domain

CHAPTER 2

LITERATURE REVIEW

2.1 Usability

Based on the International Standards Organization (ISO) definition of usability, Powell defines usability as “the effectiveness, efficiency and satisfaction with which specified users achieve specified goals in particular environment”, which *effectiveness* means “the accuracy and completeness with which specified users can achieve specified goals in particular environments”, *efficiency* means “the resources expended in relation to the accuracy and completeness of goals achieved”, and *satisfaction* means “the comfort and acceptability of the work system to its users and other people affected by its use”[11]. Note that this definition applies equally well to Web page usability. It also implies that usability is user and task dependent, as well as being related to how well the user is able to accomplish what they set out to do, how efficiently the user can do this, and how satisfied the user is during and after the process. Powell also recounts Jakob Nielsen's usability guidelines for determining the usability of a Web site [12]:

- Learnability - How easy it is to learn to use?
- Rememberability - How easy it is to remember how to use?
- Efficiency of use - How much work does it require the user to do?
- Reliability in use - Does it work correctly and does it help users perform tasks correctly?
- User Satisfaction - Is the user generally satisfied as a result of using the site?

Generally in evaluating usability, it may be possible to measure each of these components separately or in combination using some form of metric or measure.

2.2 Automated Website Usability Evaluator

Many of the smaller companies who develop web pages have no usability professionals to help with the design of their sites and many of the companies do not even realize they should have usability professionals to assess their websites. Normally, budget constraints prohibit them from hiring a usability professional furthermore, the timeline for development may not allow for usability testing and iterative design [9]. This has motivated the development of techniques to produce automated website usability evaluation tools by independent parties.

In the World Wide Web, there are a lot of web usability evaluation tools available. Some offers the service for free such as WAVE [13], Doctor HTML [14] and W3C Tools [15] and some put price for their evaluating service such as Bobby and WebXact [16] and Deque Ramp [17]. These tools refer their guideline on usability whether on Section 508 standards [7] and/or the World Wide Web Consortium's Web Content Accessibility Guidelines 1.0 (WCAG) [8]. This means that these available tools do not validate the mandatory characteristics that are specified in the MAMPU guideline.

The tools can be classified according to few categories [11]:

- Location
    - *Web-based*
        - Tools are available on the net and it performs the real-time validation.
    - *Off-line*
        - Tools are installed on workstation and can be perform without the availability of internet connection.
- Type of service
    - *Failure identifiers*

        - Discover potential failures via simulation of user actions, like filling a form.
    - *Fault analyzers*
        - Find failures and highlight their causes, i.e. usually they systematically analyze the source code of the website
    - *Analysis and repair tools*
        - Assists the developer in fixing the faults automatically or with authentication.
- Information source
    - *Source code*
        - Analysis can be performed on the basis of actual implementation of a website
    - *Webserver logs*
        - Acquire data from the webserver logs.
    - *Testing*
        - Acquire data during user testing phase.

All of them are available on the internet but many of them have discontinued their free service as this service has proved to be one of the important elements in webpage development. The existence of the automated web usability tools had alerted the web developers to take into account usability and accessibility whenever they are developing or designing the website.

A Study of Automated Web Site Evaluation Tools was conducted and the results show that even though there were no significant differences in the participants' task completion success between automated modified sites and original raw sites, but after the developer had changed the site manually, after the reports from the evaluation tools, significant differences can be observed in the test results

[18]. This means that the automated web usability tools really help the developer in making the user friendly webpage.

2.3 E-Government

E-government is not a fresh idea. Since the era of internet bloom, we have heard of the future of governing a country through the internet. E-government can be defined as the use of internet technology as a platform for exchanging information, providing services and transacting with citizens, businesses, and other arms of government. It is the government initiatives to help local authorities provide services online and accessible via the World Wide Web. The primary delivery models are Government-to-Citizen or Government-to-Customer (G2C), Government-to-Business (G2B) and Government-to-Government (G2G) & Government-to-Employees (G2E) [19]. Within each of these interaction domains, four kinds of activities take place:

- Pushing information over the Internet, e.g: regulatory services, general holidays, public hearing schedules, issue briefs, notifications, etc.
- Two-way communications between the agencies and the citizen, a business, or other government agencies. In this model, users can engage in dialogue with agencies and post problems, comments, or requests to the agency.
- Conducting transactions, e.g: lodging tax returns, applying for services and grants.
- Governance, e.g: online polling, voting, and campaigning.

E-Government can also serve as the catalyst for export promotion, foreign direct investment, local industry promotion, transparency and democracy, and social and human capital development. One study suggests that Up to 1.54 percent EU25 GDP, or about € 166 billion could be boosted by E-government research and pilot programmes (2005-2010) according to the findings of the Economics of E-

government [20]. This shows the importance of E-government is emerging and the government needs to take E-government seriously in order to satisfy their citizen. The most important anticipated benefits of E-government include improved efficiency, convenience, and better accessibility of public services.

One of the main channels to communicate in the internet is the websites. All sorts of information can be delivered through the websites. A study by McConnell International shows that one of the most successful E-government projects to date is "web portals" [21]. So, there is a need to make a very user-friendly, useful and effective web site to make sure that the message the government needs to convey reaches its destination.

2.4 E-Government in Malaysia

Malaysian Government, towards its Vision 2020 welcomes the initiation of the Information and Communication Technology (ICT) with its promises and opportunities of a globalization. The implementation of E-government was initiated with the introduction of the Multimedia Super Corridor (MSC) in 1996 and in 1997 the Malaysian Government launched the electronic Government initiative, generally known as E-government, to reinvent itself to lead the country into the Information Age [22]. Malaysia, as any other countries, opted to implement E-government to offer efficient, high quality administrative on-line services to citizens and businesses In other words, the primary objectives are to bring dramatic improvements in the quality of government's interactions with its citizens by enhancing convenience, accessibility and efficiency of its services and also making government more responsive to the needs of its citizens and business [23].

Malaysia, in E-government ranking throughout the world has shown signs of improvement from year to year. This statement is supported by studies done by various organizations [4] [24] [25] [26] [5].

Table 2.1 Global E-government Ranking

Reports	2003/2004 Malaysian Ranking	2004/2005 Malaysian Ranking	2006 Malaysian Ranking	2007/2008 Malaysian Ranking
Accenture	17 of 22	19 of 22	N/A	14 of 22
Waseda University	4 of 33	N/A	14 of 32	N/A
Brown University	83 of 198	157 of 198	36 of 198	N/A
United Nations (UN)	43 of 191	N/A	N/A	34 of 191

From the table above, we can see that Malaysia's E-Government ranking has improved from the 157th place in 2006 to 36th place for Brown University's Global Survey. Meanwhile in Accenture's Global E-Government survey, Malaysia has improved from 19th place in 2005 to 14th place in 2007.

The indicators and measurement criteria has a major focus on *'Electronic service delivery maturity'* [5]. In line with the E-government effort, Malaysian government has launched the Malaysia Government's Official Portal which is called "myGovernment" portal. This myGovernment is the central point linking to all other Malaysian government agencies. As at May 2007 current on-progress E-government projects are Electronic Procurement (eP), Project Monitoring System (PMS), Electronic Services Delivery (eServices), Human Resource Management Information System (HRMIS), Generic Office Environment (GOE), E-Syariah and Electronic Labour Exchange (ELX) [22].

2.5 MAMPU

MAMPU is an organization that takes care of the modernisation of Malaysia. Their mission is to continuously modernise the Malaysian Public Service in achieving a high level of quality. Some of their activities are promoting the open

source society and culture in Malaysia and also coming out with this “Guideline for myGovernment Portal and other government agencies in Malaysia”.

They are the responsible organization that takes care of development and maintenance of the myGovernment portal. They have come out with the guideline on order to inform the concept and implementation of the myGovernment portal as the source of information to public sector and to guide the government agencies on building and maintaining their web portals.

CHAPTER 3

METHODOLOGY

Basically there are four phases on the methodology part to be completed throughout the project. There are:

1. Requirement Analysis and Definition
2. Conceptual Design
3. Prototypes
4. Production

Author divides the process into two categories. **Research Methodology** which includes "Requirement Analysis and Definition" and "Conceptual Design" while **Development Methodology** which includes "Prototypes" and "Production".

3.1 Software

3.1.1 XAMPP

XAMPP is a free and open source cross-platform web server package, consisting mainly of the Apache HTTP Server, MySQL database, and interpreters for scripts written in the PHP. Since author will use PHP and MySQL as the development language, this software package is definitely suiting the needs of both parties.

3.1.2 Macromedia Dreamweaver

Macromedia Dreamweaver was used as programming tool for this project. This software offers a number of advantages in term of:

- Consistent Programming Model
- Direct Support for Security
- Simplified Development Efforts
- Easy Application Deployment and Maintenance

3.2 Research Methodology

Research methodology involves two phases which are Requirement Analysis and Definition; and Conceptual Design of the project.

3.2.1 Requirement Analysis and Definition

In this phase, a thorough study was done to choose the specific guidelines and the mandatory characteristics of the MAMPU guideline was chosen as shown in Chapter 1.4. Being the most important criteria in the guideline, this part is treated as the goals that need to be achieved by Malaysia's E-Government Portal.

Next, evaluation of existing version of web usability evaluation tools were made to compare and contrast on how web evaluation tools were made. This is done by testing all the tools with different input. Input here is being the numerous E-Government portals.

After selecting the appropriate guidelines, evaluations were done to evaluate existing tools. These tools are selected because they are available freely online and were used by many organizations. The tools chosen are W3C Link Checker, W3C CSS Validator, W3C Markup Validator and WAVE.

As the research going on, author realized that not all twenty-two mandatory characteristics can be evaluated automatically given the time of the development of the project. So, author has decided to choose only certain of the characteristics. The chosen ones are:

1. Clearly declare the Official Portal/Web Site
2. Introducing the agency.
3. Displaying the agency's Customer Charter.
4. Include the Frequency Asked Question (FAQ) about the agency.
5. Include the Disclaimer
6. Include the Privacy Policy.
7. Include the Security Policy.
8. Include services where visitors can ask inquiries, give feedbacks, comments

and suggestions

9. Include downloading of files, forms, video/audio clips, and others services
10. Include Sitemap for the website
11. Include the Copyright Notice.

Only the above characteristics are achievable to be validated automatically.

Finally, a competitive analysis is done based on the criteria and tools stated above. The study focused on seven E-government web portals including the myGovernment Portal, Department of Environment, Department of Agriculture, Malaysia Trade and Industry, Ministry of Education, Malaysian Qualification Agency, Bank Negara Malaysia. The study focus on online available website evaluation tools namely [13] [15]:

- The MarkUp Validator. - Also known as the HTML validator.
- The Link Checker - Checks anchors (hyperlinks) in a HTML/XHTML document.
- The CSS Validator - Validates CSS stylesheets or documents using CSS stylesheets.
- Web Accessibility Evaluation Tool (WAVE) - A free web accessibility evaluation tool that

  aid humans in the web accessibility evaluation process.

The results of this test are discussed on Chapter 4.

3.2.2 Conceptual Design

During this stage, a site design and architecture of the website is created at abstract level. The flow on how the process of evaluating and validating the portal is shown in a flowchart. This is to show the basic concept behind the scene on what is happening on the web usability evaluation tool.

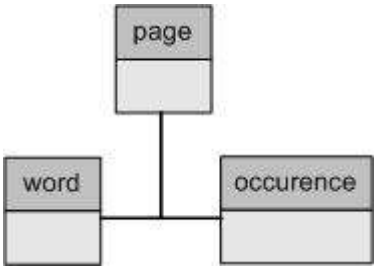


Figure 3.1 Database representation

Referring Figure 3.1, the database for the search engine consists of three tables: page, word, and occurrence. 'page' holds all indexed web pages, and 'word' holds all of the words found on the indexed pages. The rows in occurrence correlate words to their containing pages. Each row represents one occurrence of one particular word on one particular page. For this project, author is going to use mySQL and PHP and it back-end language.

For this database concept and search engine foundation, author looked up to Daniel Solin's [27] model of search engine. From there, author refines it and customized it to make it in line with the requirements.

```
CREATE TABLE page (
   page_id int(10) unsigned NOT NULL auto_increment,
   page_url varchar(200) NOT NULL default '',
   PRIMARY KEY (page_id)
) TYPE=MyISAM;

CREATE TABLE word (
   word_id int(10) unsigned NOT NULL auto_increment,
   word_word varchar(50) NOT NULL default '',
   PRIMARY KEY (word_id)
) TYPE=MyISAM;

CREATE TABLE occurrence (
   occurrence_id int(10) unsigned NOT NULL auto_increment,
   word_id int(10) unsigned NOT NULL default '0',
   page_id int(10) unsigned NOT NULL default '0',
   PRIMARY KEY (occurrence_id)
) TYPE=MyISAM;
```

The SQL code above will create the tables needed to complete the search engine.

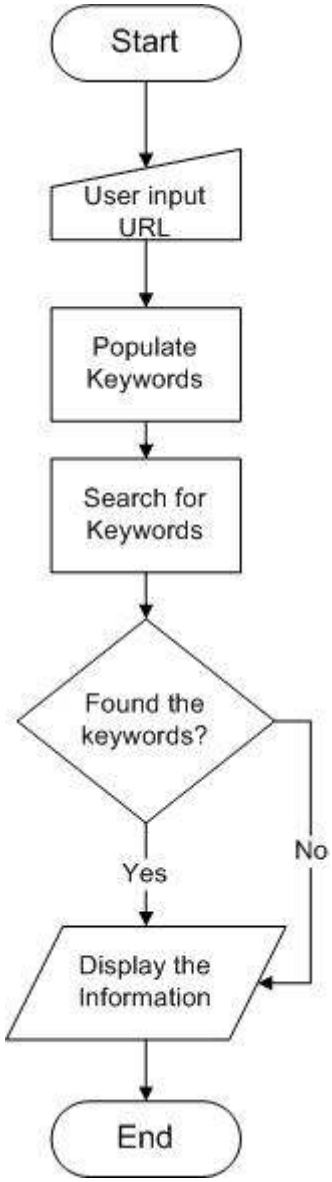


Figure 3.2: Flow Chart on the Evaluation and Validation Process

Figure 3.2 shows the basic flow on how the website works. First, user will input the URL of the site that is about to be evaluate. Then, the website will populate all the keywords and insert it into the database. After that, the search function will do the keyword searching. If the keywords are found, it will display the results on the next page. This is the basic fundamentals on how the program is going to run.

```
/* Start parsing through the text, and build an index in the database: */
if( !($fd = fopen($url,"r")) )

  die("<center><br>Could not open URL! <br><br> <a
href=\"javascript:history.back()\">Back</a></center> <br><br><br>" );

while( $buf = fgets($fd,1024) )
{
  /* Remove whitespace from beginning and end of string: */
  $buf = trim($buf);

  /* Try to remove all HTML-tags: */
  $buf = strip_tags($buf);
  $buf = ereg_replace('/&\w;/', '', $buf);

  /* Extract all words matching the regexp from the current line: */
  preg_match_all("/(\b[\w+]+\b)/",$buf,$words);

  /* Loop through all words/occurrences and insert them into the database: */
  for( $i = 0; $words[$i]; $i++ )
  {
    for( $j = 0; $words[$i][$j]; $j++ )
    {
      /* Does the current word already have a record in the word-table? */
      $cur_word = addslashes( strtolower($words[$i][$j]) );

      $result = mysql_query("SELECT word_id FROM word
                        WHERE word_word = '$cur_word'");
      $row = mysql_fetch_array($result);
      if( $row['word_id'] )
      {
        /* If yes, use the old word_id: */
        $word_id = $row['word_id'];
      }
      else
      {
        /* If not, create one: */
        mysql_query("INSERT INTO word (word_word) VALUES
(\"$cur_word\")");
        $word_id = mysql_insert_id();
      }

      /* And finally, register the occurrence of the word: */
      mysql_query("INSERT INTO occurrence (word_id,page_id)
              VALUES ($word_id,$page_id)");
      print "Indexing: $cur_word<br>";
}       }       }
```

Code above will populate the keywords and store it into the database.

```
function getResult($keyword) {


        /* Execute the query that performs the actual search in the DB: */
        $result = mysql_query(" SELECT p.page_url AS url,
                COUNT(*) AS occurrences
                FROM page p, word w, occurrence o
                WHERE p.page_id = o.page_id AND
                w.word_id = o.word_id AND
                w.word_word = \"$keyword\"
                GROUP BY p.page_id
                ORDER BY occurrences DESC " );

if (mysql_num_rows($result) == 0)

{
        print "Keyword : '".$keyword."' -\n";
        print "<font color='red'>  Nowhere to be found <br></font>";
}

 else
 {
        /* Present the search-results: */
        print "Keyword : ".$keyword." -\n";
        for( $i = 1; $row = mysql_fetch_array($result); $i++ )
  {
    print "<a href='".$row['url']."'>".$row['url']."</a> \n";
    print "(occurrences: ".$row['occurrences'].")<br><br>\n";
  }

 }

}


--------------------------------------------------------------------------------

print " <h2>Search result for Official </h2>";

        getResult('official');

print " <h2>Search result for About / Profile</h2>";

        getResult('about');
        getResult('profile');
        getResult('profile');
```

Code above will do the search function with the desired keyword.

3.3 Development Methodology

There are two steps in this Development Methodology Phase which is Prototyping and Production. This phase is includes the real production of the project.

3.3.1 Prototypes

During this stage, the real prototype is created with few objectives are set to be tested. Visual representation of the website is created. Soon after that, usability testing are supposed to be run through focus groups which includes the web developer of the E-government portals, user test which is random selection of people are asked to test the website and walkthrough which is ask a user to test thoroughly the site function.

From the tests, results are used to create refined mock-ups and improved prototypes. These designing steps are repeated until the design and usability goals are met.

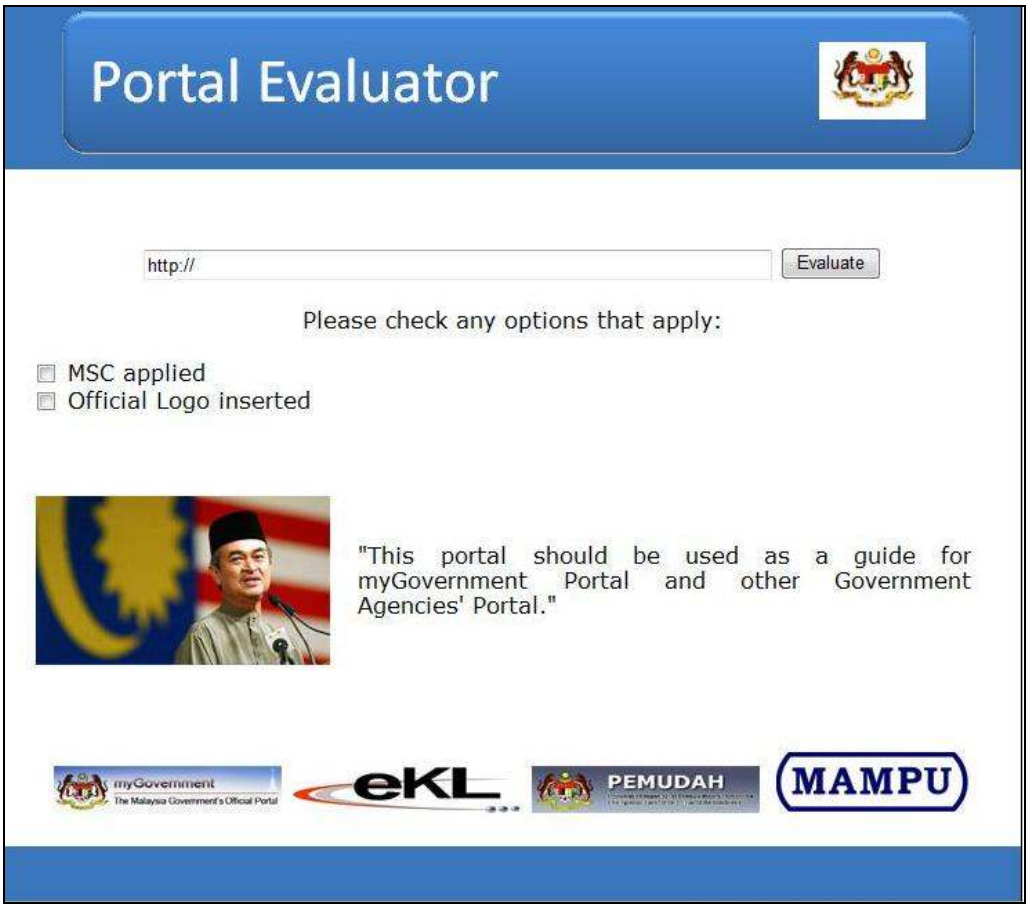


Figure 3.3 First Prototype

Figure 3.3 represent the first prototype that author created. But as the process going, the concept is not logical as come complications are found in PHP language where in one form, if user chose to do multiple actions, author needs to restructure its whole program and that would be un-economical to the completion of the project.

3.3.2 Production

In this phase, final product is created based on the feedback from the prototypes. The functionality is evaluated through testing and then results are again used to improve the website. The process again going to be repeated until all the objectives are met. In this stage, all the functions namely populating keyword and personalized keyword searching are being done and working.

Figure 3.4 Front-page of the System

Figure 3.3 shows the working production of the system where users can key in the website address and then chose whether to validate it in Bahasa Malaysia language or English language. If the evaluator clicks on the 'English' button, the automated evaluation will be done in English and the results will only shows English keywords. This concept where user chose two options between English Language and Bahasa Malaysia is more appropriate as the PHP language allows it and this accommodate the objective.

CHAPTER 4

RESULT AND DISCUSSION

4.1 Results and Discussion

In this phase, real products are shown and results are as follows.

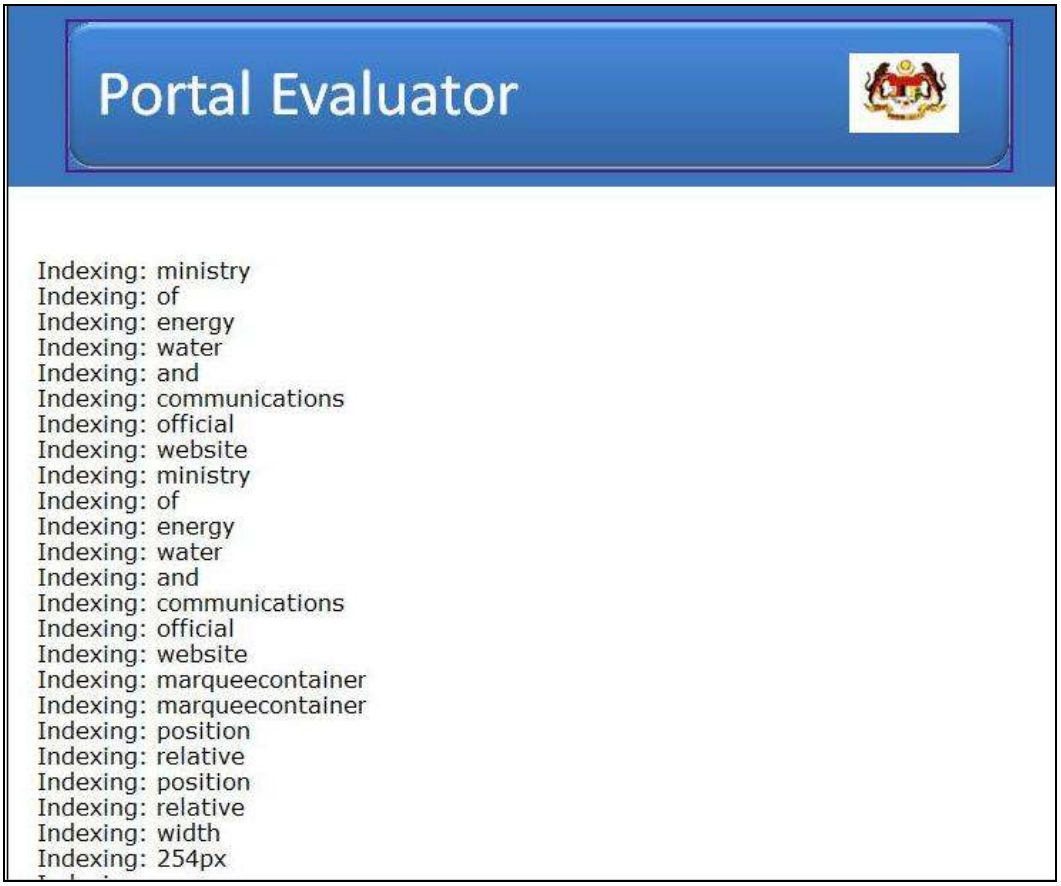


Figure 4.1 Populating the keywords

In this stage, it is shown in figure 4.1 that the "populate function" is populating all the keyword and inserting it into the database. In database, the keywords are being inserted into the table named 'word' as shown in Figure 4.2 below.

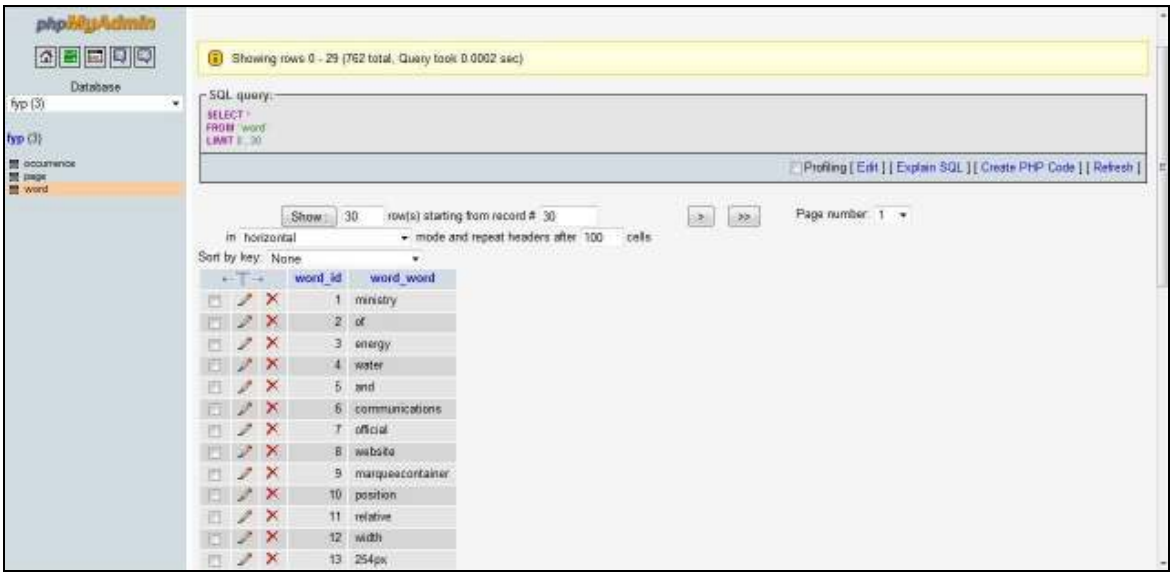


Figure 4.2 Keywords in the database

Figure 4.3 Results of the searching

As figure 4.3 shows, the results on selected characteristics are shown. All the keywords according to language are shown beside to the search results. This is convenient to the evaluator to cross check on the keyword before doing the thorough check on the real system.

As from the results, the primary objective can be considered achieved if not successfully as it will help the evaluator to clearly identify and note the area that which the myGovernment portal is lacking of.

4.2 Testing

In this phase, author has done testing to multiple E-Government Website and the results are as follows:

Figure 4.4 shows testing on Ministry of International Trade and Industry's Portal.

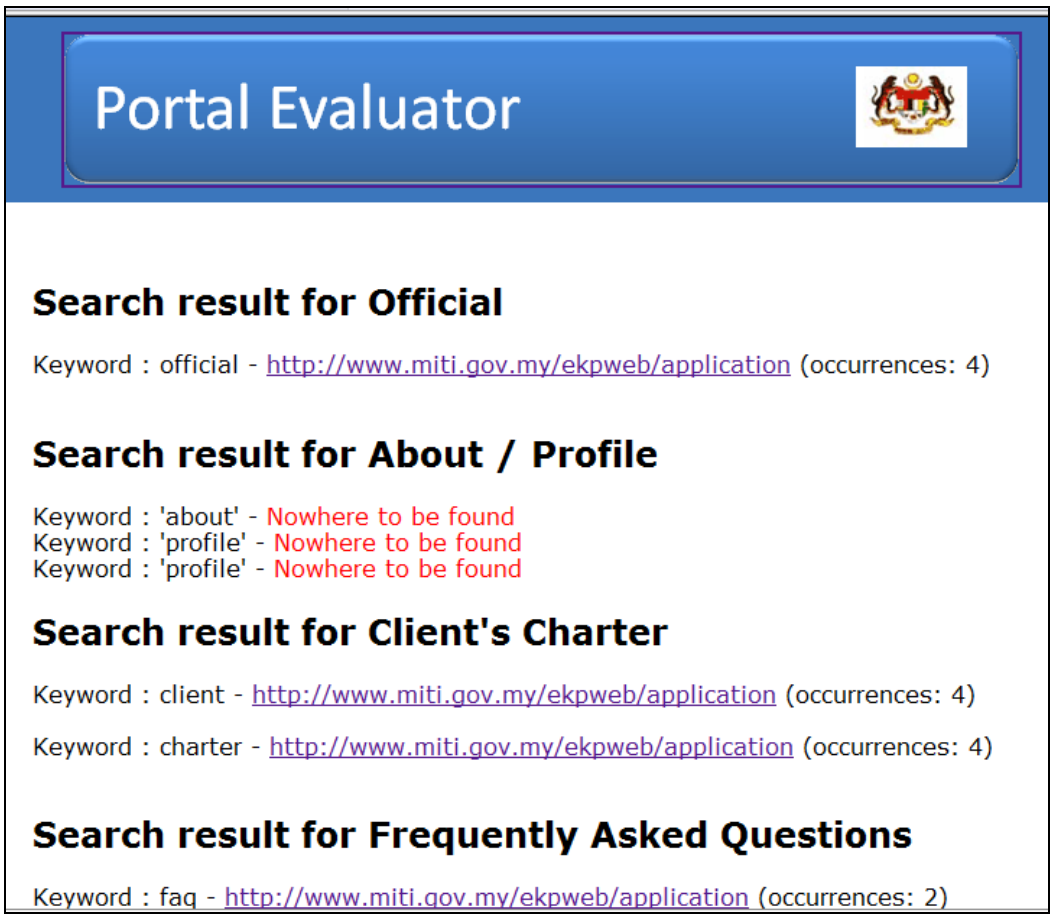


Figure 4.4 Testing on Ministry of Trade's Portal

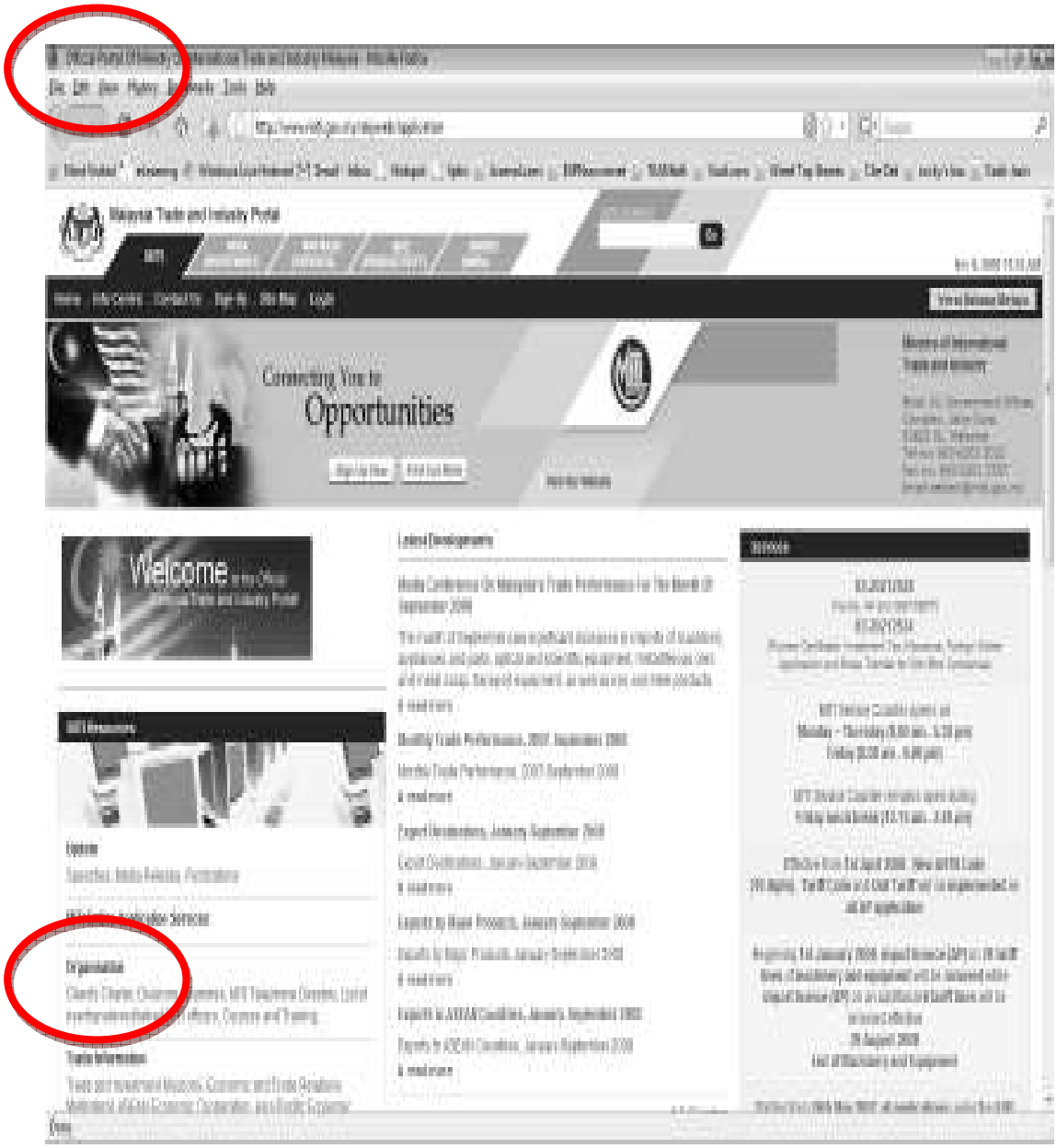


Figure 4.5 Ministry of Trade's Portal

From figure 4.5 above, it is clearly shown that the search function found the "Client's Charter" and "Official Portal" while Agency's profile was nowhere to be found. This clearly shows that the primary objective, aiding human to reduce time and workload of evaluating is achieved.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The primary objective, to automate the process of validating the portal has been successfully met.

Expert interview with staffs from MAMPU has been conducted to gather information about the system and it is possible that the system will be apply but major reconstruction need to be done with proper testing and functionality review.

The step by step development has been reported clearly in previous chapter. The programming has been shared thoroughly. The system interface as well as its operation has been explained. Database development and how it integrates with the system are also detailed out. At the end, a complete system was developed taking into consideration reliability and cost effectiveness. This criteria has been proven with series of test conducted hence justify the claim.

Even though the system did not validate the whole twenty-two criteria, the idea that it helps reduce the workload and time of validating is met. As an aid to human validation, this tool is not expected to work like a human, but to help, to assist in human evaluation process. No machine can replace human and this system is too, will just be the sidekick for the human evaluator.

The author actually planned to venture into more serious evaluation by using image recognition but the resources limited him thus this plan will be bring forward as future plan for recommendation.

5.2 Recommendation

This project has great potential to be extended incorporating many more functionalities. Therefore several recommendations need to be highlighted for those who are interested to continue this project. The project is also left with several areas that still can undergo extensive studies and fields that have potential continuation.

5.2.1 Ability to Evaluate Flash-based Website

For future work, the system can be further enhanced to evaluate flash-based website. Since the system only works on text-based website, more dynamic website is coming out and the evaluator needs to cater the functionality.

5.2.2 Ability to Recognise Image on the Portal

The system could not evaluate any image required in the guideline. Thus, any technology such as image recognition could be useful to validate any image appeared on the website

5.2.3 Offline Evaluation

This system relies heavily on internet connection, thus when internet connection is unavailable, the system become legacy. So an offline evaluation method will be very useful.

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APPENDICES