Web Accessibility Model for Visually Impaired Students on eLearning in Higher Education

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Abstract

More than a decade ago, internet had gradually come to play a major role in the world as it was an advance technological tool provided various benefits to human being. Internet could also influence in educational field because it was the advance media to create distance learning in term of online learning or eLearning. Many universities and colleges have turned to focus on eLearning class instead of traditional class due to students and teachers could access anywhere and anytime. Internet learning or eLearning also well enabled visually-impaired students to access more materials and work more independently than what they could do via traditional method. In the meantime, eLearning could provide effective learning for higher education to all people who need to continue their studies without being required to enroll in traditional academic system because those people could apply, register, study, and take examination through their own computer based. However, the information and activities posted via internet learning were not fully appropriately accessible with adaptive technology used by general visually-impaired students. Therefore, all eLearning websites should be focused on the issue of accessibility to facilitate visually-impaired students to effectively access including eLearning for higher education. This paper therefore would be proposed the eLearning model used for creating success eLearning on higher education together with the factors assisted to create effective eLearning for higher education, and component required to create accessibility of eLearning for higher education to support visually-impaired students. This paper could summarize that to create effective eLearning for higher education that could support the accessibility of visually-impaired students, there were four factors required to focus on for developing eLearning for higher education and the eLearning website must consist of four components guideline.

Keywords – eLearning Model, ELearning, Higher Education, online education, visually-impaired students, web accessibility.

1. Introduction

More than a decade ago, the World Wild Web or known as WWW for short became a new gateway to communicate. It also called Internet is a most popular thing and wild spread to almost every households. People are now communicate to each other and sharing information as fast as a matter of second. As fast as the technology changed the Internet became one of a valuable tool for distance learning. As the economy grew alongside the technology, distance learning has become one of a high profit margin in education industry. ELearning websites is the advance developed tool in the twenty-first century which will generate new era of education under the concept of anyone can study in anywhere at any time.

Many Universities and Colleges throughout the world have turned their focuses from a traditional face-to-face classroom to a new way of learning at-home-base classroom, which fit many life who don’t have the luxury of times, transportation, and importantly financial. According to Arrigo (2002), since the middle of the 1990s, the number of colleges and universities which have provided courses and degree programs via eLearning mode has been growing dramatically. And in 2005, as one of
the example of many universities, The University of Phoenix had a high number of online learners of more than 140,000 and earned approximately 5,700 million baht per year (Charmonman, 2005). The Blue Ocean Strategy was then created from numerous case studies and used in the rapid growth of internet learning business.

Meanwhile, according to Royal College for the Blind (2002), eLearning via the Internet is well enable visually-impaired students to access more materials and work more independently than they could using traditional method.

The Institution of higher education policy (1999) done a comprehensive research on how the effectiveness of distance learning. There are five main reason found from this research, times, individual learning process, technology problems, and motivation support.

However as many reasons from many researches and case studies, there are still many more strategies and models to develop under many circumstances throughout the learning process and preparation on both learners and administrators to which make the most successful in eLearning for higher education particularly in Thailand.

In the meantime, most online educational environments were still not accessible to students with disabilities, together with the information and activities posted were not appropriately accessible with adaptive technology used by general visually-impaired students (Arrigo, 2005). Therefore, all eLearning websites particularly eLearning websites developed to facilitate visually-impaired students should be focused on the issue of web accessibility to facilitate visually-impaired students to effectively access. But, to create web accessibility in any website for visually-impaired users, it cannot be relied only one or two things. Beside that there are several components required to create web accessibility to facilitate this group of users.

As a result, the aim of this paper would be done to present how to develop success eLearning model for higher education and to effectively support the accessibility of visually-impaired students. This paper would be divided into two main sections: First, to propose the eLearning model for higher education in Thailand by finding out the factors effecting to create success eLearning model for higher education and evaluation concept of the eLearning model. And, second, to propose the component of accessibility that necessary required relying on for developing eLearning for higher education that enable to support the accessibility of visually-impaired students.

2. ELearning and Higher Education

E Learning is the transforming learning delivery where allowing to the reach online source of information which is the solution for individual study and can reduce the pride and stimulate the common coalition (Sloan-C, 2007).

Higher Education could be referred as postsecondary education at colleges, universities, junior or community colleges, professional schools, technical institutes, and teacher-training schools (EducationUSA, 2008).

3. Visually Impaired People and Visually Impaired Student

Several definitions regarding the term “Visual impairment” are identified from various sources. According to Beverley, Bath, and Barber (2007), numerous formal definitions of visual impairment issued worldwide, and all definitions cover a broad spectrum ranging from people who are partially sighted to people who are completely blind.

The World Health Organization defined the visually-impaired people as any person who has visual acuity of less than 6/120 [<20/400].

The legal definition of visually impaired people was those who have visual acuity of not greater than 20/200 in the better eye with correction or a field not subtending an angle greater than 20 degrees (Jernigan, 2002).

The definition ‘visually-impaired students’ therefore refers to those students who have impairment on their visual which did not affect their intellectual skill to study.
4. Effective Factors to eLearning Model for Higher Education

It is widely mentioned that eLearning occurs in a wide range of teaching activities where technology of one form or another is involved. According to The Institute for Higher Education Policy in 2000, the insights gleaned from the study of QUALITY ON THE LINE demonstrated that the effected factors for eLearning environments are institutional support, course development, teaching or learning process, course structure, student support, faculty support, evaluation and assessment.


In addition, an empirical study among college students suggested that a framework for the Critical success factors in online education focused on three aspects in eLearning includes technology, instructor and the previous use of the technology from a student’s perspective (Volery, 2000).

Furthermore according to Soong, Chan, Chua and Loh (2001); Graf and Caines (2001); Oliver (2001); Govindasamy (2002); and Vate-U-Lan (2008), it could be summarized the factors effecting to create success eLearning model for higher education into four main keys includes human deliberation factor, instructional design factor, technology development factor, and social delivery factor.

4.1 Deliberation of Human

In general, the term “human deliberation” combined by 2 words which were “Human” and “Deliberation”. The term Deliberation itself referred as a process in which members of a community talk together about a common problem by considering different experiences and weighing the costs and benefits of various options for action in an effort to identify common ground (Partners of the Americas, 2005). So, Human deliberation could be considered as the process done by people which referred as people.

For eLearning model field, human deliberation therefore could be explained as the process done by belonging people in eLearning to participate in cost/benefit and various options of eLearning operation. According to Soong, Chan, Chua and Loh (2001), the key main factor effecting to create eLearning model for higher education was human factors in terms of technical competency of both instructor and student, eLearning mindset of both instructor and student, and level of collaboration between instructors and students. Meanwhile, Graf and Caines (2001) mentioned that one key factor was the student participation to study. Oliver (2001) said two out of four major issues confronting the successful adoption and sustained use of eLearning in Australian higher education were belonged to human deliberation includes teacher expertise in online teaching, and student readiness to move online. In addition, factors effected for successful eLearning implementation were institutional support, student support, and faculty support (Govindasamy, 2002).

Finally, Vate-U-Lan (2008), one of the factors in HITS model for success eLearning implementation was human factor.

4.2 Design of Instruction

Wikipedia (2009), Instructional Design could be defined as the practice of maximizing the effectiveness, efficiency and appeal of instruction and other learning experiences. The process covered to determine the current state and needs of the learner, to define the end goal of instruction, and to create some intervention to assist in the transition. Generally, the process informed by pedagogically or adult learning tested theories of learning and may take place in student-only, teacher-led or community-based settings (Wikipedia, 2009).

Graf and Caines (2001) proposed six items of content robustness as the criteria to measure success eLearning that belonged to instructional
design which referred to the degree to which the course content is available online, how it is structured, the use of images and graphics, and the degree of interaction among students and with the lecturer and the type and quality of student assessment. In the meantime, instructional design was one factor to implement success eLearning according to Vate-U-Lan (2008). In addition Oliver (2001) one of the factors to support and sustain quality in eLearning programs illustrated was provision of content and learning resources and instructional designs. And Govindasamy (2002) the factors effected for successful eLearning implementation were course development, course structure, and evaluation and assessment. These could be classified as the factor of instructional design.

4.3 Development of Technology

Technological development was the process of research and development of technology, which were expected to become generally applied in the near future (Haller, 1996).

Soong, Chan, Chua and Loh (2001) stated that one factor effecting success eLearning was perceived information technology infrastructure provided to teachers and learners. While, one of the key success factor to create sustained use of eLearning in Australian higher education was the factor regarding to technology infrastructure (Oliver, 2001). Then, in HITS model of success eLearning implementation, technology was another factor proposed to implement success eLearning (Vate-U-Lan, 2008). Finally Graf and Caines (2001), one of the effective factors to create success eLearning was technology used for encouraging degree of interaction among students and lecturer, and student participation to study.

4.4 Delivery of Social

The term social delivery generally referred as the output contributed by social to specific case, so it should be defined in terms of productivity, maintenance, and development of social toward specific case or idea(Holland, 1974)..< This could be implied in eLearning as the contribution to create success eLearning for higher education from social factor.

According to Graf and Caines (2001), there were some items in 10 items of academic rigor and 6 items of content robustness proposed for measuring success of eLearning that belonged to social delivery, such items as student participation, course content, course structure, and answering resource. Oliver (2001), one of factor that belonged to social delivery which leads to sustain adoption of online learning for higher education in Australia was provision of content and learning resources given to students. Then, Govindasamy (2002), some factors effected for successful eLearning implementation belonged to social delivery as well, includes course development, and course structure. Finally, Vate-U-Lan (2008) proposed HITS model and classified social as one of the factor in terms of financial support, cultural support, learning content and language support for creating success eLearning.

From all 4 given factors mentioned, in order to create success eLearning for higher education, those 4 factors should be simultaneously implemented and processed together. According to Soong, Chan, Chua and Loh (2001) recommended to implement success eLearning, all factors identified either human or technology must be worked together. These four factors could be called as 4D factors of eLearning for higher education development.

5. Components to Create Accessibility for Visually-Impaired Students on Elearning

According to W3C (2005), it was essential that several different components of Web development and interaction worked together in order for the Web to be accessible to people with disabilities, and four main components includes content which is the information in a Web page or Web application including natural information such as text; images; and sounds, and code or markup that defines structure; presentation; and etc, web browsers including
media players; and other user agents, assistive technology including screen readers; alternative keyboards; switches; scanning software; and etc, and authoring tools which is software that created Websites.

W3C (2005), Those components were required to operate interdependently, as Web developers usually use authoring tools to create Web content, and people who is the users use Web browsers; media players; assistive technologies; or other user agents to get and interact with the content. There were significant interdependencies between the components as the components must work together in order for the Web to be accessible (W3C, 2005).

5.1 Web Content

Web content generally defined as the textual; visual or aural content that was encountered as part of the user experience on websites, and also might be included other things such as text; images; sounds; videos; and animations (Abdelzaher and Bhatti, 1999).

According to W3C (2006), the WCAG was the document explains how to make Web content accessible to people with disabilities. And there were two versions of WCAG were proposed.

There were 8 guidelines effectively supported to visually-impaired people directly to access any website if the web developers rely on to create their web content includes to provide text alternatives for all non-text content; to provide synchronized media equivalents for time-dependent presentations; to ensure that information/functionality/structure are separable from presentation; to distinguish clearly between foreground words and images from the background in visual presentation; to make all functionality operable via a keyboard or a keyboard interface; to facilitate the ability of users to orient themselves and move within the content; to ensure that the meaning of content can be determined; and to organize content consistently from ‘page to page’.

5.2 Web browsers

Web Browser defined as any software that gave a user access to website; and often provide a graphical interface that let users click buttons; icons; and menu options to view and navigate Web pages (Dzbord et al. 2003).

However, according to W3C (2006), the component of web browser was mainly related to user agents including media players; and other ’user agents as well, because web browser has been belonged to users. And, the term user agent was used in two ways includes the software and documentation components that together conform to the requirement to use, and any software that retrieved and renders Web content for user including Web browsers; browser extensions; media players; plug-ins; and other programs that help in retrieving and rendering Web content (W3C, 2006).

According to W3C (2006), User Agent Accessibility Guidelines or UAAG was part of a series of accessibility guidelines published by W3C beside WCAG and ATAG.

The UAAG guideline documents has explained how to make user agents accessible to people with disabilities including visually-impaired users and particularly to increase accessibility to Web content, due to user agents include of web browser together with media players and assistive technology which were software that some people with disabilities use in interacting with computers (W3C, 2006).

Based on UAAG 2.0 which is considered as the latest version of UAAG, the guidelines are as following: to follow applicable specifications and conventions, to facilitate access by assistive technologies, to ensure that the user interface is perceivable, to ensure that the user interface is operable, and to ensure that the user interface is understandable.

5.3 Assistive Technology

Cook and Hussey (2001), Assistive technology is a generic term that includes assistive, adaptive, and rehabilitative devices and the process used in selecting, locating, and using them to support greater independence for people with disabilities by enabling them to perform tasks that they were formerly unable to accomplish or had great difficulty accomplishing by providing enhancements to or
changed methods of interacting with the technology needed to accomplish such tasks.

According to W3C (2005), assistive technology including screen readers; alternative keyboards; switches; and scanning software was the key to support accessing website by disability people.

With this concern, W3C therefore has mentioned about how to use assistive technology to support full accessibility through website, but W3C however did not set up specific guideline like WCAG; ATAG; OR UAAG to apply with assistive technology component, but UAAG was allowed to apply for using with assistive technology.

5.4 Authoring Tools

W3C (2006) defined the term authoring tool as any software or collection of software components that authors could use to create or modify Web content for use by other people.

According to Harrison (2002), when recommended design strategies for the website were implemented which would be supported websites especially eLearning website to be fully accessed by every people including visually-impaired people; any Web-based learning program could potentially be made accessible to students with visual impairment; as assistive technologies like Screen readers or Braille displays could provide audio access for students who are blind and also alternative pointing devices; onscreen keyboards and voice recognition; and other adaptive technologies offered a choice of input and output methods, but however, one of the greatest barriers to access was the lack of authoring tools that support web developers which in line with existing accessibility guidelines.

As a result, W3C had developed the particular guideline to guide the developers to develop and use accessible software supporting to create accessible web content so called Authoring tools accessibility guidelines [ATAG].

In general, the ATAG has provided guidance for developers of software which created content for the web or in a web-based markup language, and the purpose of the Guidelines were to assist developers in designing authoring tools that generate accessible web content and to assist developers in creating an accessible authoring interface (W3C, 2006).

Based on the ATAG 2.0 which is considered as the new latest version and developed from ATAG 1.0, the guidelines includes authoring tool must facilitate access by assistive technologies, authoring tool user interface must be perceivable, authoring tool user interface must be operable, authoring tool user interface must be understandable, production of accessible content must be enabled, authors must be supported in the production of accessible content, and accessibility solutions must be promoted and integrated.

6. Evaluation Criteria

In order to ensure the effective of eLearning model for higher education that could support the accessibility of visually-impaired students. It is required to evaluate both the theme of effective on higher education provided and the theme of effective for accessibility to support visually-impaired students.

For evaluation of effective on higher education provided, according to Hammer and Champy (2003), there were four major criteria applied to evaluate the performance of any operation includes cost efficiency, quality, service, and speed. These criteria could be applied to evaluate the eLearning provided on higher education:

(1) Cost Efficiency
One important part of the eLearning value is the sum of an ability to save money and how much do the benefit generate to the business (enhance skill and knowledge, improve job performance, and impact results). It is called cost efficiency.

(2) Quality
According to Kirkpatrick (1998), there were four levels of quality includes reaction,
learning, performance, and results. Reaction was the typical end-of-course evaluation or rating sheet, while Learning was the evaluation simply as tracking strategy, and Performance was the determination of the effectiveness in the eLearning system to ask eLearners who went through the online learning, finally results were often couched in a demand to prove that eLearning works and works better than others (Kirkpatrick, 1998).

(3) Service
Another important criterion area for eLearning is service, in terms of easy accessibility and the quality of access.

(4) Speed
The last of the four criteria is speed. There are three major considerations: First, how quickly eLearning initiative be up and running (the development question). Second, how quickly can the eLearning initiative reach everyone who needs the content (the delivery question). And third, how fast can the eLearning initiative be altered due to a change in the business or the need to distribute new or revised information. For evaluation of effective on the accessibility for visually-impaired students, once the eLearning model proposed on website to provide higher education mode of studying, the website is required to submit to The National electronic and Computer Technology center (NECTEC) to verify the quality of accessibility. The quality was measured and given through three level: A = acceptable with minor improve, AA = good with minor improve, and AAA = excellence for accessibility.

7. Model Summary

From the data reviewed, this paper could summarize the model to create effective eLearning for higher education and enable to support the accessibility of visually-impaired students as follows:

First, to develop eLearning website for higher education effectively, the developers are required to rely on four key component factors include deliberation of human, design of instruction, development of technology, and delivery of social.

Second, the eLearning website developed for higher education study should constructed based on guidelines given in four components include web content, web browsers, assistive technology, and authoring tools.

These two steps would lead to create effective eLearning for higher education and enable to support visually-impaired students to fully access.

8. Conclusion

This paper found that to create success and effective eLearning for higher education, four factors required to consider while developing the eLearning for higher education study include deliberation of human, design of instruction, development of technology, and delivery of social. And in order to ensure the eLearning for higher education website could support visually-impaired students to access, the website of eLearning for higher education should be developed based on the guideline proposed to create web content, web browsers, assistive technology, and authoring tools. These are all requirements to create effective of eLearning for higher education that enable to support the accessibility of visually-impaired students.

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