

WEB CONTENT ACCESSIBILITY MODEL FOR PUBLIC HOSPITALS IN THAILAND

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Abstract - Thai Government policy is to reduce social inequality and increase opportunities to access government services. However, most Thai websites do not support ubiquitous ingress, especially regarding health content which is important to enhance quality of life. Design of effective hospital websites is paramount for the public to source information concerning health care. The “W3C@SDU Model” is proposed as suitable for public hospitals in Thailand. This model consists of seven components as web developer, consciousness, content, concept, standard, director of hospital and university. Hospital directors and web developers must be conscious that content access is available to all user groups, particularly the elderly and those with disabilities, who have more complex problems and needs. Furthermore, they must understand and comprehend the principles of developing a website with easy user accessibility by following both WCAG 2.0 and government website standards. Universities should increase consciousness of these issues among students studying courses related to web development. Public hospitals and other government institutions can use this model to develop their websites according to government website standards so that the websites are easily accessible by everyone.

Keywords - Web Content Accessibility, W3C, Public Hospital Website, Health Content, Disability, Elderly, Thailand

I. INTRODUCTION

A website is an important source of information and knowledge that users can access anytime, anywhere. Therefore, website development should be supported and promoted to provide optimal content and services for the benefit of the public. Thailand operates an information technology policy framework which sets out the vision of an e-society, whereby everyone can access and use information technology on equal terms to maintain a social and economic balance. Nowadays, many websites provide news and useful information including hospital web pages that impart health information. Many people access hospital websites to search for health information; however, only some achieve their aims while others such as the disabled and the elderly have difficulty. Most websites are not geared up or designed to facilitate information access for all user groups. Users with disabilities require adaptive features to more easily access information and services provided by websites. Therefore, website developers must use adaptable software systems to encourage user heterogeneity [1-2].

Website developers in foreign countries have recognized the disparity in website content access for the disabled and the elderly. They support a universal design (UD) website created following guidelines set by the World Wide Web Consortium (W3C) [3] as an environment that can be accessed, understood and used by all people regardless of their age, size, ability or disability. Many countries are interested in analyzing web accessibility, web evaluation, web development and web improvement to allow universal access to web content [1-2, 4-5, 7-8]. The World Wide Web Consortium (W3C) has published

Web Content Access Guidelines (WCAG) 2.0 with success criteria to attain the goals of accessible web content for everyone, including those with disabilities and the elderly [4]. Achieving web accessibility will allow all types of users to access web content equally without any barriers [5]. Success criteria can be tested for each guideline according to the requirements which match the needs of different groups. Three levels of consistency have been defined as A (minimum), AA and AAA (maximum) [2, 6-7]. Tools used to evaluate accessibility include WAVE, A Checker, TAW, and HTML Tidy [8].

Furthermore, the website, <http://validator.w3.org>, can be used to check the website for W3C standards or not. The methodology to improve web accessibility is based on front-end adaptation of web content presentation using CSS, JQuery and JavaScript technologies [9]. Project managers are tasked with the responsibility to ensure that web teams adhere to accessibility principles [10]. Although Thailand enforces information and computer technology (ICT) laws for people with disabilities, most Thai websites do not support universal access to content because web designers and developers do not follow WCAG 2.0 guidelines, standards, and techniques for web accessibility. Therefore, here, a web content accessibility model for public hospitals in Thailand was developed to match the needs of users with equal universal access. Many people look to the web to source information concerning health care, particularly those with disabilities and the elderly. Thus, this research study aims to 1) evaluate web content accessibility for public hospitals in Thailand, 2) analyze the contents of public hospital websites in Thailand following the government website standard, 3) study problems concerning website access and user

needs of public hospital websites in Thailand, and 4) develop a web content accessibility model for public hospitals in Thailand. The remainder of this paper is organized in the following manner. In Section 2, the details experimental is described. Results and discussion are presented in Section 3. In Section 4, conclusion is described to show benefit of the Model.

II. DETAILS EXPERIMENTAL

2.1. Data collection

Both quantitative and qualitative research methods were employed. The population consisted of 998 public hospital websites in Thailand as quantitative research. Samples were selected from government hospital websites that performed standard inspections as specified by the World Wide Web Consortium (W3C), with the least error of 278 websites. Qualitative research consisted of in-depth interviews with 15 key informants and a focus group involving 12 key informants. Research instruments used for data gathering comprised 1) evaluation forms to access website content, 2) forms of web content analysis following the government website standard, 3) in-depth interviews, and 4) focus group notes. Data were collected from 1 October 2016 to 30 September 2017.

Methodology for quantitative research:

- 1) Evaluate web content accessibility for public hospitals in Thailand (998 websites) using automatic and manual checking at Level A success criteria of WCAG 2.0 during May 2017.
- 2) Analyze and synthesize website content for the least error 278 websites following the government website standard.

Methodology for qualitative research:

- 1) Assess the problems of website access and user needs of public hospitals websites in Thailand through in-depth interviews with 15 key informants consisting of the disabled, the elderly and general people.
- 2) Develop guidelines for a web content accessibility model for public hospitals in Thailand using data generated from a focus group discussion with 12 key informants consisting of public hospital web developers, users and website evaluators.
- 3) Apply the model to develop public hospital websites for easy access by everyone with reference to the government website standard.
- 4) Assess the ability to access website content and inquire about the satisfaction of those who visited the prototype website developed from the W3C@SDU Model through in-depth interviews with 15 key informants consisting of the disabled, the elderly and general people.

2.2. Data analysis

The triangulation technique was used to analyze data from in-depth interviews, while information imparted from focus group discussions was assessed using content analysis techniques.

III. RESULTS AND DISCUSSION

3.1. Web content accessibility for public hospitals in Thailand

From a total of 998 public hospitals in Thailand, 739 have websites. Checking websites for accessibility can be done by automatic checking and manual checking.

3.1.1. Automatic checking

Automatic checking using the website <http://validator.w3.org> at Level A success criteria found that no hospital website passed the content accessibility evaluation because the websites that can be verified have errors and warnings in the content accessibility for every hospital (722 hospitals). The results of the evaluation of web content accessibility for public hospitals that have websites (739 hospitals) by automatic checking are shown in Table 1.

Automatic Checking Results	No. of Hospitals	Percent (%)
The website has errors and warning when accessing the content.	722	97.70
Users cannot access the website.	10	1.35
The program cannot check the website.	6	0.81
The webpage does not show any content.	1	0.14

Table 1: The results of the evaluation of web content accessibility for public hospitals in Thailand by automatic checking

Evaluation results showed that all websites have errors and warnings because web developers at public hospitals do not design the webpage for universal access, especially for the disabled and the elderly. They appear not to understand the principles of website development that everyone can access. Therefore, they should study web development methods and edit their site designs to remove errors and warnings in accessing content in accordance with the principles.

3.1.2. Manual checking

The evaluation of web content accessibility for public hospitals in Thailand by manual checking at Level A success criteria of WCAG 2.0 consists of four principles (perceivable, operable, understandable, and

robust). The results of the evaluation of web content accessibility for public hospitals in Thailand (998 hospitals) by manual checking are shown in Table 2.

Success Criteria	No. of Websites	Percent (%)
Users can access content with a keyboard.	728	72.95
The web doesn't have movement, flashes, or scroll up and down.	409	40.98
There is audio and/or video.	123	12.32
There is a volume control button that can stop, mute, or adjust the volume.	122	12.22
There are captions when pointing the mouse.	100	10.02
The user can stop motion, flash, or scroll up and down.	88	8.82
There are captions when pointing the mouse relative to what is shown.	49	4.91
There is a description for the menu name.	43	4.31
There are buttons or menus that can change the font size.	25	2.51

Table 2: The results of the evaluation of web content accessibility for public hospitals in Thailand by manual checking

Evaluation results also indicated that not many public hospitals develop websites following WCAG standards because web developers do not consider these criteria. Therefore, they should study WCAG criteria and develop websites for the benefit of all users.

3.2. The contents for public hospital websites in Thailand

The contents for most public hospital websites in Thailand does not match the Government Website Standard Version 2.0. Specifically, some elements are available on the websites of a few hospitals (<5%), as detailed in Table 3. Analysis and synthesis of web content in accordance with public website standards determined that many content components appeared on only a few public hospital websites. Website development does not follow WCAG standards. Therefore, web developers should develop websites in accordance with the aforementioned standards so that all groups of users can receive benefits.

Issues / Suggestions	No. of Websites	Percent (%)
There is a manual or instructions for the operation of the staff.	0	0.00
There is an application to assist people according to the mission of the organization.	1	0.36
The information has been to the web https://www.info.go.th is a center for seeking government services.	3	1.08
There are cabinet resolutions.	5	1.80
There are buttons or menus to increase or decrease the font size and specify the minimum browser version.	6	2.16
There are concession contracts or joint venture contracts with private companies.	9	3.24
There is a question and answer section (Q&A).	11	3.96
There is a CIO event calendar.	13	4.68

Table 3: Elements of the government website standards that appear on the public hospital websites in Thailand (<5%)

3.3. Web accessibility problems and user needs of public hospital websites in Thailand

3.3.1. Web accessibility problems

Problems in terms of accessing public hospital websites in Thailand for the general people, the disabled and the elderly can be summarized as

follows: As for the process, many websites have too many sub-menus, making it difficult to access the content. In addition, the contact information is in a location that is rarely seen. As for the design, the webpage has too much text, the color of the text and background are harmonized, which makes it difficult to read, menus are rare and not meaningful, difficult and complicated menu operations, while important

and searchable information is on the bottom of the webpage, which makes it difficult to find. Further, there is too much information promoting corporate activities, there are no captions and most CAPTCHA (Completely Automated Public Turing Computer and Humans Apart) have no sound. As for the content, the problems include not finding the information you seek, being unable to access the information you need, having a difficult time finding information, and the hyperlink cannot be linked. In addition, the content on the hospital website lacks some important information such as details about doctors. There may also be no clear categorization, which makes information difficult to find.

3.3.2. Needs of web users

The user needs of public hospital websites in Thailand for general people, the disabled and the elderly can be summarized as follows: For the process, the webpage should not have too many sub-menus, and the information used to contact the hospital should be moved to a more prominent location, such as the top of the homepage of the website. Contact information, department information and doctor-related information should be on the top page of the website. Using images without captions should be avoided. The images used should have captions. In addition, the webpage should have images detailing the process for using the service. As for the design, the user wants to reduce textual information and add more images but requires captions. The image description should be included in the alt tag. The menu should use words that are easy to understand and not complicated, while the web structure should be categorized. Moreover, if the webpage has a table, it must have a header. As for the content, the homepage requires information that is more useful to users than staff, such as doctors' names and schedules.

Websites shouldn't add .pdf files because screen reader programs sometimes can't read them. Content on the web should use words that are easy to understand or use more descriptive images, such as info graphics, and have various procedures. Furthermore, if there is a video, it should have subtitles. Web accessibility problems impact the needs of web users in public hospitals in Thailand. Factors that are obstacles for the disabled and the elderly result from lack of education concerning web accessibility and understanding the terms of access to content by web developers [11].

3.4. The web content accessibility model for public hospitals in Thailand

A small group meeting was held to brainstorm ideas on how to develop public hospital websites for everyone to access, making it a web content accessibility model for public hospital in Thailand,

"W3C@SDU Model". This model consists of seven components as web developer, consciousness, content, concept, standard, director of hospital and university, which are shown in Fig.1 with the following details:

W: Web developers

The web developers who develop the website to be able to connect with users and check and improve the weakness of the website must take into account all groups of users, including the disabled, the elderly or even patients with seizure diseases. Therefore, they must understand the guidelines to develop web content accessibility, website accessibility checking, the standard of WCAG 2.0 and the government website standards. In addition, they should pay attention to the accuracy and completeness of content while making sure it is up-to-date.

C: Consciousness

Hospital directors and web developers must be conscious that content access is available to all user groups, particularly the elderly and those with disabilities, who may have more complex problems and needs. If they do not have consciousness and do not consider the users, there may be inequality in accessing health information, which may affect the management of the public health system of the country.

C: Content

Content is very important in web development. If everyone can access the contents on public hospital websites, it will benefit users, allowing them to find and use information to strengthen health on their own and reduce social gaps in the digital age. The website content should have the following characteristics:

- 1) People with visual disabilities will focus on textual content. If there are images, however, add captions on meaningful websites as well.
- 2) People with hearing disabilities need images to be presented. If they are letters, use words that are easy to understand and do not use too many technical terms. In addition, if there is sign language on the website, it will be highly useful.
- 3) The elderly wants to have content management systematically to be easy to find. It would also be helpful to enlarge the letters as needed.
- 4) Patients with seizure diseases cannot see characters or images that are flashing quickly. Therefore, any animations should be in slow motion or use slow-changing images. There should also be a button to stop the animation, if desired.

C: Concept

Web developers must understand and comprehend the principles of developing a website with easy user accessibility by following WCAG 2.0. The four main guiding principles of accessibility in WCAG 2.0 are:

1) Perceivable

Information and user interface components must be presentable to users in ways they can perceive. For example, there is text to describe the image and video, there is sign language, the color of the background and font color will be different, and there is a letter symbol A⁺, A and A⁻ to choose for reducing or enlarging the letters.

2) Operable

User interface components and navigation must be operable. For example, users can access website content using a keyboard from a screen reader program. If a character is entered, it must not move too quickly. If the image is changed, it should not be switched too quickly.

3) Understandable

Information and the operation of the user interface must be understandable. For example, there must be a clear separation of content structure on the webpage. If the webpage inserts a table, it must have a header. The language used should be accurate, meaning the use of words that are easy to understand and uncomplicated.

4) Robust

Content must be robust enough so that it can be interpreted reliably by a wide variety of user agents, including assistive technologies. For example, each element must have a complete start/end tag and no duplicate attribute or ID if using computer language to describe the content (Markup Language).

S: Standard

The contents of public hospital websites should be in accordance with Government Web Standard Version 2.0, consisting of the following 8 components: name of government website, basic information about the organization, information that the people can verify, public participation, corporate services recommended features, website security and policy.

D: Director of Hospital

Public hospital administrators or directors should have knowledge and understanding about the importance of website development for everyone to access in order to set a policy for relevant parties to comply with WCAG 2.0 standards and government web standard.

U: University

Universities should develop information technology courses to include content related to web development for everyone to access and create awareness among students about these issues. This public hospital website model involves collaboration between the director of public hospitals, web developers and universities in Thailand, using website development principles that everyone can access by following both WCAG 2.0 and government website standards. For web designers and web developers should consider W3C guidelines,

especially with the ever-increasing numbers of disabled and elderly people, to provide equal rights of access to website information [12]. The government should adjust guidelines to access government websites or develop methods that are suitable in an organizational context.



Fig.1. Web content accessibility model for public hospital in Thailand (W3C@SDU Model).

IV. CONCLUSIONS

"W3C@SDU" is a model for creating website content that everyone can access. Public hospitals and other government institutions can use this model to develop their websites according to government website standards so that the websites are easily accessible by everyone. The use of this model will enable website developers to easily maintain and improve the websites, reducing costs and budgeting for website maintenance because it is standardized website development. Moreover, this model can be used as a guideline for establishing the ICT policy of the Ministry of Public Health in accordance with government website standards. In addition, using the "W3C@SDU Model" to create web content for the organization will result in all website users, including general people, disabled groups, and the elderly, being able to access information and knowledge about health through sustainable lifelong learning. Therefore, all groups of users being able access the web content equally, use information and knowledge to utilize in daily life, will result in better quality-of-life and have the power to develop society as well as the nation.

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