Proposed Models of Appropriate Website and Courseware for E-Learning in Higher Education: Research Based Design Models

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Abstract: The purpose of this study was to investigate proper website and courseware for e-learning in higher education. Methods used in this study included the data collection, the analysis surveys, the experts' in-depth interview, and the experts' focus group. Results indicated that there were 16 components for website, as well as 16 components for courseware with suggestions for basic design layout to be considered. Based on the findings, results showed that the models were proposed, and the prototypes were created to examine the effectiveness and the learners' satisfaction of the models. The surveys' results of users' usability and their satisfaction showed high level effectiveness of the prototypes, as well as high satisfaction towards the prototypes. Therefore, such models of proper website and courseware for e-learning in higher education should be in consideration as grounded components and basic design layout when design and development of website and courseware for e-learning in higher education. (Contains 9 figures)

Introduction

In accordance with the Thai National Education Act B.E. 1999, increasing of educational opportunities for Thai people is an important government policy. The opportunities in enhancing Thai people's knowledge both in urban and rural areas widely and equally, regardless of economic status, were emphasized. Thus for, a gap between knowledge levels of the population has been decreased; whilst the chances for lifelong learning and the building up of knowledge based society have been enhanced. Thailand Cyber University Project (TCU), under the Office of the Higher Education Commission (OHEC), Ministry of Education, is an ongoing project being carried out according to OHEC's strategic plan related to an enhancement of lifelong learning, TCU's major responsibility is to assist all the higher education institutes to deliver distance learning via the Internet; ensure that all online courses are of a high quality and meet government standards; promote the sharing of teaching resources and human resources by introducing a credit exchange mechanism between higher education institutions. Hence, one of the TCU's missions is to conduct research and development in the use of IT to deliver learning online, using a Learning Management System (LMS), for the Cyber University. In fact, TCU's missions are to research, develop, discover, and use educational innovations and new technologies for e-learning, while maintaining internationally accepted educational standards and ensuring a high level of productivity by using established development processes; and to cooperate with both state and private higher educational institutions in order to develop informal certificated courses related to e-learning in higher education.

Nowadays, though there are various formats of website and courseware design, there is no common ground or proposed models that institutions that plans to initiate e-learning program can follow. Also, to response to one of the TCU's missions is to conduct a research and development of standards and quality assurance of Thai distance education. Accordingly, a research project on developing models of proper website and courseware for e-learning in higher education is essential. Such models along with suggested guidelines would extremely assist the institutions to get started with a design and a development of website and courseware for their e-learning properly. In addition, since one of the TCU certificated courses titled Designing Effective Website and Courseware for e-learning, research finding would definitely increase the quality of the course contents. Learners who are mostly instructors and instructional designers in public and private institutes would gain the research-based content while attending this course. They later on would definitely apply such finding to their teaching courses or their current work extensively.

Objectives of this research are: (1) to review the related literatures including research reports and academic articles and also to survey the need and preferred website and courseware formats from the learners as well as the experts, (2) to ask for experts' opinions in relations to the proper model of website and courseware for e-learning in higher education by employing the focus group method, (3) to develop the proper model of website and courseware for e-learning in higher education based on the Thai context, and (4) to develop the prototype of the website and courseware in order to try out for usability testing and users' satisfaction with the online learners. According to the mentioned objectives, higher education institutes will have proper model of website and courseware for e-learning in higher education appropriating to Thai context. Also, TCU can employ such findings to improve their e-learning website and courseware to the higher quality of teaching and learning.

The Research Study

A framework of this research study was based on the 6 major areas including (1) Multimedia design including picture, graphic, animation, text, sound, and video (2) Interface design (3) Content design (4) Design of navigation (5) Design of Usability and (6) Design of Accessibility (Alessi and Trollip, 1991; Gary, 2008; Khan, 2005; Lynch and Horton, 1999; Mayer, 2005; Waterhouse, 2005).The research methodology employed a research and development method in order to develop a proposed model and to investigate the result of the developed model and prototype. Accordingly, the research methodology consisted of 4 phases as follows:

Phase 1 in response to the objective 1 to review the related literatures including research reports and academic articles and also to survey the need and preferred website and courseware formats from the learners as well as the experts, the output emerging out from this phase is components for drafts of proposed models. Detail procedures are as follows:

1. Analyzing and synthesizing related documents including research reports, academic articles. Such information was used as guidelines to design and develop effective website and courseware appropriate to the higher education e-learning environment.
2. In addition to the information gained from the related documents, researcher conducted the survey to online instructors and learners to investigate their need and their preferences. The returned surveys were from 10 online instructors and also 64 learners of the e-learning program were reported and used as guidelines to conduct the proposed models.

Phase 2 in response to the objective 2 to ask for experts' opinions in relations to the proper model of website and courseware for e-learning in higher education by employing the focus group method, the output emerging out from this phase is the drafts of proposed models. Detail procedures are as follows:

1. In-depth interviews with 10 experts answering to the surveys and who have at least one year experience teaching in e-learning mode were conducted to confirm an appropriateness of the survey results. The result of the 16 components for website and 16 components for courseware design were adjusted accordingly.
2. Based on the above results, the researcher proposed a draft model of website and courseware for e-learning in higher education that experienced instructors and learners were in agreement to be important.

Phase 3 in response to the objective 3 to develop the proper model of website and courseware for e-learning in higher education based on the Thai context, the output emerging out from this phase is the drafts of prototypes based on the models. Detail procedures are as follows:

1. The researcher invited the experts who have had experiences with e-learning at least 3 years to evaluate the draft model of website and courseware for e-learning in higher education appropriating to the Thai context. There were found minor inappropriate details\ in some components. The changes were made accordingly. Thus, the website model comprising of 16 important components (orders are according to the website design procedures) includes: multimedia design (background), multimedia design (text), link design, content design, attractive/instructional effective content, multimedia design (graphic), reliability, content quality, navigation, multimedia (audio), multimedia (video), web2.0 technology, link control, accessibility, usability testing, and design quality. The courseware model also comprising of 16 important components (orders are according to the website design procedures) includes: multimedia (background), multimedia (text), link design, content design, attractive/instructional effective content, content quality, multimedia dimension (graphic), navigation, multimedia (audio), multimedia (video), learning activity, learning assessment and evaluation, learning feedback, courseware information, quality assessment, and SCORM standard.

2. The models of web design and courseware design were drafted and presented to the experts to brainstorm about the appropriateness of a position of each element on the page design and layout. The models then were revised based on the experts' comments.

Phase 4 in response to the objective 4 to develop the prototype of the website and courseware in order to try out for usability testing and users' satisfaction with the online learners, the output emerging out from this phase is the proposed models. Detail procedures are as follows:

1. The prototypes designed in accordance to the proposed website and courseware design models for Thai higher education e-learning were conducted. Such prototypes were evaluated by the feedback from 50 retuned surveys of learners who are online instructors and learners in TCU project.

2. To guarantee that the prototypes were appropriate, the models and prototypes of website and courseware were last examined by the experts to guarantee that they were appropriate in terms of the components and element position to the higher education e-learning in Thailand.

3. Adjustment of the models and the prototypes were made according to the learners' comments, as well as experts' suggestions. Then, the proposed models of proper website and courseware for e-learning in Thai higher education were presented.

Findings

According to the proposed models of proper website and courseware for e-learning in higher education, four parts of findings were presented.

Part 1: Analyzing and synthesizing of 68 related documents and 64 returned surveys

Documents included research reports and academic articles. Indeed, researchers collected research reports and academic articles related to the proper website and courseware design from the year 1995-2005. Sixty eight research reports/academic articles were found including 39 research reports/academic articles related to website design and 29 research reports/academic articles related to courseware design. Additionally, there were total of 64 learners of the e-learning professional program participating in the survey. 56% are male and 44% are female. The majority of learners aged between 41-50 (28%) and has held the master degree (66%). Most of them have a major in information technology (28%) while some of them majored in educational technology (17%) and engineering (8%). Most learners in this program work as a government officers (32%) lecturers in public and private institutes (28%) and full-time students (13%) respectively. Most of them have working experience for over 16 years (39%). All of them are currently joining TCU e-learning professional program consisting of 3 majors: 47% are in E-Learning Courseware Designer, 28% are in E-Learning Project Manager, and 20% are in E-Learning Instructor respectively.

Part 2: Drafts of proposed models

There were total of 10 experts participating in the survey. Half of them are male and another are female. All of them are government officers of OHEC who are responsible in teaching online courses in various programs, such as courseware production course, introduction to e-learning course, development of educational media by Mind Mapper course, development of educational media by MS Producer course, introduction to computer graphic course, and development of streaming media course.

Website's components: Based on the results from the three surveys, experts' in-depth interview, and experts' focus group, the proper model of website for higher education e-learning consisted of 16 components was proposed. Though, the components could be classified into 3 categories including multimedia design, content design, and interface design, the presented component orders were in accordance to the design procedures. Details of each component were reported as follows:

1) Multimedia Design: Background

The appropriate background for the instructional effectiveness was a light color background with dark color text. In fact, instructors and learners agreed that attractive background for the instructional effectiveness should use light white color theme for background with dark blue color or dark brown color for text. Also, the use of plain simple white background with black font would be appropriate most in the content area.

2) Multimedia Design: Text

The appropriate text for the instructional effectiveness should be easy to read. The attractive text for the instructional effectiveness should be Tahoma or Verdana. In other words, the text should be in san-serif type

which appropriate and easy to read on the computer screen. The size should be approximately 10-20 points depending on the text position on the screen.

3) Interface Design: Links

The appropriate links for the instructional effectiveness and attractiveness should include title name with clear clarify, links within a website, and a link back to the main page.

4) Content Design: Elements

The appropriate content design for the instructional effectiveness should at least contain captioned graphic and video motion.

5) Content Design: Format

In order to gain learners' attractiveness and instructional effectiveness, content should be concise, updated, and chunked to help organize contents in appropriate categories.

6) Multimedia Design: Graphics

The appropriate graphics for the instructional effectiveness should be in line with the objectives as well as the content. The most attractive graphics for the instructional effectiveness was animated graphics.

7) Content Design: Reliability

The appropriate content reliability that had an impact to learners' attractiveness and effectiveness to the learning was to address web master contact information including name and e-mail address, recent updated date and time, and also to include related links relevance to the contents.

8) Content Design: Quality

The appropriate and attractive content quality for the instructional effectiveness should present fact with no bias. Completeness of the content with referencing to the resource used should be provided.

9) Interface Design: Navigation

The appropriate navigation for the instructional effectiveness should at least provide site structure of the website to help learners navigate the website. It should also provide alternative links for information searching with a link back to the main page consistently. Also, experts agreed that the navigation should indicate the progress made, so that learners know exactly where they are on the website without guessing. In other words, the use of bread crumbing feature should be in consideration.

10) Multimedia Design: Audio

The appropriate audio for the instructional effectiveness should be clear with appropriate intonation. Also, there should be an option for audio to turn on and off continually. The attractive audio for the instructional effectiveness should be an option for turn on and off a background audio.

11) Multimedia Design: Video

The appropriate video for the instructional effectiveness should be used as supplement media to the text and graphic rather than the core media. The video should also contain an option to turn on and off continually. The attractive video for the instructional effectiveness should be downloadable, embedded on the webpage, the embedded video size that not larger than 320x265pixel with an option linking to full screen page When asking about the video content, the learners agreed that the updated innovation related to the TCU project and organization would be most interesting to them.

12) Interface Design: Web 2.0 as a supported tool

The appropriate web 2.0 as a supported tool for web design for the instructional effectiveness included: (1) web application tools, such as blog and RSS feed, (2) communication tools, such as chat, instant message, desktop video conference, and podcast, (3) community tools, such as webboard, wiki, and other social networking tools, (4) file sharing tools, such as, photo sharing, video sharing, music sharing, and document sharing. Indeed, the attractive web 2.0 tool for the instructional effectiveness includes blog, chat/instant message, and wiki.

13) Interface Design: Link control

The appropriate link control for the instructional effectiveness and attractiveness included an easy to control with rapid content accessibility to the desired content and information.

14) Interface Design: Accessibility

The appropriate web accessibility for the instructional effectiveness and attractiveness includes easy to be accessible, and provided prompt interaction with the users.

15) Interface Design: Usability testing

The appropriate web usability for the instructional effectiveness includes the test of interface design (links should be emphasized), content design, and accessibility (accessible speed should be concerned). In fact, the attractive usability testing for the instructional effectiveness and attractiveness include easy to get to a desired contents with prompt assist or interaction to the users.

16) Interface Design: Quality

The appropriate web design quality for the instructional effectiveness and attractiveness includes ability to get to a specific navigated content easily and precisely.

Courseware's components: based on the results from the three surveys, experts' in-depth interview, and experts' focus group, the proper model of courseware for higher education e-learning consists of 16 components was proposed. Though, the components could be classified into 3 categories including multimedia design, content design, and interface design, the presented component orders were in accordance to the design procedures. Details of each component were reported as follows:

1) Multimedia Design: Background

The appropriate background for the instructional effectiveness should use light color background with dark color text. In fact, instructors and learners agreed that attractive background for the instructional effectiveness should use light white color theme for background with dark blue color. Also, the use of plain simple white background with black font would be appropriate most in the content area.

2) Multimedia Design: Text

The appropriate text for the instructional effectiveness should be easy to read. The attractive text for the instructional effectiveness should be Tahoma or Verdana. In other words, the text should be in san-serif type which appropriate and easy to read on the computer screen. The size should be approximately 10-20 points depending on the text position.

3) Link Design

The appropriate link design for the instructional effectiveness should include quick accessibility to the navigated content, easy to control links, and the control over instructional pathways. The most attractive link design for the instructional attractiveness and effectiveness was the prompt accessibility to the navigated content.

4) Content Design: Elements

The appropriate content design for the instructional effectiveness and attractiveness should at least contain animated graphics for an emphasized/important content, as well as brief video for important evidences.

5) Content Design: Format

In order to gain learners' attractiveness and instructional effectiveness, content should be chunked into a brief topic representing one concept for one content presentation. The presentation would be attractive to learners when content was in a well organized and a sequencing manner. When asking about the courseware learning method, learners preferred a courseware that could be recordable of learning process. In fact, learners preferred a courseware with recordable play and pause function that every time when they access to the courseware, they can continually see the content without starting over again at the beginning.

6) Content Design: Quality

The appropriate content quality for the instructional effectiveness should be completeness and in line with objectives. The content should also be updated. The content quality for the instructional attractiveness and effectiveness should be well organized with linkages among contents, completed, and in line with objectives.

7) Multimedia Design: Graphic

The appropriate graphics for the instructional effectiveness should be in line with the objectives as well as the content. The most attractive graphics for the instructional effectiveness was animated graphics.

8) Interface Design: Navigation

The appropriate navigation for the instructional effectiveness and attractiveness included consistent navigation icons/links. Also, the navigation should indicate the progress made and the current location must be shown so that learners know exactly where they are.

9) Multimedia Design: Audio

The appropriate audio for the instructional effectiveness should be clear, enthusiasm, and attractive with appropriate intonation. Also, there should be an option for audio to turn on and off narration continually. In fact, the most attractive audio for the instructional effectiveness should be an option for turn on and off a background audio, and a narration should be clear with appropriate and passionate tone.

10) Multimedia Design: Video

The appropriate video for the instructional effectiveness should be used as supplement media to the text and graphic rather than the core media. The attractive video for the instructional effectiveness should be downloadable. When asking about a preferred video type, instructors and learners agreed with a video used to enhance understanding of concepts in each topic.

11) Content & Interface Design: Learning activity

The appropriate learning activity for the instructional effectiveness was to provide an opportunity for learners' interaction. The attractive learning activity for the instructional effectiveness should be an activity emphasizing on learners' interaction, especially one with guided questions. Such questions would enhance learners' opportunity to exchange thoughts and ideas through the use of online communication tools, such as a webboard.

12) Content & Interface Design: Learning assessment and evaluation

The appropriate learning assessment and evaluation for the instructional effectiveness should be in line with the learning objectives. The attractive learning assessment and evaluation for the instructional effectiveness includes multiple choice questions with multiple chances to answering such questions, and also test scores should be presented promptly.

13) Content & Interface Design: Learning Feedback

The appropriate feedback for the instructional effectiveness should be presented in the same screen with questions and answers. In fact, the attractive learning feedback for the instructional effectiveness should be included questions, answers, and feedback on the same screen and, should also provide answers after a few times attempt.

14) Content Design: Information

The appropriate information should be included at least course objectives that would enhance learners' instructional effectiveness and attractiveness to the courseware.

15) Content Design: Assessment

The appropriate quality assessment for the instructional effectiveness and attractiveness should be considered a courseware that goes in line with designed curriculum.

16) Interface Design: SCORM Standard

The appropriate SCORM standard for the instructional effectiveness should be considered a courseware that compatible with various Learning Management System (LMS) platforms. In order to gain learners' attractiveness regarding the SCORM standard, courseware should be adaptive which could be fitted to learners with different learning styles and personalities.

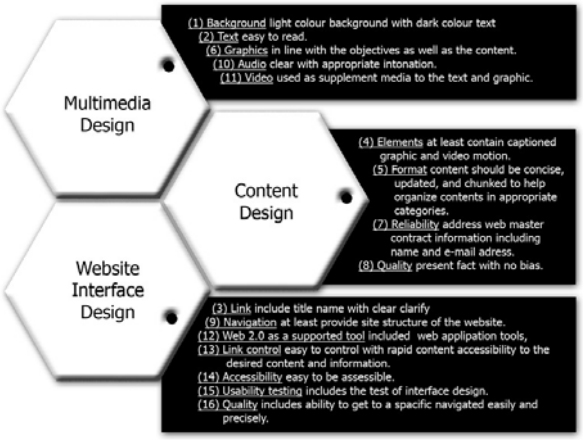

Figure 1: Website's components could be classified into 3 categories including multimedia design, content design, and website interface design

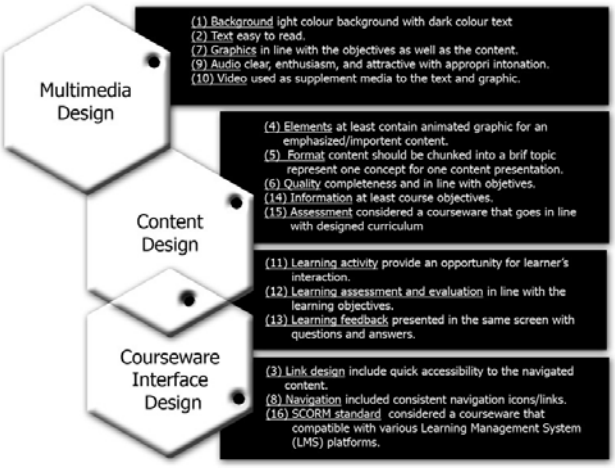

Figure 2: Courseware's components could be classified into 3 categories including multimedia design, content design, and courseware interface design

Part 3: Drafts of prototypes based on the proposed models

According to the summary of 16 components from the survey results and experts' in-depth interview, and information gained during the experts' focus group, it provided not only the summary of vital components, but also the proper design layout for webpage and courseware designs in higher education e-learning. Figure 3 shows the summary of proposed models for website design, while figure 6 shows summary of proposed model of courseware design, gained during the research project phases 1 and 2.

Additionally, based on the proper components and layout for webpage and courseware designs for higher education e-learning, draft prototypes were conducted in order to investigate levels of effectiveness and learners' satisfaction toward the prototypes. Result gained during this research phase 3 would be beneficial for

the website and courseware developer to design and develop the proper website and courseware for higher education e-learning. Therefore, the screen capture with captioned numbers of the webpage prototype was presented in figure 4 and 5. While figure 4 presented the homepage for a project and/or an organization, figure 5 presented the course homepage. Also, figure 7 presented the screen capture of the courseware prototype.

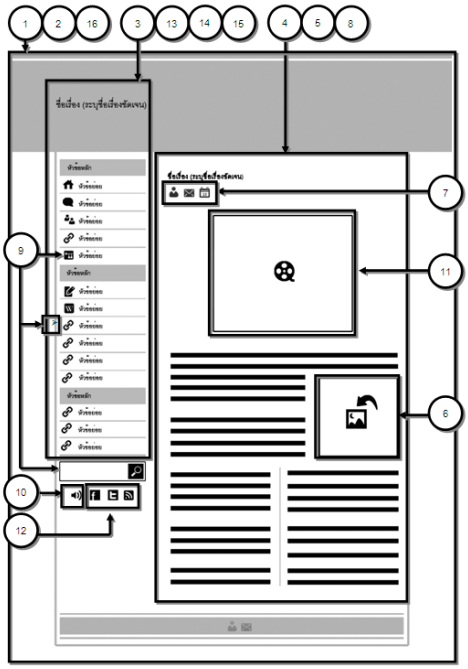

Figure 3: Model of vital components with proper layout for webpage design for higher education e-learning (Components' number are captioned)

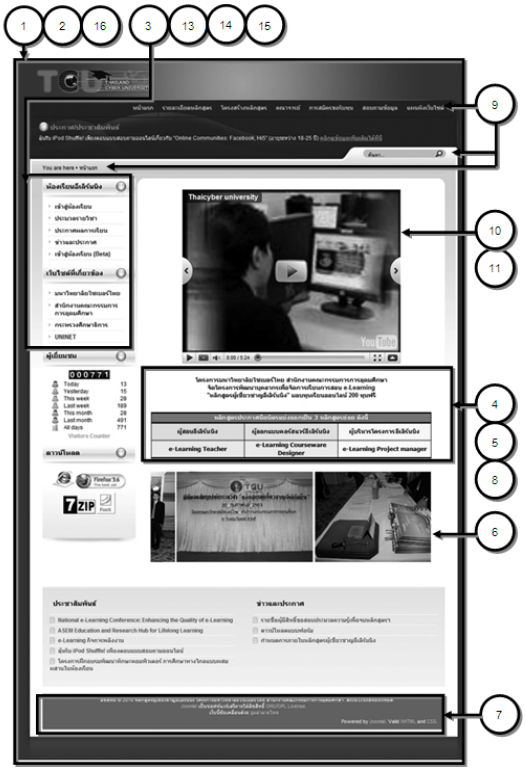

Figure 4: Prototype of homepage for a project

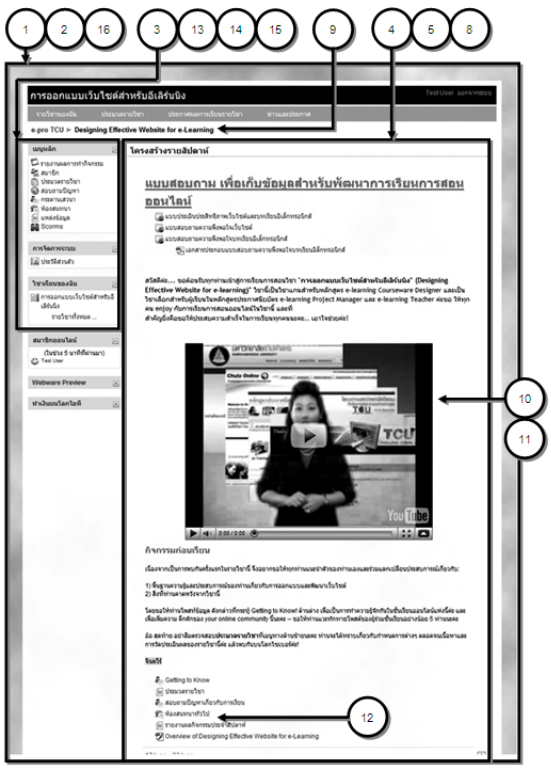

Figure 5: Prototype of course homepage

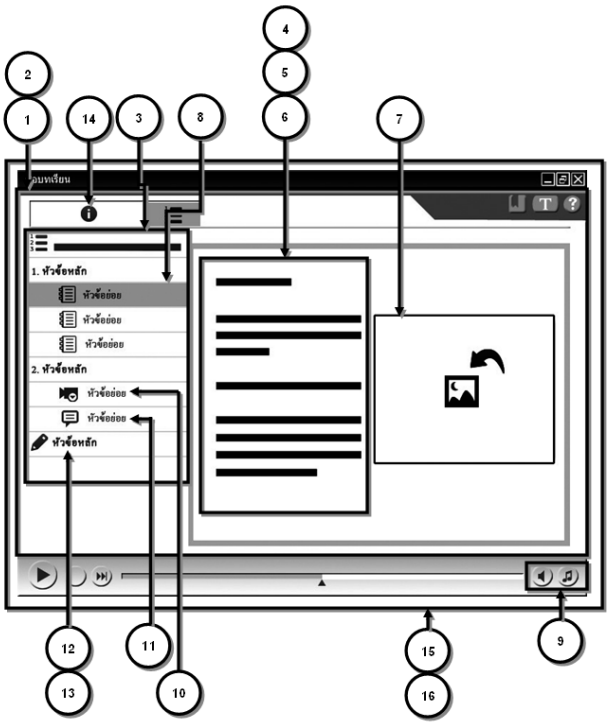

Figure 6: Model of vital components with proper layout for courseware design for higher education e-learning (Components' number are captioned)

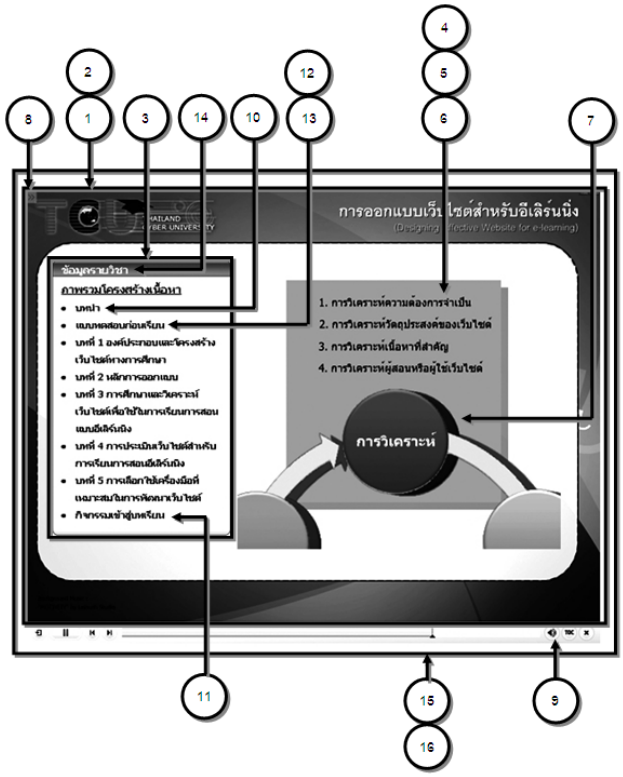

Figure 7: Prototype of a courseware deign for higher education e-learning

Part 4: The proposed models

In this section, the finding of effectiveness level of the proposed model of appropriate website and courseware for e-learning in higher education is presented. Also, the learners' satisfaction level toward the prototypes based on the proposed models of appropriate website and courseware for e-learning in higher education is also presented. The result found from the effectiveness of website and courseware for higher education e-learning was in high level (80% up). In fact, there were seven dimensions when considering the effectiveness of such website and courseware including: (1) multimedia design (7items) (2) interface design (13items) (3) content design (10items) (4) navigation design (21items) (5) usability (5items), and (6) accessibility (7items).

The result found from the learners' satisfaction toward the web design prototype was in high level ($\bar{X}$ = 4.08, S.D. = .55). In fact, there were four dimensions when considering the learners' satisfaction toward the website prototype including webpage layout (ATT1), content design (ATT2), screen design (ATT3), and assessment design (ATT4). When considering into each dimension, the findings were found as follows: satisfaction toward the content design (ATT 2) had a highest mean ($\bar{X}$ = 4.25, S.D. = .53), followed by satisfaction toward screen design (ATT 3) ($\bar{X}$ = 4.08, S.D.= .53), and satisfaction toward webpage layout (ATT 1) ($\bar{X}$ = 4.06, S.D.= .63) respectively. Figure 8 shows learners' satisfaction levels toward the webpage prototype. Besides, when considering the result found from the learners' satisfaction toward the courseware design prototype, the overall was in high level ($\bar{X}$ = 4.08, S.D. = .58). In fact, there were 8 dimensions when considering the learners' satisfaction toward the courseware prototype including introduction design (ATT1), content appropriateness (ATT2), language appropriateness (ATT3), instructional design (ATT4), multimedia design (ATT5), interactive design (ATT6), feedback design (ATT7), and courseware formats (ATT8). When considering into each dimension, the findings were found as follows: satisfaction toward the language appropriateness (ATT3) had a highest mean ($\bar{X}$= 4.28, S.D. = .50), followed by satisfaction toward instructional design (ATT4) ($\bar{X}$ = 4.26, S.D.= .61), and satisfaction toward multimedia design (ATT 5) ($\bar{X}$ = 4.21 S.D.= .62) respectively. Figure 9 shows levels of learners' satisfaction toward the courseware prototype.

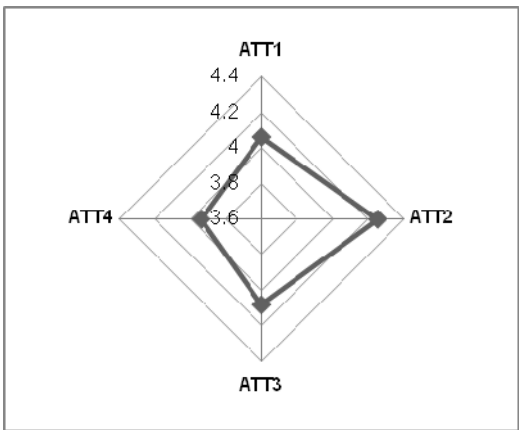

Figure 8 Levels of satisfaction of learners toward the webpage prototype

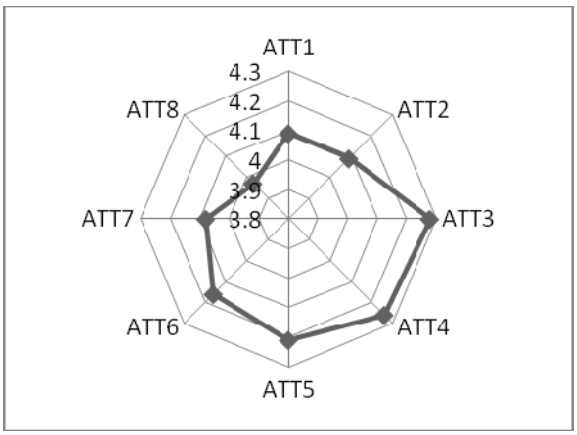

Figure 9 Levels of satisfaction of learners toward the courseware prototype

Conclusions

According to the need of one common proper model of website and courseware designs for higher education, institutions seeking to initiate e-learning program can apply as grounded guidelines. Also, in order to response to one of the TCU's missions that is to conduct a research and development of standards and quality assurance of Thai distance education, this research study aims to proposed research based design models of appropriate website and courseware for e-learning in higher education. Thus, to achieve such aim, four phases of research methodology were conducted: *Phase 1* was responded to the objective 1 reviewing the related literatures including research reports and academic articles and also to survey the need and preferred website and courseware formats from the learners as well as the experts, the output emerging out from this phase was

components for drafts of proposed models. The finding of this phase included the analyzing and synthesizing of 68 related documents and 64 returned survey from online learners. *Phase 2* was responded to the objective 2 asking for experts' opinions in relations to the proper model of website and courseware for e-learning in higher education by employing the focus group method, the output emerging out from this phase was the drafts of proposed models. The finding of this phase included 16 components of the proper model of website and another 16 components for the proper model of courseware along with suggested design layout for Thai higher education e-learning context. *Phase 3* was responded to the objective 3 developing the proper model of website and courseware for e-learning in higher education based on the Thai context, the output emerging out from this phase was the drafts prototypes based on the proposed models. *Phase 4* was responded to the objective 4 developing the prototype of the website and courseware in order to try out for usability testing and users' satisfaction with the online learners, the output emerging out from this phase was the proposed models.

The future plan, based on the research finding, the researcher would apply such research based models into practice by conducting the handbook of design and development of appropriate website and courseware for higher education e-learning. The manual will be in a form of step-by-step with easy to follow instruction. Open source and freeware will be enhanced due to the budget constraint that most institutions are facing.

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