EXAMINING THE INTEGRATED INFLUENCE OF QUALITY AND ATTITUDE FACTORS ON E-LEARNERS' SATISFACTION AND E-LEARNING SYSTEM SUCCESS IN THAI PUBLIC UNIVERSITY

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ABSTRACT

Title of Dissertation	Examining the Integrated Influence of Quality and Attitude Factors on E-Learners' Satisfaction and E-Learning System Success in Thai Public University
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E-Learning is a new way of learning for future education with many advantages, such as just-in-time information, personalized learning, ease of distribution, "anywhere, anytime availability", and the ability to track progress and performance. In Thailand, more E-Learning classes are being offered by the public universities. This study discusses the various factors that influence E-Learners' Satisfaction and E-Learning System Success in the Thai public universities. These factors include quality and attitude factors with different type of public university.

A survey was conducted at the individual level, i.e. students that were taking E-Learning class in Thai public universities (both the open and closed system). A new kind of electronic questionnaire, the e-questionnaire, has been conducted and sent to the survey students by email and website links. A total of 337 students in the Thai public universities were surveyed. In this context, this study achieved significant progress towards developing a conceptual regression model for measuring E-Learner satisfaction and E-Learning system success. The results identified the success factors influencing E-Learners' satisfaction within six different categories: information quality, system quality, service quality, attitude toward learning method, attitude toward cost effectiveness, and type of public university. Reliability tests have been applied with the reliability analysis. In addition, this research summarizes the results of the study, discusses the theoretical and practical contributions, and recommendations and suggestions for further study.

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CHAPTER 1

INTRODUCTION

This chapter introduces the areas and topics of the research study. The author discusses the significance of the study in the areas of E-Learning. The context of study is E-Learning in Thai Public Universities at the individual level. So far, the study of E-Learning at the individual level appears to be limited, even though online learning is increasing rapidly nowadays in the university. The objectives and scope of this study are identified as well as the benefits and contributions. The key terms of the study are also discussed.

1.1 Significance of the Study

E-Learning offers many advantages as businesses grow internationally, face ongoing cost-containment pressures, and encounter a highly competitive job market (National Alliance of Business, 2000). According to the EDUCAUSE Center for Applied Research, 80% of U.S. institutions offer E-Learning courses. The corporate market for E-Learning in 2004 was estimated at $23 billion, up from less than $2 billion previously. Two E-Learning companies were in the top ten of Fortune magazine's 100 fastest growing companies: Career Education ($849 million) and Corinthian Colleges ($473 million) (Storey, 2004). The advantages of this form of education are lower delivery costs and minimized productivity losses, just-in-time information, personalized learning, ease of distribution, "anywhere, anytime availability", being unhampered by geography, and the ability to track progress and performance.

With many advantages of E-Learning, students' interest in online courses has increased over time. Students desire more materials to be placed online and more online course offerings nowadays. As a result, more and more courses are now supported by technology or offered online. E-Learning in Thailand is in the early age

and is used by only a few universities that currently offer online programs with degrees among the public universities in Thailand. At present, there is still a lack of measurement of satisfaction and system success regarding E-Learning in the Thai university. While online learning is increasing, researchers want to understand how various tool features or factors are used by students to generate satisfaction and system success. E-learner satisfaction and E-Learning System Success are critical factors that influence the future development of E-Learning. Understanding how critical factors affect e-learners is a very important research issue for E-Learning today.

In terms of Thailand's education, E-Learning is also mentioned and supported by the Higher Education Development Plan No. 10, the plan of educational development for higher education. The government believes that E-Learning will help enlarge learning opportunities all over the country. The public and private universities will need to bring the Plan No. 10 to apply and effectively adjust to changing economic, politic, society, and technology and culture in line with the plan of national economic and social development.

E-Learning is important to the development of Thailand's education since there are many advantages in teaching and learning, as indicated below.

1) There is greater flexible time for the class work of students. E-Learning allows students to learn more whenever they choose. There are also the benefits of being able to study during a holiday or in one's leisure time.

2) Students can choose a place to study by themselves. This is important for students that live in big cities and have to encounter traffic jams, especially in the morning and evening. Also, students who live in rural areas have to travel far from home to school. E-Learning gives students access to learning from anywhere (that can be connected to the internet). Students can gain knowledge from self-development opportunities.

3) The traditional classroom in various educational institutions is costly since it is necessary to spend money for instructors, transportation, and equipment for each class repeatedly. E-Learning can reduce these expenses in by approximately 30-50 percent compared to the regular classroom.

4) A greater variety of courses can be offered by E-Learning. In the past, the traditional classroom offer limited subjects or only fields that were of interest to the institution and not necessarily the learners. Outsiders had no chance to choose the subject they wanted to study. So, E-Learning has aimed to create a community of learning linked to the center of knowledge content. More lessons in various fields are provided for the students through E-Learning in different subjects as appropriate.

5) Students will learn knowledge correctly and get consistence in knowledge transferring. The contents of each lesson are the same as the original all the time. There is no distortion in the transfer process because every individual student browses the computer using the same system. Thus the data are the same for everyone. Students can be assured that the content of the lesson is the most reliable.

6) There is more room for discussion in the community of learning online (Virtual Learning Community), even if individual students are not on the same classes. The community system offers various communication tools that will allow students to contact each other to discuss and exchange ideas between students and teachers or colleagues, even in other classes, freely. This process yields better transfer of knowledge.

7) It is easy to see the progress of students. E-Learning is developing computer systems and system Learning Management (LMS: E-Learning Management System) that can be recorded and monitored for evaluation of student learning. This LMS can be considered as a tool to help students and teachers improve their learning and teaching with integrity and for the purpose of the study.

8) It is a good idea to learn technology along with using E-Learning since students need to use the educational program through a web browser that relies on the computer technology, such as hardware and various software packages. In this way the students will become familiar with the technology and be ready to accept new technologies and changes. Both hardware and Software are changing all the time.

Moreover, this research will investigate how different types of public universities (such as the Open-Closed system) impact e-learner's satisfaction and achievement against the "Resource-Based View Theory." According to this theory, the organization's performance is pressured to conform to resource-based view rules with similar schemas, rules, norms, and routines, and social behavior. Few studies have

discussed types of universities in this connection, and it would be interesting to see how it is impacted by these types as well as other factors. This research will make both theoretical and practical contributions to the education in Thailand.

1.2 The Objectives of the Research

The objective of the research is to examine the integrated influence of quality and attitude on E-Learners' satisfaction & E-Learning system Success in the Thai public university with a comparison between two different types of public university (the open and closed system).

1.3 Research Questions

1) "What is the level of satisfaction of e-learners and E-Learning system success for students who take E-Learning classes in the Thai public universities?"

2) "What are the key factors that affect e-learner satisfaction when learning online?"

3) "What are the key factors that affect E-Learning system success when learning online?"

4) "How do the types of public university affect e-learners who take E-Learning classes?"

5) "What is the relationship of the factors affecting E-Learners' satisfaction?"

1.4 Scope of the Study

This study focuses on e-learners, that is, students that are currently taking online classes in the Thai public university. Some Public Universities were selected for this research. There are some universities that offer combined online programs with many degrees, from a Bachelor's to an M.S. or M.A. and Ph.D. Other universities are not included here since they still implement E-Learning only to a small degree.

1.5 The Benefits of the Study and Contribution of this Research

This research investigates the factors affecting E-Learning satisfaction and system success, as well as the impact caused by different types of public universities (Open-Closed System Type). In addition, the contributions of this research are in the area of both theoretical and practical contributions.

1.5.1 Contributions of the research

1) Theoretical Contribution

This research is based on the "the concept of the resource-based view theory." Its focus is on the internal resources of the organization as well as external resources. In today's education, there are rapid changes in the environment for future online education, with a more modern and easier way because of the new information technology. Prior research in the RBV (resource-based view) did not highlight about the new information technology. So, this research is to confirm if introduced IT resources in education firms still relate to better performance or outcomes.

2) Practical Contribution

This study will help the organization adapt to changes and survive and have a sustainable competitive advantage. Moreover, this study investigates different types of public Universities (open and closed) to see if there are any significant impacts on E-Learning performance. Both the open and closed public university can use this research to improve their performance in E-Learning and reduce the impacts from different gaps of open-closed types of Universities. The results of the study can also be used for designing best satisfaction and system success for E-Learning courses and improving these systems by focusing on the key factors affecting them. It is useful for both E-Learning course developers and instructors so that they can achieve higher performance. The universities can also better manage their online classes to enhance their overall outcomes.

1.6 Definitions of Key Terms

1.6.1 Attitude Toward Cost Effectiveness

Attitude Toward Cost Effectiveness refers to the hypothetical construct that represents an individual's degree of like or dislike in relation to spending money on

new ways of learning, which is different than traditional learning, for example, regarding fee expenses, education expenses, and additional material expense for study.

1.6.2 Attitude Toward Learning Method

Attitude in learning style refers to the hypothetical construct that represents an individual's degree of like or dislike for new learning styles, which is much different from the traditional learning style.

1.6.3 E-Learning

E-Learning means electronic learning. It is the delivery of knowledge to learners by using electronic media, such as computers connected to the internet or an intranet network. E-Learning can be learned from the web, CD with computer. Students and teachers can communicate with each other via e-mail, web board, and chat rooms.

1.6.4 Information Quality

Information quality refers to the quality of digital content or description, data presentation, or online articles in various media such as streaming video, audio segments, and images.

1.6.5 Service Quality

Service Quality refers to the quality of the problem solving such as IT service support, customization, and online community.

1.6.6 System Quality

System Quality refers to the quality and performance of characteristics of E-Learning systems, including availability, ease of use, reliability, response time, user interface, pictures, graphics, or functions that communicate to the user, and accessibility.

1.7 Organization of the Study

This study is composed of six chapters. Chapter one discusses the significance of the study and its objectives, scope, and benefits in terms of theoretical and practical

contributions and definitions of key terms. Chapter two covers the background of E-Learning in Thai education, mainly focusing on public universities. Chapter three covers the literature review and past related research. This chapter also discusses the resource-based view theory and the key constructs of the research. Chapter four discusses the research methodology, including the details of the equation modeling using various analyses, such as Regression, ANOVA, and T-Test to fit the data and the proposed model. Chapter five provides the results of the study and a data analysis, including a discussion of the findings of this research. Chapter six discusses the conclusions, limitations, and recommendations for further study.

CHAPTER 2

BACKGROUND OF E-LEARNING IN
THE THAI PUBLIC UNIVERSITY

This chapter provides background on the E-Learning in Thai education, mainly focusing on public universities. Moreover, this chapter discusses the development of the E-Learning in Thailand and provides some examples of E-Learning in Thai public universities.

2.1 Background of E-Learning in Thailand

According to Thailand's Higher Education Development Plan No. 9 to 10, E-Learning has been introduced to the plan of educational development in Thai higher education. The public and private universities will need to apply E-Learning to their operations and to adjust effectively to changing economic, politic, society, and technology and culture, in line with the plan for national economic and social development. The government desires to have E-Learning as a tool in order to enlarge educational opportunities among the Thai people all over the country.

Since the early age of the computer, Thailand had started using computers as a tool to create learning tools and for knowledge transfer. One tool for teaching and learning, which replaced books and documents, was called CAI (Computer Aided Instruction), which made software tools available for a variety of tasks. The DOS-based operating systems such as the CAI program, Chula (Chula CAI) was developed by a doctor from the Faculty of Medicine, Chulalongkorn University. Another program, the so called "ThaiTas," was supported by the National Technology Electrical and Computer Center, including many software packages from foreign countries such as ShowPartnet F / X, ToolBook, and Authorware.

Later on, computer technology and the internet were developed and grew rapidly and became very important tools in Thai education. They changed the patterns of teaching, training, and knowledge transfer by developing from the old CAI into WBI (web-based Instruction) or learning through web services. This resulted in transferring and publishing data more quickly and in a more widespread way than with normal CAI. There are two important issues.

First, we can save money to invest in acquiring software to create media (authoring tools). We no longer need to buy expensive software to use as a tool to create learning tools. We can use either NotePad, which comes with all versions of Microsoft Windows, or any text editor. Others, such as HTML coding (Hyper Text Markup Language), are also tools for creating HTML documents that easily broadcast knowledge.

Second, HTML documents can provide information in many forms, such as VDO text, images, and sounds, and can create links to various locations according to the desire of developers. In summary, with these advantages, WBI is continuously developing and changing into new forms of E-Learning (Electronics Learning), which are very popular today.

2.1.1 Definition of E-Learning

E-Learning or Electronic Learning is the delivery of knowledge to learners by using electronic media such as computers connected to the internet or the intranet network using the "distance learning" principle. E-Learning can be learned from the web, CD with computer. Students and teachers can communicate with each other via e-Mail, web boards, and chatrooms. Online learning education through computer networks and the internet or intranet is to learn on your own. Students will learn by using their own ability and interests. The content of the lesson includes text, images, audio, video, and other multimedia that will be sent to students via a web browser by students, teachers, or classmates. Everyone can consult each other as well as classroom instructors through regular communication tools. Advanced communications (e-Mail, web boards, chat) helps studying for all students at any time and any place.

Tanomporn Luahacharatsang (2005a) has defined the term E-Learning as the use of broadcast content via electronic devices such as the computer, the internet or intranet,

extranet, television or satellite. The information content may be in the form of learning, such as computer-assisted instruction (computer assisted instruction), teaching on the web (web-based instruction), online learning for distance learning via satellite, or may be in an unfamiliar way such as video on-demand.

Surasit Wankairoj (2006), the program director of online learning of NSTDA, provided a definition of E-Learning as "online learning education through internet or intranet is to learn on your own. Students will have to exercise their talents and their interests by their own. The content of the lesson which contains the text, graphics, audio, video and other multimedia will be sent to students via web browser." Students, classmates, and everyone can exchange views with each other same as with regular classroom instruction by using based communication tools or advanced communications (such as e-mail, web board, chat).

The World Wide Web or website may have some interaction such as chat and dialog conversation among students. The three different patterns of this learning are comprised of a teacher and a student, a student and another student, or a student with a group of students. This interaction tool can be done through two modes.

1) Real-time, including a discussion by typing or sending information in the form of audio with the support of the chat room

2) Non-real time, including sending messages to each other via a service such as E-mail, web boards, and News-groups

Chunhaphong Thaioopatum (2006) has described E-Learning as a form of teaching and learning, a new application of modern electronic technology aimed at helping students to learn knowledge without time or location limits. A system for teaching and learning is necessary for more effective results to help students achieve the learning objectives of the course.

In another words, E-Learning is the transfer of knowledge from teachers to students through electronic media in various forms, such as satellite television or computer lessons on a CD. Now, people think of E-Learning as content broadcasting through computers and using computers to create content, materials, and communication technology, helping in the transmission of information content that can be transmitted through many channels offline, such as with CDs, or online with technology such as a network medium and content transmission via online communication.

2.1.2 Characteristics of E-Learning

E-Learning is a system of teaching and learning related to web technologies and the internet. E-Learning's environment supports lively learning or "Active Learning". New self-learning processes can be linked to real life with all forms of learning, including distance learning and learning through networking. Some characteristics of E-Learning are:

1) Anywhere and anytime (learners can get content at their convenience)

2) Multimedia (E-Learning content takes advantage of multimedia to ensure better retention in learning)

3) Non-linear (E-Learning content should be presented in a manner that is not linear. This means that students can access content on demand and flexible link to learners)

4) Interaction (E-Learning should offer an opportunity for learners to interact with the content or with others)

5) Immediate response (E-Learning should be designed to be measurable and evaluable, providing immediate feedback to students)

In order to easily compare E-Learning and traditional teaching, Table 2.1 shows the nature of teaching and traditional teaching.

Table 2.1 Comparison of Teaching with the Traditional Method and E-Learning Style

Type	Normal Classroom	E-Learning
Learning Location	Physical places needed such as school or rooms	Have or do not have a classroom. Not focused on classroom requirements, but requires a computer and network.
Teaching Preparation	Teaching preparation for normal classroom is easier than E-Learning because instructors can prepare regular	Teaching by E-Learning is more difficult because instructors need to prepare everything like a normal

Table 2.1 (Continued)

Type	Normal Classroom	E-Learning
	tools such as sheets, slides, tapes, or power point	classroom and then modify this into computer files that can be opened from various internet programs.
Face-to-face between Instructors and Learners	Every learner and instructor always sees each other face-to-face and shares their ideas easily via conversation in the classroom. However, there are some limitations; some shy people may be reluctant to speak and answer questions.	This is up to the design of E-Learning. E-Learning may use both sound and images showing the face of instructors and their teaching via video camera connected to the internet. This is "live" and reduces face-to-face gaps.
Same Time and Together	Classroom requires students to come to class and start with same schedule together. Students who cannot come to class on time will not be able to learn what transpired. Instructors need to come to teach everyday even with large numbers of students missing.	E-Learning provides anytime learning and anywhere. Instructors no longer need to wait and watch the class to teach. Some missing students who cannot come on time can easily go back to collect what they have missed. Some students can preview repeatedly to make them understand more with no limited time.
Quality of Teaching	Quality of teaching depends on each instructor and each time	There is no difference in the quality of teaching each

Table 2.1 (Continued)

Type	Normal Classroom	E-Learning
	he/she teaches. Even the same book but different instructors will give different results of knowledge transfer. Furthermore, the same instructors who teach repeatedly may be bored to speak again.	time. Students may email or use discussion boards to ask instructors when they have questions.
Learning Evaluation	Instructors need to give paper examinations, measured and graded by instructors	E-Learning gives real-time feedback when students answer questions online. They can know at once what mistakes they have made or misunderstandings they have had with correct explanations afterwards. The drawback of these evaluations are the requirement to have more exam questions and using sampling systems to test the exam (normally 2-3 times of regular paper questions). However, in another aspect, instructors may use the same sets of exam questions for the next classes as well.
Cost of Teaching	The traditional way of learning	E-Learning requires more

Table 2.1 (Continued)

Type	Normal Classroom	E-Learning
Preparation	requires instructors with media such as slides, pen, etc. that instructors can borrow from the institution	IT support with higher cost of investment for program the courses. More personnel must be hired and software needed.
Cost when Teaching	Higher cost to maintain the equipment in the classroom for ready use	A one-time investment in hardware and software programs costs less when repeatedly used.
Capacity of Students in Class	The numbers of students is limited due to classroom size. A large size will be grouped and the instructors will need to teach again.	There is no limit in the numbers of students. No attendance checks are required, no late statistics.
Self-Learning by Students	Students have more difficulty in researching additional knowledge to learn by themselves via classroom or library with limited time of instructors' office hours.	Students have no limited time with online access and no worry for instructors' office hours. Students can go online and search for the additional focused areas they need at any time. Moreover, students can use online links to search more while they are studying at the same time.
Privacy	There is less privacy since more people share the same room. Some restrictions are needed to reduce annoying each other.	There is more privacy since nobody is around. Students can learn from home while eating or doing other activities.

In conclusion, learning location, teaching preparation, face-to-face interaction between instructors and learners, same time and together, quality of teaching, learning evaluation, cost in teaching preparation, cost when teaching, capacity of students in class, self-learning by students, and privacy are different between traditional classroom and E-Learning. E-Learning gives many advantages to new education era.

2.1.3 Benefits of E-Learning

The advantages of the E-Learning system used in teaching and learning are as follows. Supachai Sukhanin (2005) has discussed E-Learning and has made the eight following points.

1) Greater flexible time for classwork for students. E-Learning allows students to learn more whenever they choose. There are also benefits for studying during a holiday or leisure time.

2) Choose a place to study on their own. Students that live in big cities have to encounter traffic jams, especially in the morning and evening. Also, students that live in rural areas have to travel far from home to school. E-Learning gives these students access to education from anywhere (that can be connected to the internet). Students can gain knowledge from ant self-development opportunities.

3) The traditional classroom is costly in various educational institutions since money must be spent for instructors, transportation and equipment for each class repeatedly. E-Learning can reduce these expenses by approximately 30-50 percent compared from the regular classroom.

4) More variety of courses can be offered by E-Learning. In the past, the traditional classroom offered limited subjects or only subjects of interest to the institution (not by the learners). Outsiders had no chance to choose the subject they wanted to learn. For this reason, E-Learning has aimed to create a community of learning linked to the center of knowledge content. More lessons in various fields are providing for students with E-Learning in different subjects as appropriate.

5) Students will receive knowledge correctly and there is consistency in knowledge transfer. The contents of each lesson are the same as the original every time. There is no distortion in the transfer process because every individual student can browse the same computer system. This will pull out the same data for everyone. Students can be assured that the content of the lesson is the most reliable.

6) There is more expansion for discussion in the community of learners online (Virtual Learning Community). Community system offers various communication tools that will allow students to contact each other to discuss and exchange ideas between students with teachers or colleagues, even in other classes, freely. This process yields better transfer of knowledge.

7) It is easy to see the progress of students. E-Learning develops computer systems and system Learning Management (LMS: E-Learning Management System) that can be recorded and monitored for evaluation of student learning. This LMS can be considered as a tool to help students and teachers improve their learning and teaching with integrity and for the purpose of the study.

8) It is good to learn technology along with using E-Learning since students need to use the educational program through a web browser that relies on the computer, such as hardware and various software packages. The students will be familiar with the technology and ready to accept new technologies and changes. Both hardware and software are changing all the time.

Ckie Kasemsan (2005) has suggested that we can see clearly the E-Learning features and benefits as follows.

1) Convenience. Students can learn anywhere and at any time because the system of teaching and learning is not tied to a class. The system will provide virtual classroom learning. In studying various subjects, students will be able to attend classes depending on the places that have a computer that can connect to the internet

2) Modernization of content. This is another unique feature of learning and teaching via E-Learning because lesson production in the form of the websites is easily changed and improved. The lesson can also be a supplement with related links.

3) Easy-to-use system. Due to the functionality of an E-Learning system via a website, students can use it by just clicking the mouse or typing on the keyboard.

4) Excellence in the system. The system can track student records including the attendance and test scores, so students can check themselves at any time. E-Learning is the communication between teachers and students to both groups and individuals. It can combine and display the results of the study points for feedback instantaneously via the system.

5) Cheap Cost. Students can study at home or anywhere. This saves travel costs and other expenses.

6) Used as a primary or secondary medium. A primary medium means using it for full teaching. Students will attend and submit their work to communicate with teachers with the system without having to attend classes. However, if used as a secondary medium, it means that E-Learning can be used as a supplement to the traditional classroom, for example, in revising course content.

In conclusion, the many benefits of E-Learning provide flexibility for students. That is, students can select the time and place to learn by themselves, and they can view the content repeatedly for greater understanding. E-Learning can save costs on travelling and many varieties of tools can be used to facilitate communication between students and instructors.

2.1.4 Components of E-Learning

The Office of Science and Technology Development Agency (NSTDA) has stated that E-Learning system elements have four parts. Each part must be properly designed for the entire system.

1) The first component in the E-Learning course is Content Delivery in Multiple formats. It is created as e-Content, which is derived from the authors, teachers, or instructors. In order to create such content in the form of multimedia, content can be built by the computer and network via the internet.

2) Management of learning experience. This part is about the management system for E-Learning or so called "LMS (Learning Management System)," which is software to manage Database Application Software for example for course planning, learner registration, education online material, and progress and evaluation.

3) Network Community of Learners. There is an online community for e-learners to learn among each other via internet.

4) Content Developers and Experts. The last part is about Content Developers or Experts to input or change the content.

Furthermore, Supachai Sukhanin and Konanok Wongpanich (2005) have described the components of E-Learning in four parts. The first is content. This is one of the most important parts of E-Learning. E-Learning developers need to focus on content as a high priority as well as the E-Learning Management System or LMS. This LMS will be the center of all communication and knowledge transfer online to

students and teachers. Moreover, the system provides learning progress and evaluation reports. This two-way communication is unique and different from the traditional classroom. E-Learning uses two-way communication to create more interactive and attractive learning to students, for example, online questions with real time answers. In addition, this two-way communication will help students ask or consult with the teacher or students by using the two types of communication below.

(1) Synchronous Type such as chat (message, voice), white board, text Slides, real-time annotations, interactive poll, conferencing, etc.

(2) Asynchronous Type such as webboards and email

5) Examination and Evaluation. This part makes E-Learning perfect for learning. Examination and evaluations, including pre-tests, will generate efficiency in learning. E-Learning will use the Exam Bank System Database to manage examinations, which is in the LMS (E-Learning Management System). The characteristics of the Exam Bank System Database are below.

(1) Online Examination via Web Browser

(2) Online Examination via Multimedia

(3) Security in Send-Receive Examination

2.1.5 E-Learning Application

Chunhaphong Thaioopatum (2006) has suggested that application of E-Learning can be made at three levels, as follows.

Level 1 is supplementary. At this level, a lot of information is presented online and can be found in other forms as an option.

Level 2 is complementary. At this level, it will increase some online media in the regular class. As a component part, students will need to learn online.

Level 3 is comprehensive replacement. At this level, "online" is the primary format and has been used since the beginning of the learning process.

According to Pattama Nopparat (2006), E-Learning content can be divided into the following three characteristics.

1) Text online; content is text based, which has the advantage of saving time and cost of content production and management course. Instructors or experts can produce their own content.

2) Low Cost Interactive Online Course; here content is in text form, graphics, audio, and video processors made simple, which should be developed in LMS. This is helpful for teachers or experts in the creation of up-to-date content on their own.

3) High Quality Online Course; content is in the form of professional multimedia interface. Production requires a team of manufacturing professionals, content instructional design experts, and instructional designers and specialists. Multimedia production at this level requires the use of tools or applications, such as Macromedia Flash or Flash Player.

2.1.6 Caution about the E-Learning

Supachai Sukhanin and Konanok Wongpanich (2005) mention that E-Learning needs to be caution in lesson design that is attractive to learners in six ways.

1) Content should be divided into appropriate chapters of appropriate length for learners. With a good framework and length for each chapter, learners will be able to learn more effectively and systematically.

2) Should have self-learning in E-Learning with a control system that allows learners to evaluate themselves.

3) An interactive design for E-Learning is required to create a good learning atmosphere.

4) A system with a real-time progress report with answers should be offered from the evaluation test. This will help learners have more attention to learning.

5) Good lessons or activities need to be prepared with pre-test examinations as well as end-of-class examinations to evaluate the skill and ability of learners. The results of these tests can be used to select appropriated content and activity for learners.

6) Focus on positive reinforcement in learners with complimentary messages or sound. Avoid bad comments and penalty since it will make learners less attentive to their failure progress.

Tanomporn Luahacharatsang (2005b) has mentioned that developers should focus more about E-Learning below.

1) Misunderstanding in the use of E-Learning. Do not implement because its a trend. Should focus on meaning, method, and design to create touchable usefulness.

2) Should adjust teaching style to fit with E-Learning. Need to find ways to get good attraction from learners.

3) Investment in E-Learning needs to offer learners and instructors convenient ways to learn online with good facilities.

4) Inappropriate E-Learning design. Designing should be based on learners' age and should offer non-linear content to fit their needs.

2.1.7 LMS (Learning Management System)

The Learning Management System is software for online learning and to manage each course with various tools. The software offers services in four groups: students, instructors, registration, and administrators. Services include learning activities, evaluation, tests, learning progress, web boards, etc.

The components of the LMS consist of five parts.

1) Course Management (used by three user groups, learners, instructors, and administrators)

2) Content Management (tools to create content in form of either text-based or streaming media

3) Test and Evaluation System (for taking examinations and grading)

4) Course Tools (assistant to learning with tools such as web board and chatroom

5) Data Management System (file and folder management)

Sunee Rasakeitsak (2005) gives examples of the components of the LMS below.

1) Course Management

(1) Browse Courses

(2) Register

(3) Login/Log-out

(4) Request Instructor Account

(5) Create a new course and rights level of usage in public, protected, or private (Public – anyone can view, no need to login, Protected – login required, Private – register required and need approval from instructors)

   (6) Enroll

   (7) Approval from instructors

  2) Content Management

  Content Editor for instructors by HTML and File Manager tools with PowerPoint, Word Document, PDF, or picture files

  3) Communication

  There are two types of communication. First is asynchronous type such as forums and inbox. Second is synchronous type such as chat

  4) Testing System. Instructors can easily create online tests by selecting Tools > Test Manager with Multiple Choice, True or False, or Open-Ended

  5) Course Tracking. Instructors can view how often students use the system statistically.

 In addition, there are important components for LMS, including a system management system and expectations from students for the future.

  1) Course content management system

   (1) Access to content lessons developed by teachers within the system

   (2) Access to materials that teachers obtain from other people

   (3) Access to courseware library of the institute

   (4) Access to courseware from the internet

  2) A user management and course management system

   (1) System Login / Logout.

   (2) Upload and download files (multimedia files) such as Microsoft Office, Adobe Acrobat PDF, HTML, Image

   (3) Registered courses

   (4) The details of each course

   (5) Check each course grade

   (6) Create a calendar of weekly work

   (7) Detailed records of the students

   (8) User's guide online

   (9) Watch videos of the lesson

   (10) Validation exercise results/exam results

   (11) Review of timetable

3) Course tracking system

    (1) Monitoring the course of study

    (2) Check the attendance by topic or lesson learning

    (3) Summary of monitoring attendance

4) Performance measurement system evaluation (or assessment system)

    (1) Monitoring progress statistics and focus on their own learning

    (2) Exercises online

2.1.8 Characteristics of the Program Users

The nature of the program on the part of users is as follows.

1) Students

    (1) Notification of access of all enrolled subjects

    (2) To obtain information on instructors who teach courses

    (3) Downloads work that teachers assign to each students as well as current and back.

    (4) to Send electronic mail to all people of all groups and teachers and assistants in courses

    (5) Reviews or posts during the study together or between students and teachers in courses, including discussion boards and chat room

    (6) links to external sites

2) Instructors will have the additional function of the level of the students which is used for management and to create and control the course, including the following:

    (1) Create a self-test

    (2) The supply of tests. Administrators can search for tests to use.

    (3) Review score of students who take the course that teachers can teach.

    (4) Monitoring usage statistics for each student's course

    (5) To determine the right to work within the course of study

    (6) The appointment or assignment with content descriptions of each. Courses and other information can be edited at any time.

    (7) Packing the contents of the course

3) The administrator is a function of management and uses management and control systems as follows:

(1) To determine the status of the user

(2) Add, delete, and modify user information

(3) The use of the capabilities of the user

(4) Change the name and symbol on the website

2.1.9 E-Learning in the Public University

There are two types of public university such as open and closed university. The details are below.

2.2 Background of Open University in Other Countries

The open university is a distance learning and research university founded by the Royal Charter in the United Kingdom and funded in part by the United Kingdom government. It is notable for having an open entry policy, i.e. students' previous academic achievements are not taken into account for entry to most undergraduate courses. The majority of the open university's undergraduate students are based on the United Kingdom and principally study off-campus, but many of its courses (both undergraduate and postgraduate) can be studied off-campus anywhere in the world. The open university was established in 1969 and the first students enrolled in January 1971. The university administration is based at Walton Hall, Milton Keynes in Buckinghamshire, but has regional centers in each of its thirteen regions around the United Kingdom. It also has offices and regional examination centers in most other European countries. The university awards undergraduate and postgraduate degrees, as well as non-degree qualifications such as diplomas and certificates, or continuing education units.

With more than 180,000 students enrolled, including more than 25,000 students studying overseas, it is the largest academic institution in the United Kingdom and Europe by student number, and qualifies as one of the world's largest universities. Since it was founded, more than 3 million students have studied its courses. It was rated the top university in England and Wales for student satisfaction

in the 2005 and 2006. The Open University is also one of only two United Kingdom higher education institutions to gain accreditation in the United States of America by the Middle States Commission on Higher Education, an institutional accrediting agency, recognized by the United States Secretary of Education and the Council for Higher Education Accreditation.

2.3 Background of Open-Closed University in Thailand

There are two types of public university in Thailand, the open and closed types. The closed university in Thailand is a university that requires examination and admission for recruiting students. More regulations with Time Check in Classrooms are expected as well as formal student uniforms and required activity attendance. Many famous closed universities in Thailand are Chulalongkorn University, Thammasart University, and Kasetsart University.

In contrast, the open university usually refers to a university with an open-door academic policy, no entry requirements, and special terms. An open university is a system whereby the Thai government has tried to enlarge the opportunity for the education of Thai people. Usually, they can accept an unlimited number of students since it is different from the normal classroom of the closed university. Distance learning and self-learning also support these students. In Thailand, there are two open universities, Ramkhamhaeng University (established 1971) and Sukhothai Thammathirat Open University (established 1978).

2.3.1 E-Learning at Chulalongkorn University

The Chulalongkorn University Online project, so-called "ChulaOnline.com," is one of E-Learning. Chulalongkorn University has offered many courses by qualified teachers from Chulalongkorn University and gives opportunities to learn across the regions all over the country. Www.ChulaOnline.com. has been conducting teaching via ChulaELS (Chula E-Learning System) developed by Thais with accommodating learners (or users) unlimited usage.

By logging into http://www.chulaonline.com/, one can see the access management system for learning and teaching at Chulalongkorn University. ChulaOnline can support users in Thailand without limit. The system is shown in Figure 2.1.

Figure 2.1 The Management System of Teaching and Learning of Chulalongkorn
University

Figure 2.1 above displays the login to the management system of teaching and
learning at Chulalongkorn University. User login, as a student, can log in with the
username and password sent by the university.

2.3.2 E-Learning at Ramkhamhaeng University

Ramkhamhaeng center for teaching electronic learning started in about the year 2001, to be responsible for the system and teaching of the university in E-Learning form. It is central in the production of lessons in E-Learning linked with faculty, the computer institute, and the Office of Educational Technology. The objective is to improve the care of the movement of the E-Learning website (http://www.ram.edu/), which controls and maintains learning and teaching online using E-Learning lessons in databases. It includes a database for student lessons and courses linking information in both internal and external database infrastructure.

Associated with the program management system, the teaching and learning (Learning Management System) program management will support systems, and other multimedia applications, database administrator, and follow-up. The teaching and learning by E-Learning system generates the study of communication technology, applications, services, and education. Ramkhamhaeng University uses E-Learning as

an alternative supplement for students to learn. There are several plans for staff development and training in the use of knowledge and lessons for people inside and outside the university and to support learning and teaching E-Learning courses and the entire university system regarding E-Learning effectively. With many actions and various activities related to knowledge, E-Learning now is used to promote and manage learning through electronic media, including education and research. It continues to develop materials and methods of teaching and learning to develop themselves into a learning society and to promote its knowledge base internationally.

Figure 2.2 The Management System of Teaching and Learning at Ramkhamhaeng University

Figure 2.3 Screen of the Login to the Management System of Teaching and Learning

Figure 2.2 -2.3 shows the login form of the management system for learning and teaching at the university. It supports the use of two service user groups: students of Ramkhamhaeng University and guests of Ramkhamhaeng University. Students will be able to attend courses, and guests can register via E-Learning (by going to the section New-User > Please Register of the menu) and filling in the details, which are different from username, login and password, to login.

2.3.3 E-Learning at Kasetsart University

Kasetsart University is a public university where bodies of knowledge and research potential have been continually accumulated for seven decades. As a national research university endorsed by the Commission on Higher Education of Thailand with the vision to become "the world's leading research university in agriculture, food, technology and innovation," Kasetsart University aims to become a leading university and to deploy networks for the accomplishment to be a world class university in the near future. E-Learning is also one of its focuses for expanding students' knowledge. The login form for accessing the management system of Kasetsart University can be done from the screen below in Figure 2.4.

Figure 2.4 Shows the Login to the Management System of Kasetsart University

The Figure above shows the main screen of the management system for learning and teaching at Kasetsart University. The image on the left is the portion of the login to the statistical reporting system. The middle of the screen is an international public relations course by course number consisting of the content to be promoted. The notification dates are ranked by the division in order and are easy to find. The top of the screen is related to management subjects such as available courses, news courses, statistics on usage, contact us, and help.

2.3.4 E-Learning at Sukhothai Thammathirat's Open University (STOU)

E-Learning at STOU is used as supplementary material provided through the computer network for both undergraduate and graduate studies. It helps students to have more interaction with the instructors and between learners and learners. Students can view and set courses offered by the study at http://www.stou.ac.th/elearning. Moreover, multimedia such as CD-ROMs are used as regular sets of courses and used in conjunction with teaching materials. Figure 2.5 below shows the main webpage for E-Learning t STOU and the log in Form.

Figure 2.5 E-Learning of STOU

STOU focuses more on E-Learning and distance learning since it is an open university. There are series of teaching style remotely with computing experience for each course. Moreover, STOU is preparing plans to produce mixed media in the form of an instruction set, which consists of a set of distance-teaching ways by computer media such as teleconferences with organized content and print media supplemented by additional materials.

CHAPTER 3

LITERATURE REVIEW

In this chapter, the author reviews the theory and related studies on e-learner satisfaction and system success in the Thai public university. Other factors included in this study are reviewed as well as the different types of public university. At the end of this chapter, the author proposes research hypotheses for theory testing.

3.1 Review of Literature

This research is based upon the resource-based theory of the firm, which emphasizes the resources used in the organization. The effective utilization of the resources of each organization can lead to a competitive advantage.

3.1.1 Resource-Based Theory of the Firm

An interesting part of this study is "the resource based theory of the firm." The resource-based view is an economic tool used to determine the strategic resources available to a firm. These resources can be used to lead to higher returns over a longer period of time and to achieve a sustainable competitive advantage. The fundamental principle of the resource-based view is that the basis for a competitive advantage of a firm lies primarily in the application of the bundle of valuable resources at the firm's disposal (Wernerfelt, 1984, Rumelt, 1984).

Wernerfelt (1984) has mentioned that a resource means anything that can be thought of as a strength or weaknesses of a given organization, and can be defined as tangible and intangible assets that are tied to the organization. Examples are brand names, in-house knowledge of management and technology, employment of skilled personnel, trade contracts, machinery, efficient procedures, and capital. Resources are defined as firm-specific assets that are difficult to imitate by other firms (Teece,

Pisano and Shuen, 1997). Some specific resources include trade secrets, specialized production facilities, and engineering experience. These resources are difficult to transfer among firms for many reasons, such as transaction and transfer costs.

The resource-based theory focuses on firms' capabilities, assets, and the existence of isolating mechanisms as the fundamental determinants of firm performance (Teece, Pisano and Shuen, 1997). Barney (1991) has mentioned that resources include all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc., controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness. Types of resources may include both tangible and intangible resources. For example, tangible resources are machines and buildings, and intangible resources are brand names, personnel skills and expertise or knowledge, and IT such as E-Learning. Moreover, in order to transform a short-run competitive advantage into a sustained competitive advantage requires that these resources be heterogeneous in nature and not perfectly mobile (Barney, 1991). Effectively, this translates into valuable resources that are neither perfectly imitable nor substitutable without great effort (Hoopes, Madsen and Walker, 2003). If these conditions hold, the firm's bundle of resources can assist the firm in sustaining above-average returns.

In order to achieve a competitive advantage, the resource-based view of the firm indicates that organizational resources must have four attributes: value, rareness, imperfect imitability, and susbstitutability (Wernerfelt, 1984; Barney, 1991; Hoskisson, Hitt, Ireland and Harrison, 2008). The details of these four attributes, so-called "VRIN," are as follows.

VRIN Criteria

One key point of the theory is to evaluate whether these resources fulfill the following "VRIN criteria." The details are below:

1) Valuable

The resources of an organization can be utilized to generate a competitive advantage when those resources are valuable. Resources are valuable when they can help the organizations to implement strategies or achieve effectiveness and efficiency. The resource-based view model implies that organizations can utilize valuable resources to exploit opportunities and to neutralize threats from the environment. A

resource must enable a firm to employ a value-creating strategy, by either outperforming its competitors or reducing its own weaknesses (Barney, 1991). Mahoney and Pandian (1992) mentioned that "relevant in this perspective is that the transaction costs associated with the investment in the resource cannot be higher than the discounted future rents that flow out of the value-creating strategy" .

2) Rare

To be of value, a resource must be by definition rare. In a perfectly competitive strategic factor market for a resource, the price of the resource will be a reflection of the expected discounted future above average returns (Barney, 1991). Organizations can gain competitive advantage only when other organizations cannot simultaneously implement the same or a similar value-creating strategy so that they can have a competitive advantage. Similar resources or strategies do not lead to competitive advantage and therefore rare resources are necessary so that the organizations can create a competitive advantage. Moreover, rare resources might come from a combination of or interaction among physical capital, human capital, and organizational capital. It is difficult to have similar talents in other organizations; however, even small-size organizations can also obtain rare resources and generate a competitive advantage.

3) In-imitable

If a valuable resource is controlled by only one firm, it could be a source of competitive advantage (Barney, 1991). This advantage could be sustainable if competitors are not able to duplicate this strategic asset perfectly. An important underlying factor of inimitability is causal ambiguity, which occurs if the source from which a firm's competitive advantage stems is unknown (Peteraf, 1993). Value and rareness of resources can be sources of competitive advantage, yet, if the resources are easy to imitate, the organizations cannot hold competitive positions for a long time. Organizations can have resources that are imperfectly imitable for reasons such as:

(1) The ability of an organization to acquire a resource depends on unique historical conditions, such as the unique organization's founding or unique circumstances from the new management team that takes over the organizations.

(2) The link between the resources and the organizations' competitive advantage is causally ambiguous. When the link is difficult to understand, other organizations cannot duplicate successful strategies by imitating similar resources and it is difficult to know which resources to imitate. Imitating organizations, therefore, do not know what actions and activities they should take to gain competitive advantage.

(3) The resources making the competitive advantage are socially complex. Many aspects of organizational resources are complex social issues. We can see examples such as interpersonal relations among members or managers, organizational cultures, and the relationship among organizations and stakeholders, including customers or suppliers. It is interesting to see that these complex social relationships enhance value for the organizations and improve their long-term performance. Furthermore, to imitate the resources of other organizations can be very costly for competing organizations.

4) Non-substitutable

Even if a resource is rare, potentially value-creating, and imperfectly imitable, an equally important aspect is lack of substitutability (Dierickx and Cool, 1989). If competitors are able to counter the firm's value-creating strategy with a substitute, prices are driven down to the point that the price equals the discounted future rents (Barney, 1986), resulting in zero economic profits. In addition, the main focus of this aspect of resources is that organizational resources are non-substitutable by other resources available in the environment. An organization with valuable, rare and imperfectly imitable resources tends to have a competitive advantage over its competitors; however, these competitors may strive for alternative resources to compete with this organization. If the alternative resources are not rare or imperfectly imitable, the organization can still maintain its competitive advantage over its competitors. The alternative resources are not substitutable for the resources that generate a competitive advantage for the organizations. The competitors may try to substitute with similar resources; however it is very difficult to imitate exactly the resources of another organization. For this reason, acquiring similar resources might be useful in competing with organizations that have a competitive advantage with rare, valuable, and imperfectly imitable resources. But if the substitutes are not rare,

valuable or imperfectly imitable, the competing organization still cannot acquire a greater competitive advantage.

Teece, Pisano and Shuen (1997) mentioned that apart from being involved in the learning process of the organization, with coherence of internal and external processes, the organizations must be concerned about their specific resources or assets, including knowledge assets, and reputational and relational assets. These assets determine the competitive advantage of the organization. The important assets are listed below:

Technological assets tend to be protected by the organizations and in many cases the organizations are unwilling to sell the technology know-how or it is difficult to transfer knowledge of technological assets.

Complementary assets are more about the assets related to the technological innovation of the organization. They are assets used to produce new products or services. However, new products and processes may increase the use of complementary assets or destroy the future use of the assets, because these complementary assets may become obsolete and lack fit with the new technology.

Financial assets are crucial for both the short-term and long-term operations of the company. The need for cash is always important for business activities. Moreover, cash flow management plays important roles for investment and effective financial plans. Internal and external funding are significant in supporting the projects of the organizations (Keown, Martin, Petty and Scott, 2002; Brigham and Ehrhardt, 2005).

Reputational assets show a great deal of information about the organizations and affect the responses from customers, suppliers and competitors. Reputational assets are intangible assets, allowing the organization to accomplish several goals in the markets. The main value of reputation is external for customers and suppliers. Organizations with good reputations may access sources of funds at a lower cost compared to those with poor reputations.

Structural assets are tied to the formal and informal structure of organizations. The relationship of organizational structures and external linkages can be crucial to organizational competences and capabilities. The degree of hierarchy and level of vertical and lateral integration represents organizational-specific structure. Different types of organizational structures result in various outcomes (Argyris, 1995).

Institutional assets, for example, environments such as laws, regulations and public policies, affect the institutional assets of organizations. Public policies determine what the organizations can or cannot do. Another aspect involves different nationalities, because organizations with different nationalities or geographical locations may have different institutional assets.

Market asset, such as products or service markets where the organizations operate, can directly affect strategies and how the organizations utilize some assets in particular. The strategies of the organizations should be created in response to the types of market, resulting in the capabilities and competences of the organizations to be suitable to those markets.

3.1.2 E-Learning (Electronic Learning)

E-Learning is an all-encompassing term generally used to refer to computer-enhanced learning, although it is often extended to include the use of mobile technologies such as PDAs and MP3 players. It may include the use of web-based teaching materials and hypermedia in general, multimedia CD-ROMs or websites, discussion boards, collaborative software, e-mail, blogs, wikis, text chat, computer aided assessment, educational animation, simulations, games, learning management software, electronic voting systems and more, with possibly a combination of different methods being used.

Along with the terms learning technology and educational technology, the term is generally used to refer to the use of technology in learning in a much broader sense than the computer-based training or computer aided instruction of the 1980s. It is also broader than the term online learning or online education which generally refers to purely web-based learning.

One of the advantages of E-Learning is that there is "no need to travel or transport." E-Learning is naturally suited to distance learning and flexible learning, but can also be used in conjunction with face-to-face teaching, in which case the term blended learning is commonly used. To illustrate about E-Learning, we may divide it into four types of E-Learning (Allen and Seaman, 2005).

1) Traditional Learning

Courses with no online technology used. Content is delivered in writing or orally. Proportion of content delivered online is 0%.

2) Web-Facilitated Learning

Courses which use web-based technology to facilitate what are essentially face-to-face courses. These courses employ a course management system (CMS) or web pages to post the syllabus and assignments. Proportion of content delivered online is 1-29%.

3) Blended/Hybrid Learning

Courses that blend online and face-to-face delivery. A substantial proportion of the content is delivered online, typically uses online discussions, and typically has some face-to-face meetings. The proportion of content delivered online is 30-79%. Blended learning is quite popular. It is a combination of multiple approaches to learning, for example, self-paced, collaborative or inquiry-based study through the use of 'blended' virtual and physical resources. Examples include combinations of technology-based materials, face-to-face sessions, and print materials.

4) Full Online Learning

This is a course course where most of the content is delivered online. There typically are no face-to-face meetings. The proportion of content delivered online is 80-100%.

In conclusion, E-Learning is the use of various technological tools that are either web-based, web-distributed or web-capable for the purposes of education (Mark Nichols, 2003. Moreover, E-Learning is also learning that takes place in the context of using the internet and associated web-based applications as the delivery medium for the learning experience (E-Learning Advisory Group, 2002) and refers to the use of internet technologies to deliver a broad array of solutions that enhance knowledge and performance (Rosenburg, 2001; Parker, 2002) In this study, we will focus only and "blended/hybrid learning and full online learning."

Universities all over the world are offering internet distance education so that students can study from any place at any time. In the year 2002, there were 10-20 million persons studying for their degrees through the internet. The numbers of students are increasing rapidly. Therefore, many universities have started offering internet distance education. In Thailand, E-Learning is still in the beginning era. There are only a few universities with full programs with E-Learning. Many universities use E-Learning combined with the traditional classroom. Examples are

Assumption University, Chulalongkorn University, Kasetsart University, Ramkhamhaeng University, and Sukhothai Thammathirat Open University.

3.1.3 Satisfaction

Satisfaction is the process of fulfillment, a process in which a customer will experience a beginning expected state and an ending performance state (Oliver, 1993). Satisfaction may refer to : "A feeling of gratification," "fulfillment of a need or desire," "the pleasure obtained by such fulfillment," "the source of such gratification," "reparation for an injury or loss," "vindication for a wrong suffered," and "feeling good about their accomplishments." According to reinforcement theory, people should be more satisfied or motivated if the task and the reward are defined, and an appropriate reinforcement schedule is used. When a student is required to do something to get a reward that a teacher controls, resentment may occur because the teacher has taken over part of the student's sphere of control over his or her own life. The establishment of external control over an intrinsically satisfying behavior can decrease the person's enjoyment of the activity (Lepper & Greene, 1979).

E-Learner satisfaction refers to the questions, "How was it for you?" Whatever the E-Learning system provides, one should always ask the learners for their reactions, including questions about style, pace, and quality of learning (Michel Plaisent, 2004). Furthermore, Wang (2003) presented many variables that could influence learner satisfaction, such as content, learner interface, learning feedback and assessment, personalization and learning community. Interface and access are of considerable importance to students' satisfaction. The need to measure satisfaction is critical in order to evaluate whether the systems that are currently being employed actually meet the users' needs (Johnson & Rupert, 2002)

User satisfaction is a measure of the successful interaction between an information system and its users. It is also defined as the extent to which learners believe that the information system meets their needs (Ives, Olson andBaroudi, 1983). If a system meets the requirements of the users, their satisfaction with the information system will be enhanced (Bharati, 2003). Conversely, if the system does not provide the necessary information, they will become dissatisfied. Research findings (Lucas, 1978; Robey, 1979) provide evidence that heavily-used systems are positively

correlated with user satisfaction. In contrast, Schewe (1976) found no significant relationship between system use and user satisfaction; moreover, Lawrence and Low (1993) did not find this relationship to be significant. In addition, for E-Learning satisfaction, there are some possible predictors from many studies stated below in Table 3.1. Table 1 shows some prior researchers' views regarding individual differences in E-Learning system satisfaction.

Table 3.1 Possible Predictors of E-Learning Satisfaction

This Study	Dolone and Mclean, 2003	Wang, 2003	Chiu et al., 2005	Lee et al., 2007
Type of University	System Quality Information Quality	Learner Interface Content Personalization	Perceived Usability Perceived Value	Organization/ Clarity Breadth Learner Control
Information Quality	Service Quality	Learning Community		Learner Value Interaction
System Quality				Enthusiasm
Service Quality				
Attitude Toward Learning Method				
Attitude Toward Cost Effectiveness				

3.1.4 E-Learning System Success

System success is the act of achieving or performing, an obtaining by exertion, successful performance, accomplishment, the achievement of object. The success system will have a positive impact on a learner's learning and good performance of the system. The system is an important and valuable aid to learners in the performance of one's class work. DeLone and McLean (1992) studied articles that address the subject of user satisfaction in their research. They concluded that user satisfaction was widely used as a measure of information system success. However, while user satisfaction has been widely used as a surrogate for systems performance and information system

success, critics have questioned its general applicability because of poor instruments that have been developed to measure satisfaction (Galletta and Lederer, 1989).

In addition, for E-Learning system success, there are some possible predictors from many studies, as stated below. Table 3.2 shows some prior researchers' views of individual differences in E-Learning system success.

Table 3.2 Possible Predictors of E-Learning System Success

This Study	Holsapple and Lee-Post, 2006	Liaw, 2007	Wang and Liao, 2007	Selim, 2007
Type of University	System Quality System Usage	Instructor and Learner Attitudes	Technical Quality System Related	Learning Attitudes Toward
Information Quality	Services Content Quality	Toward E-Learning	Hypothesis	E-Learning Systems
System Quality				
Service Quality				
Attitude Toward Learning Method				
Attitude Toward Cost Effectiveness				

3.1.5 Quality Factors

In this study, which is based on much literature, many factors of quality issues are put together. It is interesting to see which factors affect E-Learners' satisfaction and system success. Quality factors are shown and divided into three groups, such as Information Quality factors, System Quality factors, and Service Quality factors.

1) Information Quality (IQ)

Information quality of E-Learning is about content in many ways, such as accuracy, completeness, ease of understanding, and relevance of the online course materials (McKinney et al., 2002; DeLone and McLean, 2003). Content is comprised of the information and experiences created for an audience. Digital or web content is related to the use of hypertext, hyperlinks, and a page-based model of sharing

information. E-Learning content is learning experience that is rich, student-centered, and involves an innovative mix of online content and interactions, a deep library of online resources, online mentoring for each course, offline reading materials, online group study sessions, graded reports, and assignments and final assessments (Wordpress, 2002).

Information quality is a measure of the value which the information provides to the user of that information. "Quality" is often perceived as subjective, and the quality of information can then vary among users and among uses of the information. Nevertheless, a high degree of quality increases its objectivity or at least its inter-subjectivity. Accuracy can be seen as just one element of IQ but, depending upon how it is defined, can also be seen as encompassing many other dimensions of quality. If not, it is perceived that often there is a trade-off between accuracy and other dimensions, aspects or elements of the information determining its suitability for any given task. A list of dimensions or elements used in assessing subjective information quality is:

(1) Intrinsic IQ: Accuracy, Objectivity, Believability, Reputation

(2) Contextual IQ: Relevancy, Value Added, Timeliness, Completeness, Amount of Information

(3) Representational IQ: Interpretability, Ease of understanding, Concise Representation, Consistent Representation

(4) Accessibility IQ: Accessibility, Access security

Information quality in E-Learning is a very important success factor for E-Learning satisfaction and system success. It is the heart of E-Learning. Much content in many forms, such as online articles, streaming video, audio segments, images, specially-designed websites and unique learning objects, and any electronic elements are created to enhance courses and to improve learning (Storey, 2004) Clive Shepherd (2003) has mentioned that "content and the way in which E-Learning is introduced into an organization are the crucial deciding factors in the success of E-Learning." E-Learning standards vary according to the level of complexity, the details of description, and means of technical implementation. The standards may open up new levels of content description and data presentation, as well as have an impact on the reuse and interoperability of E-Learning content (Giedrius, 2002).

Even the best-planned E-Learning implementation can fail if the content is not engaging and relevant (ICF consulting, 2002). Choosing the type of content to be used depends on the other aspects of the E-Learning program, and on the pedagogy (Khurram, 2001; Plaisent, 2004).

Nagy Attila (2004) has noted concerning the content criteria to measure system success that "to measure the progress and the level of achievement of our goals. E-Learning should always deliver content which is current and relevant. Learning through E-Learning therefore must provide the learners with access to available experts, to the best sources, promptly responding tutors and fast solutions providers."

In terms of Information Quality factors, they can be measured by specifying characteristics related to E-Learning study, such as Accurate Information, Exactly What You Need, Useful Information, Sufficient Information, Up-to-Date Information, Easy to Understand

2) System Quality (SQ)

Not only the information quality of E-Learning but also system quality is a crucial factor in E-Learning. The system may include the performance characteristics of web-based learning systems or sites, availability, interface, ease of use, reliability, and response time (McKinney et al., 2002; DeLone and McLean, 2003. The E-learner interface also known as the Human Computer Interface or Man-Machine Interface (MMI)) and is the aggregate of means by which people—the users—interact with the system—a particular machine, device, computer program or other complex tool (Wikipedia.org). The user interface provides means of: input, allowing the users to manipulate a system. Output is allowing the system to indicate the effects of the users' manipulation. Many aspects of interface are mentioned below: "Learner interface remains key factors for determining satisfaction" (Hisham, Campton, & FitzGerald, 2004).."One cannot expect learners to visit the application time and time again simply to learn the interface" (Miller, 2005),

System quality is useful and a key success factor for E-Learning. John Chaisson (2004) has stated that "Information technology and E-Learning interfaces provide the employee training and development necessary to create the skills and competencies required to adapt to changing markets." Christophe, Christophe, Laurent and

Martine (2006) have also mentioned "If an E-Learning web-based interface is barely usable, hard to grasp, makes users not want to use it or even use other tools".

Moreover, not only interface, accessibility is also important. In the past, computer programs in DOS mode were used, but now, we need to be able to access new Graphical User Interfaces (GUI), and the need for electronic and information technology accessibility regulations has become more crucial. Since a GUI generally requires a mouse and therefore certain motor skills, this innovation adds to the already considerable problems of using a keyboard for physically challenged users. Additionally, the use of more complex graphics has made interaction with the computer increasingly difficult for vision-impaired users (E-Learning Guild, 2005).

The Figure 3.1 below shows some of the E-Learning web tools related to interface and accessibility design. Moreover, Figure 3.2 indicates the importance for learner needs via user interface and accessibility.

Respondents' Accessibility Design and Development Experience
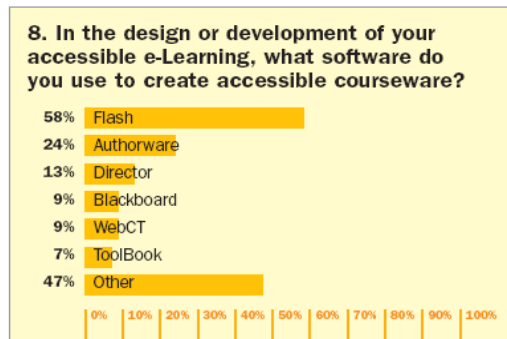
8. In the design or development of your accessible e-Learning, what software do you use to create accessible courseware?

58%	Flash
24%	Authorware
13%	Director
9%	Blackboard
9%	WebCT
7%	ToolBook
47%	Other

8. In the design or development of your accessible e-Learning, what software do you use to create accessible courseware?

In this question as well, respondents were invited to select more than one choice.

What is most striking about this list, including the high percentage of "Other" responses, is that these are common design and development tools. There does not seem to be a design or development software product that has been created specifically for accessible e-Learning design and development.

The "Other" list also points out a significant oversight on our part concerning the choices we provided for this question. Dreamweaver was mentioned by 12% of those who selected "Other," which makes it the fourth highest frequency.

Results from "Other" (in alphabetical order)

- Acrobat 6
- ANGEL
- ATutor
- BASIC
- Captivate
- CCT
- Centra
- Contribute
- Coursebuilder
- hicaption
- HTML
- Janison
- java
- Knowledge Producer
- KoolTool
- LearnerWeb
- LearningSpace
- OnDemand
- OutStart Evolution
- PowerPoint
- Proprietary software
- Qld Government Designed
- ReadyGo
- RoboDemo

Figure 3.1 E-Learning Web Tools with Interface and Accessibility Design
Source: E-Learning Guild, 2005.
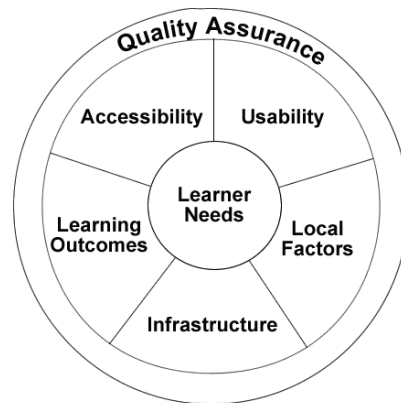
Figure 3.2 Learner Needs and Their Key Factors
Source: Brian, 2004.

In terms of System Quality factors, we can measure them by specifying the characteristics related to E-Learning study, such as user friendly, stable, attractive features, and high speed access.

3) Service Quality (SVQ)

Service quality is a business administration term and describes the degree of achievement of an ordered service. There are two types of service quality, objective and subjective. Objective service quality is the concrete measurable conformity of a study result with previously defined benefits; since measurability is remarkable dependent on the definition's accuracy, a measurable quality criterion easily can turn out as a subjective one. Subjective service quality is the learner's perceived conformity of the study result with the expected benefit. This perception is overlaid with the learner's original imagination of the service and the service providers talent in presenting his or her performance as a good one. Moreover, a defined result can turn out as unreachable. Then the best possible achievable result would be the objective ideal result, but subjective an unsatisfactory result of a service. Service quality can be related to service potential, service process, or service result. In this way, for example, potential quality can be understood as the learner's qualification, process quality as the speed of the generated service, and result quality as how much the performance matches the learner's wishes.

Service quality is related to the learner's perception of the overall support delivered by the learning system/site (Parasuraman et al., 1985; Pitt et al.,

1995; and Kettinger and Lee, 1997, including other service issues such as interaction, customization, community, sharing or discussing questions and ideas, and any IT service support. Alderman and Fletcher (2005) have stated that ".. quality interaction [is] an essential contributor to these students' achievement and satisfaction, some aspects of instructional design require modification to further enhance achievement and satisfaction." Together with personalization or customization of the user via interface will make E-Learning even better. The right personality certainly helps. Clive Shepherd (2002) mentioned that "As a learner I have always wanted to do things 'on my terms' and have therefore taken responsibility for my own progress." Moreover, Owen Conlan (2002) stated that "the cornerstone of the personalization process is the building of an appropriate learner profile. This profile is induced to a selection process to assemble a personalized course for the learner." Personalized support for the learner interface becomes even more important when E-Learning takes place in open and dynamic learning and information networks (Dolog, 2004). Many courses should be designed with personalization, providing each student with the course (learning path) most suited to his or her needs (coming from his/her profile), in accordance with precedence-succession relationships (Carchiolo, 2003). Researchers have found that student satisfaction at the graduate level is related to faculty student interaction, peer interaction (Roach, 2006).

Online communities between organizations can contribute to organizational performance as the organizations utilize the relationship with their social network, as for example, with consultants, external advisors, and customers (McDonald and Westphal, 2003). Social networks can also be an important source of knowledge. Interacting with customers, suppliers or learning from external experts, an organization can capture and acquire new knowledge. In their research, Somchai Numprasertchai and Igel (2005) stated that by forming a social network, collaboration and exchange among universities, government agencies, and industries can help generate a greater breadth and depth of research knowledge than pure in-house development.

Brookes, Morton Dainty and Burns (2006) also found that community is important for knowledge capturing and knowledge transfer. Liebowitz (2005) suggested that community refers to the relationships and flows between "actors," including people, groups, organizations, computers, or other information/knowledge

processing entities. In this study, community can be defined as the combination of all relationships that exist between the organizations and external groups, such as students and instructors.

A critical mass of users is then needed to initiate and sustain such an E-Learning community. Community tools as a well-designed repository environment will support the process of knowledge construction, increase learner satisfaction, and enable social and mutual support (Sandrock and Vo, 2004). The users of a large and active learning community can greatly benefit from adaptive personalization tools capable of timely selecting and recommending new incoming information which meets their specific interests (Tasso, 2004).

The growing importance of E-Learning as a tool for informal learning and team development in business is leading to new types of E-Learning communities with different objectives, different boundaries and memberships, different demands on the moderator, and different measures of effectiveness (Sloman, 2003) Figure 3.3 and Figure 3.4 below illustrates the E-Learning community tools used nowadays.
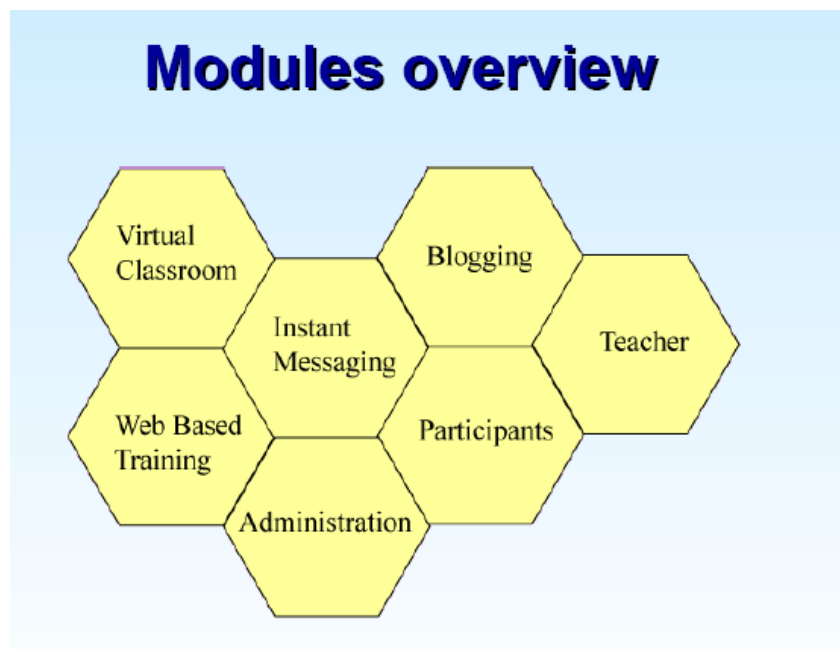
Figure 3.3 Modules Overview in Service Quality Factor: E-Learning Community
 Tools

Source: Graf, 2005.

Specific Key Activities

Figure 3.4 Service Quality Factor: E-Learning Community Tools
Source: Herd, 2006.

Another important factor for service quality is good IT support service or fewer technology glitches. E-Learning courses should be offered 24 hours and offer quick response for IT problems if the learners have any. There are many IT problems occurring during the E-Learning process; for example, these technology glitches usually are improper functions, slow speed, downtime, and limited bandwidth. Moreover, Luther Tai (2008) mentioned that "There can be no technical glitches because learners will not come back if there are glitches that cause frustration". According to Sathima Patomviriyavong (2006), E-Learning programs rely critically on the speed of the internet broadband. A system's fall-down, a heavy traffic over the information highway, and availability of the broadband in certain geographical areas can cause monetary losses and reputation damages to the program (Sathima Patomviriyavong, 2006). Technology glitches can slow down rapid E-Learning efforts before they ever get started. Information technology can be useful for creating competitive advantages for improving goods and services by the application of computer-based information systems and advances in telecommunications (Farrell and Song, 1988; Lee and Choi, 2003).

According to Karl M. Kapp (2004), he suggested doing a "technology rehearsal" by checking the technical aspects of the E-Learning solution before it is needed. One should know about the following: browser versions on desktops or laptops, versions of plug-ins, the status of speakers on workstations, firewall and other security restrictions, bandwidth limitations, the Learning Management System (LMS) compatibility, and other information technology (IT) restrictions. The uses of information technology are pervasive and have an impact on several aspects of the study in the university, including information processing, human resources, communication, and decision making. Hislop (2002) has mentioned that information technology plays important roles in the management of organizational knowledge, including the application of information technology systems. Furthermore, the resource-based view theory suggests that information technology is one of the resources that can lead to a differential value of the organization. Consequently, it is important that the E-Learning system should be concerned with making sure that information technology is adequate, available, integrated well with human resource capability, and utilized effectively to support knowledge management in the organization, including effective communication across boundaries and time zones.

In terms of service quality factors, we can measure them by specifying the characteristics related to E-Learning study, such as customization, being well organized, interactivity with other students and Instructors, and helping with IT support options available.

3.1.6 Attitude Factors

An attitude simply means a hypothetical construct that represents an individual's degree of like or dislike for an item. Attitudes are generally positive or negative views of a person, place, thing, or event—this is often referred to as the attitude object. People can also be conflicted or ambivalent toward an object, meaning that they simultaneously possess both positive and negative attitudes toward the item in question. The E-Learning method is changing ways of learning, unlike with the traditional classroom and many people may not be prepared for this change. E-learners need more self-discipline and good IT skills. It is interesting to see the attitude of e-learners from different viewpoints.

Ray J. Tsai's research about online users indicates that online learners' level of satisfaction is related to the initial use of an E-Learning system and is positively associated with their E-Learning continuance intention. Moreover, he mentioned that "the higher an online learners' computer self-efficacy, the higher his/her outcome expectations." Other researchers, Davis (1989), have suggested that external factors might be important determinants in order to gain specific information that can more accurately assess the adoption of the information systems. They theorized that the effects of external variables on intention are mediated by perceived ease of use and perceived usefulness. Figure 3.5 below shows his hechnology acceptance model.
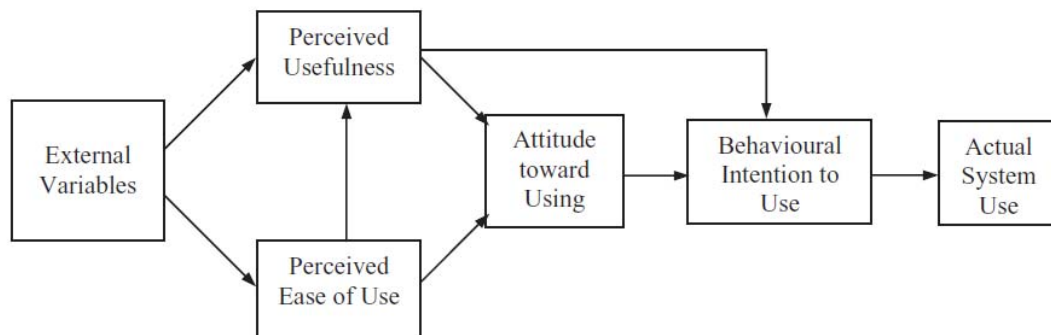
Figure 3.5 Technology Acceptance Model
Source: Davis, 1989.

There are two areas of interest in this study regarding attitude factors. The first is Attitude in Learning style since it is new way of learning and more highly technology than the traditional one. It requires a lot of changes. The second is Attitude Toward Cost Effectiveness. Many non e-learners still question if it is costly or reasonable to shift from their traditional way to another way of learning.

1) E-Learner's Attitude toward the Learning Method (AL)

As mentioned by Patricia Bertea (2009), the successful e-learner must have qualities such as self-motivation, patience, self-discipline, ease in using software, good technical skills and abilities regarding time management, communication, and organizing abilities. These factors have a direct impact on students' attitude towards E-Learning. Thus, the attitude can be positive, if the new form of education fits the students' needs and characteristics, or negative, if the student cannot adapt to the new

system, because he or she does not have the set of characteristics required. Some attitude questions are "Can E-Learning offer the possibility to efficiently manage your time?" and "Can E-Learning be more efficient as teaching method?"

User's attitude toward virtual learning establishes a suitable environment for instruction. According to Liaw and Huang, (2000) the attitude of users can be divided into feeling, both cognitive and behavioral. In establishing and developing virtual learning, the understanding of social needs is necessary. First the characteristics of learners, such as attitude, motivation, beliefs, trust, should be determined (Passerini and Granger, 2000). Similarly, one should have a positive attitude to virtual learning leads for greater motivation (Liaw and Huang, 2000). Clark (1994) has noted that internet and multimedia certainly are educational issues but the extent of their use depends on the attitude of professors and students.

2) E-Learner's Attitude toward Cost Effectiveness (AC)

The methods of E-Learning have changed from traditional learning. Distance and equipment have also changed. Saving distance and time reduces the cost of transportation and increases other opportunity costs. However, E-Learning requires more equipment and new ways of operating this equipment. It would be interesting to see how the E-learner's Attitude toward Cost effectiveness affects satisfaction and system success. E-Learning has also been praised as a lower-cost option for future education. In traditional learning, the costs of individual classes and learning institutions vary depending on location, degree or type of program, and area of study. However, some online universities generally charge in the same way that traditional universities do, by charging per credit hour. Some are even more expensive than traditional ones. Location,tTravel for learners, the cost of loss of productivity, training location fees, and instructor costs must be weighed against the cost of redesigning the course into an interactive experience that results in cheaper expenses for the learners.

Because the only requirements for E-Learning (in most cases) are a computer with internet access, E-Learning students can learn from home, libraries, internet cafes or any other location that has internet access. This is why E-Learning is a preferred option for those that work full time or part time and cannot afford to travel to a physical school. The ease of location with E-Learning also makes it preferable for stay-at-home parents with young or special-needs children. E-Learning can also save money in that e-learners do not have to pay for gas, repair vehicles or deal with

parking validation if they choose to remain at home while taking courses online. Ease of location is also beneficial for students that are home-schooled, as they can gain social interaction through online communications as well as educational materials. Moreover, using other electronic media, for example print and audio, can also reduce costs and introduce variety for learners (Brooks, 2009).

3.1.7 Type of Public University

There are two types of public university in Thailand such as the open and closed types. The closed university in Thailand is a university that requires examination and admission for recruiting students. More regulations with time check in classrooms are expected as well as formal student uniforms and required activity attendances. Many famous closed universities in Thailand are Chulalongkorn University, Thammasart University, and Kasetsart University.

In contrast, the open university usually refers to a university with an open-door academic policy, no entry requirements, and special terms. An open university is one system where the Thai Government has tried to enlarge opportunity for the education of the Thai people. Usually, they can accept unlimited numbers of students since the closed university is different from the normal classroom. Distance learning and self-learning also support these students. In Thailand, there are two open universities: Ramkhamhaeng University (established 1971) and Sukhothai Thammathirat Open University (established 1978).

3.1.8 Individual Background Variables

Individual background variables are age, Gender, full-time studying, level of degrees, GPA, hours spent per connect, frequency used, and available internet at home. These control variables are included since it is important to explore these variables to investigate whether they can be held constant as they affect organizations. Delaney and Huselid (1996), Huseyin (2005), Lin and Chen (2007) and have suggested that there are control variables which affect organizational performance, including organizational size, organizational age, and R&D source. In addition to the independent variables above, individual background variables should also be considered regarding satisfaction and success since it is important to explore these variables to investigate whether they can be held constant as they affect results.

3.2 Conceptual Framework

The model of this study on E-Learning satisfaction and system success is shown in Figure 5. According to the literature review, there are many factors that impact E-Learning satisfaction and system success, such as information quality, system quality, service quality regarding attitudes of e-learners, as well as individual background. In addition, the types of public university, such as the open or closed type, are also included here in order to see if they impact E-Learning satisfaction and system success.

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┌─────────────────────────────────────────────────────────────────────────────┐
│  ┌──────────────────────────┐  ┌──────────────────────┐  ┌─────────────────┐ │
│  │ IQ: Information Quality  │  │ TP: Type of Public   │  │ AL: E-Learner's │ │
│  │ IQ1: Accurate Information│  │      University      │  │ Attitude Toward │ │
│  │ IQ2: Exactly What You need│ │ TP0: Open System     │  │ Learning Method │ │
│  │ IQ3: Useful Information  │  └──────────────────────┘  │ AL1: Method Preference │
│  │ IQ4: Sufficient Information│                           │ AL2: Useful for Learning│
│  │ IQ5: Up-to-Date Information│                          │ AL3: Learners' will to learn│
│  │ IQ6: Easy to Understand  │                            │ AL4: Instructors' will to teach│
│  └──────────────────────────┘                            └─────────────────┘ │
│                                                                               │
│  ┌──────────────────────────┐   ┌──────────────┐   ┌──────────────────┐      │
│  │ SQ: System Quality       │   │  E-Learning  │   │  E-Learners'     │      │
│  │ SQ1: User Friendly       │   │    System    │   │  Satisfaction    │      │
│  │ SQ2: Stable              │   └──────────────┘   └──────────────────┘      │
│  │ SQ3: Attractive Features │                                                 │
│  │ SQ4: High Speed Access   │                                                 │
│  └──────────────────────────┘                                                 │
│                                                                               │
│  ┌──────────────────────────┐   ┌──────────────────────────────────┐         │
│  │ SVQ: Service Quality     │   │ AC: E-Learner's Attitude         │         │
│  │ SVQ1: Customization      │   │ Toward Cost Effectiveness        │         │
│  │ SVQ2: Well organized     │   │ AC1: Reasonable Spending         │         │
│  │ SVQ3: Interactivity with other students │ AC2: Worth Equipment Cost Paying │
│  │ SVQ4: Interactivity with Instructors │ AC3: Saving in Overall Cost │       │
│  │ SVQ5: Help Support option available │ └────────────────────────┘         │
│  └──────────────────────────┘                                                 │
└─────────────────────────────────────────────────────────────────────────────┘
┌─────────────────────────────────────────────────────────────────────────────┐
│                        Individual Background                                  │
│                                                                               │
│ Age, Gender, Full-Time Studying, Level of Degrees, GPA, Hours Spent per connect, Frequency Online Used │
└─────────────────────────────────────────────────────────────────────────────┘
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Figure 3.6 Conceptual Framework: Quality and Attitude Factors on E-Learners'
Satisfaction and E-Learning System Success in the Thai Public
University

3.3 Research Hypotheses

The research hypotheses for this study are listed below:

1) H01: E-Learners' satisfaction is related to the information quality provided through the E-Learning systems.

2) H02: E-Learners' satisfaction is related to the system quality provided through the E-Learning systems.

3) H03: E-Learners' satisfaction is related to the service quality provided through the E-Learning systems.

4) H04: E-Learners' satisfaction is related to the e-learners attitude in learning style provided through the E-Learning systems.

5) H05: E-Learners' satisfaction is related to the e-learners attitude toward cost effectiveness provided through the E-Learning systems.

6) H06: E-Learners' satisfaction is related to the types of public university in Thailand provided through the E-Learning systems.

7) H07: E-Learning system success is related to the information quality provided through the E-Learning systems.

8) H08: E-Learning system success is related to the system quality provided through the E-Learning systems.

9) H09: E-Learning system success is related to the service quality provided through the E-Learning systems.

10) H10: E-Learning system success is related to the e-learners attitude toward the learning style provided through the E-Learning systems.

11) H11: E-Learning system success is related to the e-learners attitude toward cost effectiveness provided through the E-Learning systems.

12) H12: E-Learning system success is related to the types of public university in Thailand provided through the E-Learning systems.

13) H13: There is a significant difference in E-Learners' satisfaction and E-Learners' system success.

14) H14: E-Learners' individual background is significantly related to E-Learning satisfaction and system success.

In summary, this chapter discusses the definitions and theories regarding the model studied. Key factors are reviewed and discussed. Related literature is identified to suggest the relationships among independent variables and dependant variables. There are fourteen hypotheses to be tested in order to understand their relationships. In short, the key literature related to this research includes the resource-based theory of the firm, E-Learners' satisfaction, E-Learning system success, information quality, system quality, service quality, attitude toward the learning method, attitude toward cost effectiveness, and type of university and individual background.

CHAPTER 4

RESEARCH METHODOLOGY

This research is based on the quantitative method using e-questionnaires to analyze the relationships of factors affecting E-Learning satisfaction and system success. In this chapter, the author discusses the research methodology applied in analyzing the relationships of influential factors. The types of research, the purposes of the study, and the techniques employed for data collection were clearly made before conducting the research. Neuman (2003) has stated that there are several dimensions for researchers to consider before getting started with any research, as listed below:

Dimensions of Research

1) How research is used (basic, applied)

2) Purpose of the study (Exploratory, descriptive, explanatory)

3) The way time enters in (Cross-sectional, longitudinal (time series, panel, and cohort)

4) Technique for collecting quantitative data (Experiments, surveys, content analysis, and existing statistics studies)

According to Neuman (2003), quantitative research is concerned with the issues of design, measurement, and sampling because it is based upon a deductive approach, which focuses on detailed planning before data collection and data analysis. Quantitative research methods are selected because this study is based upon resource-based theory, and measures are systematically created before data collection and are standardized for all observations. Uses of statistics, tables, or charts and discussion are used to show the relationships to the hypotheses.

4.1 Unit of Analysis

For the units of analysis, they are generally formed from a higher level, such as the organizational level, to the lower level (the individual level). Babbie (1999) has stated that, for social scientists, most of the units of analysis are individuals and the observations made to describe the characteristics of a number of individuals, such as sex, age, regions of birth, and attitudes. Moreover, there are actually four types of units of analysis: individuals, groups, organizations, and social artifacts.

The unit of analysis of this study is at the individual level since the study focuses on E-Learners' satisfaction and system success. Individuals are the students taking online classes at selected public universities in Thailand of two different types, such as open and closed university.

4.2 Target Population and Sampling of the Study

The target population for E-Learning students in the Thai university is very difficult to count at this time since E-Learning is a new way of learning in many universities and also it depends on whether or not top management support E-Learning methods for their universities. According to the data from the Thailand Cyber University Project, the Office of the Higher Education Commission, and the Ministry of Education, there are 41 universities and organizations (20 universities and 21 organizations) using E-Learning for a total of 107,881 students over 6 years (see Figure 4.1). The average numbers of students per year and per institution is 439 students each. Examples of universities that are using E-Learning are shown below.
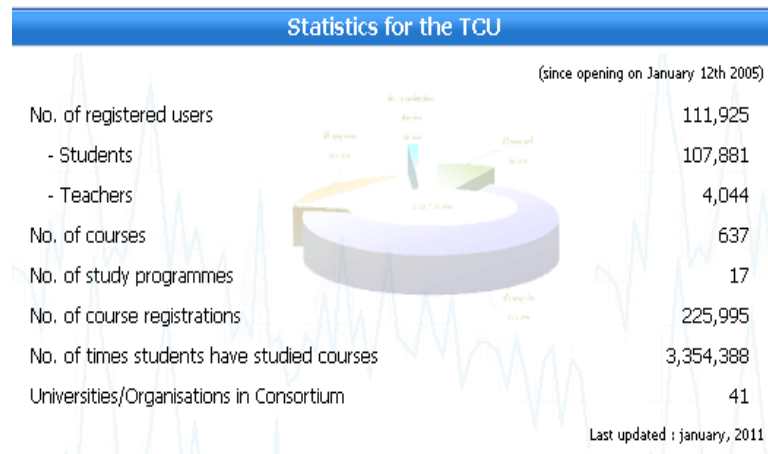
Figure 4.1 E-Learning Statistics

Source: Ministry of Education, Office of the Higher Education Commission, 2010.

Examples of Universities Using E-Learning

- Chulalongkorn University
- Kasetsart University
- Naresuan University
- Silpakorn University
- Chiang Mai University
- Mahidol University
- Mae Fah Luang University
- University of the Thai Chamber of Commerce
- Sukhothai Thammathirat Open University

- Prince of Songkla University
- Rangsit University
- Burapha University
- Dusit Rajabhat University
- SrinakharinWirot University
- Rajamangala University
- KHON KAEN University
- King Mongkut's University
- Ramkhamhaeng University
- Sripatum University

The population of E-Learning is mixed, from lower-level degrees such as a bachelor's to higher-level degrees such as the Ph.D. This research surveyed students with a bachelors' degree or above level that were currently taking online classes at a public university. Chulalongkorn University and Kasetsart University were selected for the closed public university since they are among the most famous universities in Thailand. The approximate number of students currently taking online programs is predicted to be about 400-500 students a year for each university. Other selected

public universities are Sukhothai Thammathirat Open University (STOU) and Ramkhamhaeng University. They employ a system of learning which enables students to study by themselves without having to enter conventional classrooms. Instruction is given through the use of tutorials, computer-assisted learning, and E-Learning.

Due to the large population, the stratified sampling method was used according to the Elementary Sampling Theory (Yamane, 1967) in order to determine the appropriate sample size, as seen in the table 3.1 below.

Table 4.1 Sample Size for ±3%, ±5%, ±7% and ±10% Precision Levels Where Confidence Level is 95% and P=.5

Size of Population	Sample Size (n) for Precision (e) of:			
	±3%	±5%	±7%	±10%
500	a	222	145	83
600	a	240	152	86
700	a	255	158	88
800	a	267	163	89
900	a	277	166	90
1,000	a	286	169	91
2,000	**714**	**333**	**185**	**95**
3,000	811	353	191	97
4,000	870	364	194	98
5,000	909	370	196	98
6,000	938	375	197	98
7,000	959	378	198	99
8,000	976	381	199	99
9,000	989	383	200	99
10,000	1,000	385	200	99
15,000	1,034	390	201	99
20,000	1,053	392	204	100
25,000	1,064	394	204	100

Table 4.1 (Continued)

Size of Population	Sample Size (n) for Precision (e) of:			
	±3%	±5%	±7%	±10%
50,000	1,087	397	204	100
100,000	1,099	398	204	100
>100,000	1,111	400	204	100

Source: Yamane, 1967.

Note: a = Assumption of normal population is poor. The entire population should be sampled.

Therefore, in this study, the population was approximately 2,000 e-learners (approximately 500 e-learners in each university). As seen in the table, if the size of the population is 2,000 for ±5% precision level, where the confidence level is 95%, the sample size will be 333. The sample size for each group of closed and open public university was equally divided. Hair, Black, Babin, Anderson, and Tatham (2006) have suggested that for research modeling, a sample size of 200 is small but reasonable. In this study, the sample size was 333, which passed over the criteria for a sample size of 200.

Table 4.2 The Population and Sample Universities for the Study

Type of University	Name of University	Numbers of Surveyed Students
Open University	Ramkhamhaeng University	117
	Sukhothai Thammathirat Open University (STOU)	55
Closed University	Chulalongkorn University	67
	Kasetsart University	98
	Total	**337**

There were 4 universities surveyed with a total of 337 students: 58 students from Chulalongkorn University, 94 students from Kasetsart University, 93 students from Ramkhamhaeng University, and 41 students from STOU.

In summary, 172 surveyed students were collected from open universities (Ramkhamhaeng University and STOU), and 165 surveyed students were collected from closed universities (Chulalongkorn University and Kasetsart University).

4.3 Data Collection and Instrument Design

The instrument used in this study was designed to obtain information about E-Learners' independent variables, dependent variables, as well as their individual backgrounds. A 7 point Likert scale was used for items. Questionnaires were developed along the steps below, the steps of the instrument development.

1) Clarification of the concept of variables

2) Development and refinement of the item pool

3) Pre-pilot review of the pilot survey instrument (first piloted on a group of 40 students in order to test for reliability, and make minor modifications)

4) Addition of individual background items

5) Pilot survey (7-point Likert scale ranging from one (strongly disagree) to seven (strongly agree).

The survey instrument was used to collect data from learners about their perceptions of the impact of the online learning environment in regards to their benefits and satisfaction level. The questionnaire was developed from the literature after a comprehensive survey of various validated E-Learning effectiveness models, as seen in the literature review section. In the survey, there were 40 questions with two main parts. The first part aimed to gather generic background data about the learners, and the second part about learners' online experiences was divided into seven sections: Information Quality, Service Quality, System Quality, Attitude Toward Learning Method, Attitude Toward Cost Effectiveness, Overall Satisfaction, and System Success. The questions that belonged to the second part were seven point Likert-type scale items. Each question anchored from 1 to 7, where 1 indicates strong disagreement and 7 indicates strong agreement. The last question was open-ended and asked for any recommendations for E-Learning satisfaction and success.

E-Learning students' data were obtained via e-mail survey, which represented cross-sectional data (for one semester, the same semester for the surveyed university). The total time spent on the data collection was approximately three months, from October to December, 2010. Since e-learners usually own an email account and communicate to others by using email and websites, the data were collected by using web-based questionnaires and emails, which were sent to students currently taking online programs.

The questionnaires were modified into the online web-based form by using Application Google Document **Google docs** . Both the Thai and English language were used in the question form. The example of Google Docs Application is shown in Figure 4.2

Figure 4.2 Google Docs Application (Online Web-Based Questionnaire Making)

Students saw the online form as in Figure 4.3 below. The full version of e-questionnaire is also attached in the Appendix.

Figure 4.3 Example of Online Form Using the Google Docs Application

        This survey reached students by posting the web-address-link on class websites or emailing them asking for the help of the IT support department in selected public universities. All input by students were automatically generated in the Google Docs Database in spreadsheets as shown in Figure 4.4 below.

Figure 4.4 Google Docs Database in Spreadsheet

The research was conducted among the public universities, both open and closed universities. One hundred seventy-two surveyed students were collected from the open university from Sukhothai Thammathirat Open University (STOU) and Ramkhamhaeng University. Additionally, 165 surveys were collected from the closed universities of Chulalongkorn University and Kasetsart University. Total received data were from 337 surveyed students. However, the data from only 286 surveyed students were used since the rest of the students did not complete the answers.

4.4 Methods of Data Analysis

In this study, the author analyzed the data by using descriptive statistics as well as the details of the equation modeling with various analyses, such as regression, ANOVA, T-Test, and correlation to fit the data and the proposed model. The data analysis as conducted by using SPSS 17.0.

4.5 Measurement of Reliability

4.5.1 Reliability

According to Hair et al. (2006), reliability means the degree to which measures are free from error and therefore yield consistent results. He has also suggested that Cronbach's alpha can be used as a measurement. To be reliable, the Cronbach's alpha should exceed the threshold of.70, although a .60 level can be used in exploratory research.

4.5.2 Pretesting

In order to test the reliability of the e-questionnaires, the author conducted a pretest with 10 first surveyed data from each university, excluded from the study, and these data were used only for the purpose of pretesting.

Table 4.3 Questions from the Pre-Testing E-Questionnaire

Construct	Observed Variable
Information Quality (IQ)	Q10: The data were accurate and reliable?
	Q11: This E-Learning provides information that is exactly what you need.
	Q12: The E-Learning provides information that is useful to learning.
	Q13: This E-Learning provides sufficient information.
	Q14: This E-Learning provides up-to-date information
	Q15: This E-Learning provides information that is easy to understand
System Quality (SQ)	Q16: The system is user-friendly. The web-based learning site functions well all the time.
	Q17: The system is always available.
	Q18: The system has attractive features that appeal to users.
	Q19: The system provides high-speed information access.
	Q20: The web-based learning site meets the specific needs of each learner or so called "customization".
	Q21: The web-based learning site provides the services I need, and were well organized and I was comfortable using the services provided.
Service Quality (SVQ)	Q22: The E-Learning system makes it easy for me to access the shared content from the learning community.
	Q23: The E-Learning system makes it easy for me to discuss questions with my lecturers and/or tutors.
	Q24: The E-Learning system makes it easy for me to contact and get help from IT Service Support
E-Learner's Attitude Toward Learning Method (AL)	Q25: Do you agree that "E-Learning is more efficient than the traditional teaching method?
	Q26: Do you agree that online classes are useful for your studying?
	Q27: Do you have a good will to learn in online class?
	Q28: Do you think that instructors have a good will to teach in online class?
E-Learner's Attitude Toward Cost Effectiveness (AC)	Q29: Do you have a good Attitude toward reasonable cost of E-Learning?
	Q30: Do You have a good attitude toward extra cost paying such as equipment required by Online Class?
	Q31: Do you think that you appreciate spending overall cost of E-Learning more than traditional classroom learning?

Table 4.3 (Continued)

Construct	Observed Variable
E-Learning Satisfaction	Q32: Are you satisfied with your online class?
	Q33: Do you think E-Learning is helpful?
	Q34: Are you pleased with the experience of using E-Learning?
	Q35: Your decision to use the E-Learning system is a wise one.
E-Learning System Success	Q36: The system has a positive impact on my learning.
	Q37: Do you think the E-Learning system is effective?
	Q38: Do you think the E-Learning system is successful?
	Q39: The system is a valuable aid to me in the performance of my class work.

These e-questionnaires were collected on a scale of 1 to 7 (lowest degree of agreement to highest degree of agreement).

Table 4.4 The Reliability Analysis of the E-Questionnaire from Pre-Testing

Construct	Cronbach's alpha
Information Quality (IQ) 5 items	.878
System Quality (SQ) 4 items	.807
Service Quality (SVQ) 5 items	.844
E-Learner's Attitude Toward Learning Method (AL) 3 items	.801
E-Learner's Attitude Toward Cost Effectiveness (AC) 3 items	.842
E-Learners' Satisfaction 4 items	.899
E-Learning System Success 4 items	.911

From the reliability analysis of the pre-testing, the construct of E-Learning system success shows the highest Cronbach alpha at .911 (4 items). The lowest Cronbach alpha was E-Learner's Attitude toward Learning Method (AL) at .842. All of them were over.70, which passed the reliability test.

4.6 Operationalization

To describe how the construct or variables were operationalized, the tables below demonstrate the operationalization for each variable.

Table 4.5 Definitions and Operationalization of Variables

Variables	Definitions	Operationalization	References
1. E-Learning Satisfaction	Satisfaction is the process of fulfillment; a process in which a customer will experience a beginning expected state and an ending performance state. Degree of overall satisfaction Degree of student learning Degree of knowledge acquisition	- I think the system is very helpful. - Overall, I am satisfied with the system. - You are pleased with the experience of using the E-Learning system. - Your decision to use the E-Learning system is a wise one.	Oliver (1993), Plaisent (2004), Clive, (2000), Whilst Wang (2003), Johnson and Ruppert (2002)
2. E-Learning System Success	The act of achieving or performing; an obtaining by exertion; successful performance; accomplishment; the achievement of one's object.	- The system has a positive impact on my learning. - Overall, the performance of the system is good. - Overall, the system is successful. - The system is an important and	Little (2004), State Education and Environment Roundtable (2005), Charbonnier (2006), Bretz (1989), University of California, Berkeley (2010)

Table 4.5 (Continued)

Variables	Definitions	Operationalization	References
		valuable aid to me in the performance of my class work.	
3. Information Quality	Digital Content Description, data Presentation, Online articles, streaming video, audio segments, images, specially designed websites and unique learning objects— electronic elements created to enhance courses and improve learning	- The system provides information that is exactly what you need. - The system provides information that is relevant to learning. - The system provides sufficient information. - The system provides information that is easy to understand. - The system provides up-to-date information. - The system provides accurate and reliable information.	Wordpress (2002), Shepherd (2003), Balbieris (2002), ICF Consulting (2002), Storey (2004), Plaisent (2004)
4. System Quality	The learner's belief about the performance characteristics of eb-based learning systems or sites, including availability, ease of use, reliability, and response time McKinney et al. (2002); DeLone & McLean (2003) User Interface, Virtual, Picture, Graphic, or Function that communicate to perception of user, Accessibility-Technical use of the website or online courses without any	- The system is always available. The web-based learning site functions well all the time. - The system is user-friendly. The user interface of the web-based learning site is well designed. It is easy to navigate the web-based learning site. - The system has	Hisham, Campton and FitzGerald (2004), Miller (2005), Chaisson (2004), Christophe, Christophe, Laurent and Martine (2006), Shepherd (2002), Conlan (2002), Dolog (2004), Carchiolo (2003)

Table 4.5 (Continued)

Variables	Definitions	Operationalization	References
	difficulty, Technology Glitches	attractive features that appeal to users. - The system provides high-speed information access. The web-based learning site can quickly load all the text and graphics.	Styliadis (2006), Tasso (2004), E-Learning Guild (2005), Kelly (2004), Hisham (2004), Tai (2008), Sathima Patomviriyavong (2006), Kapp (2004), Sandrock and Vo (2004), Roach (2006), Sloman (2003)
5. Service Quality	The learner's perception of the overall support delivered by the web-based learning system/site Parasuraman et al. (1985); Pitt et al. (1995); Kettinger & Lee (1997) Service Quality is a performance perception which influences customer satisfaction through two mechanisms, directly via customer observation of good or bad service quality and indirectly via an input to the disconfirmation comparison (i.e. discrepancy between performance and expectation).	- The E-Learning system makes it easy for me to access the shared content from the learning community. Interactivity among students - The E-Learning system makes it easy for me to discuss questions with my lecturers and/or tutors. Interactivity with instructors - The E-Learning system makes it easy for me to contact and get help from IT Service Support. - The web-based learning site can meet the specific needs of each learner or so called " Customizations". - The web-based	

Table 4.5 (Continued)

Variables	Definitions	Operationalization	References
		learning site provides the services I need, are well organized and I am comfortable using the services provided.	
6. E-Learner's Attitude toward Learning and Teaching Style	Hypothetical construct that represents an individual's degree of like or dislike for an item	Conflicted or ambivalent toward an object (E-Learning), "E-Learning offers the possibility to efficiently manage your time" and "E-Learning is not as efficient as the teaching method." - Do you agree that E-Learning is more efficient than the traditional teaching method? Prefer to use E-Learning method? - Do you agree that Online Classes are useful for your studying? - Do you agree that Students and Instructors should have a good will to learn or teach in Online Class?	Bertea (2009), Liaw and Huang (2000), Passerini and Granger (2000), Liaw (2004), Clark (1994)
7. E-Learner's Attitude toward Cost effectiveness	Cost effectiveness: Expense of fees, Education, Additional Material Expense for study.	- Cost effectiveness: tuition for online courses should be affordable, cost is reasonable and sufficient to provide	Wang (2006), Brooks (2009)

Table 4.5 (Continued)

Variables	Definitions	Operationalization	References
		high quality online education	
		- good Attitude in Cost of E-Learning and equipment/extra cost required by Online Class	
		- cheaper overall cost	
8. Type of public university	Open public university Closed public university	- Open public university - Closed public university	Ministry of Education, Office of the Higher Education Commission, (2008),
9. Individual Background Variables	Individual variables affect results.	Age, Gender, Full-Time Studying, Level of Degree, GPA, Hours Spent per connect, Frequency Used, and Available internet at home	Lin and Chen (2007), Huseyin (2005), Delaney and Huselid (1996)

CHAPTER 5

DATA ANALYSIS

Data analysis was conducted by using SPSS 17.0. The data were analyzed by using various statistic analyses, such as descriptive statistics, T-Test, ANOVA, Regression, and also with correlation analysis. Next, the author developed models with 6 constructs, including Information Quality, System Quality, Service Quality, Attitude toward Learning method, Attitude in Cost, an Type of University as factors affecting E-Learners' Satisfaction and affecting E-Learning System Success.

In this process, two models were developed showing how each factor had impact the outcomes of E-Learning and identified to help test the research hypotheses. In the last chapter, the study shows how the results can explain and support the research hypotheses proposed in the previous chapter.

5.1 Results of Descriptive Statistics

In this chapter, the results of the data analysis are shown in detail in Table 5.1. From the descriptive results, with the observed variables, it can be seen that the scale was from 1 to 7. The average mean of all data variables was in the range of 4.52 to 5.48. The most score, 5.48, was the Information Quality factor in "The E-Learning provides information that is useful for learning." The least score, 4.52, as Attitude Toward Learning Method factor in "Do you agree that E-Learning is more efficient than the traditional teaching method?" In addition, the outputs from SPSS 17.0 have also show the results of individual backgrounds such as age, gender, full-time studying, level of degrees, hours spent per connect, frequency online used.

Table 5.1 Descriptive Statistics of Observed Variables

Construct	Observed Variable	Min	Max	Mean	S.D.
	Q10: The Data were accurate and reliable.	2	7	5.09	1.096
	Q11: This E-Learning provides information that is exactly what you need.	1	7	5.09	1.229
Information Quality (IQ)	Q12: The E-Learning provides information that is useful to learning.	1	7	5.48	1.154
	Q13: This E-Learning provides sufficient information.	1	7	4.87	1.304
	Q14: This E-Learning provides up-to-date information.	1	7	4.94	1.350
	Q15: This E-Learning provides information that is easy to understand.	1	7	4.88	1.213
	Q16: The system is user-friendly. The web-based learning site functions well all the time.	1	7	5.09	1.197
System Quality (SQ)	Q17: The system is always available.	1	7	4.76	1.233
	Q18: The system has attractive features that appeal to users.	1	7	4.95	1.224
	Q19: The system provides high-speed information access.	1	7	5.02	1.179
	Q20: The web-based learning site meets the specific needs of each learner or so called customization.	1	7	4.79	1.250
	Q21: The web-based learning site provides the services I need, were well organized and I was comfortable using the services provided by the web-based learning site.	2	7	5.15	1.198
Service Quality (SVQ)	Q22: The E-Learning system makes it easy for me to access the shared content from the learning community.	1	7	4.86	1.454
	Q23: The E-Learning system makes it easy for me to discuss questions with my lecturers and/or tutors.	1	7	4.77	1.481
	Q24: The E-Learning system makes it easy for me to contact and get help from IT Service Support.	1	7	4.63	1.442
	Q25: Do you agree that "E-Learning is more efficient than the traditional teaching method?	1	7	4.52	1.472
E-Learner's Attitude Toward Learning Method (AL)	Q26: Do you agree that online classes are useful for your studying?	1	7	5.15	1.191
	Q27: Do you have a good will to learn in online class?	1	7	5.13	1.299
	Q28: Do you think that instructors have a good will to teach in Online Class?	1	7	5.14	1.277
	Q29: You have good Attitude Toward Reasonable Cost of E-Learning?	1	7	4.98	1.292
E-Learner's Attitude Toward Cost Effectiveness (AC)	Q30: You have a good attitude toward paying extra cost for equipment required by the online class?	1	7	4.98	1.204
	Q31: Do you think that you appreciate spending overall cost of E-Learning more than traditional classroom learning?	1	7	4.70	1.379

Table 5.1 (Continued)

Construct	Observed Variable	Min	Max	Mean	S.D.
	Q32: Are you satisfied with your online class?	2	7	4.94	1.121
	Q33: Do you think the E-Learning is very helpful?	1	7	5.11	1.158
E-Learning Satisfaction	Q34: You are pleased with the experience of using E-Learning?	2	7	5.19	1.153
	Q35: Your decision to use the E-Learning system was a wise one.	1	7	4.93	1.363
	Q36: The system has a positive impact on my learning.	1	7	5.12	1.232
	Q37: Do you think the E-Learning system is effective?	1	7	5.00	1.233
E-Learning System Success	Q38: Do you think the E-Learning system is successful?	1	7	4.90	1.335
	Q39: The system is a valuable aid to me in the performance of my class work.	1	7	5.17	1.226

These descriptive results imply that e-learners would like to have E-Learning courses with excellent quality of information, such as accurate and reliable content. They expect that this E-Learning will provide the exact information they need and is useful for their learning. Moreover, sufficient and up-to-date information is needed as well as information that is easy to understand. In addition to Information Quality, e-learners also need standard quality of service in term of web-based learning sites that are well organized and comfortable for use. Regarding E-Learners' attitude toward the E-Learning method, most e-learners believe that online classes are useful for their studying and are more effective than the traditional classroom method.

Next, the author shows the statistical data from the survey of e-learners. The graph in Figure 5.1 below shows the proportion of survey e-learners from different universities.
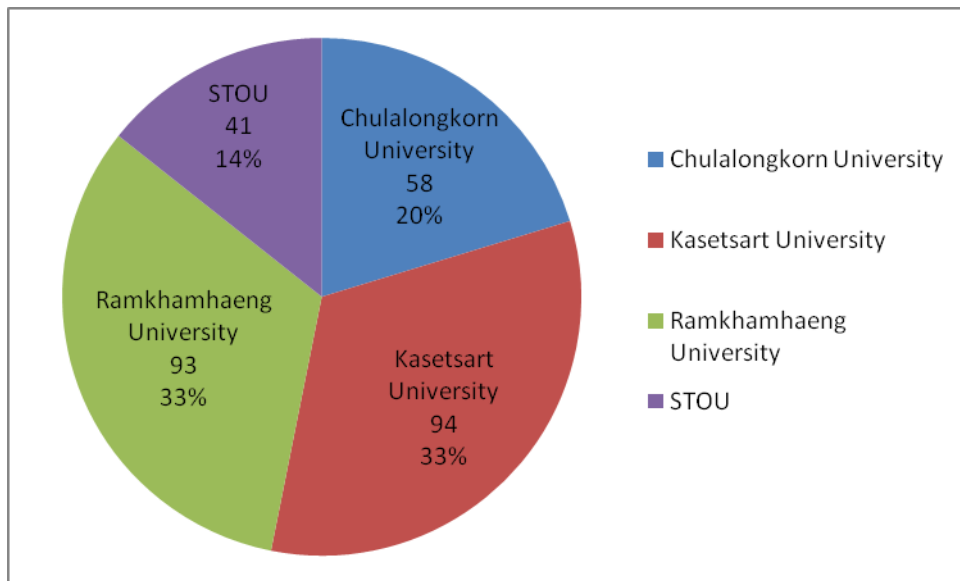
Figure 5.1 Which University have You Studied at Using the E-Learning Method?

There were 4 universities surveyed with a total of 286 students: 58 students from Chulalongkorn University, 94 students from Kasetsart University, 93 students from Ramkhamhaeng University, and 41 students from STOU. The most surveys received were from Kasetsart University with 33% and Ramkhamhaeng University with also 33%. Twenty percent of the surveys were received from Chulalongkorn University and 14% from STOU.
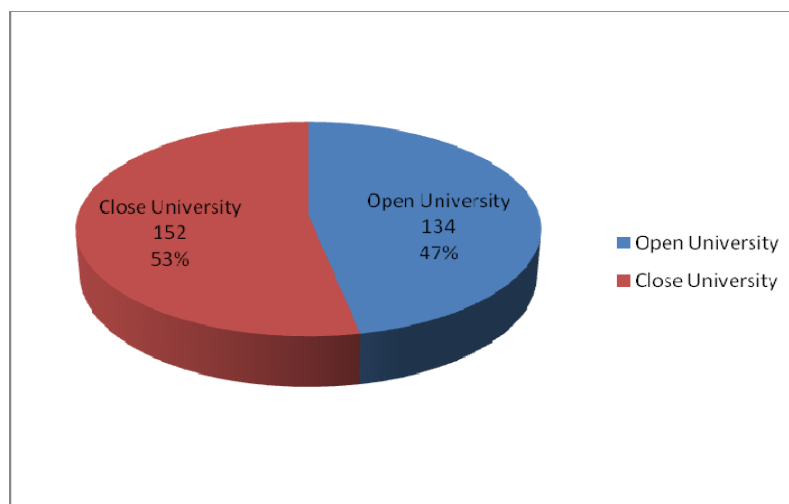
Figure 5.2 Open-Closed (0-Open , 1-Closed University)

As students were separated into two different types of University, the open and closed system, there were 134 students surveyed from open universities and 152 students surveyed from Close Universities. Fifty-three percent of the surveys were from Close Universities (Chulalongkorn and Kasetsart University), and forty-seven percent were from Open Universities (STOU and Ramkhamhaeng University).
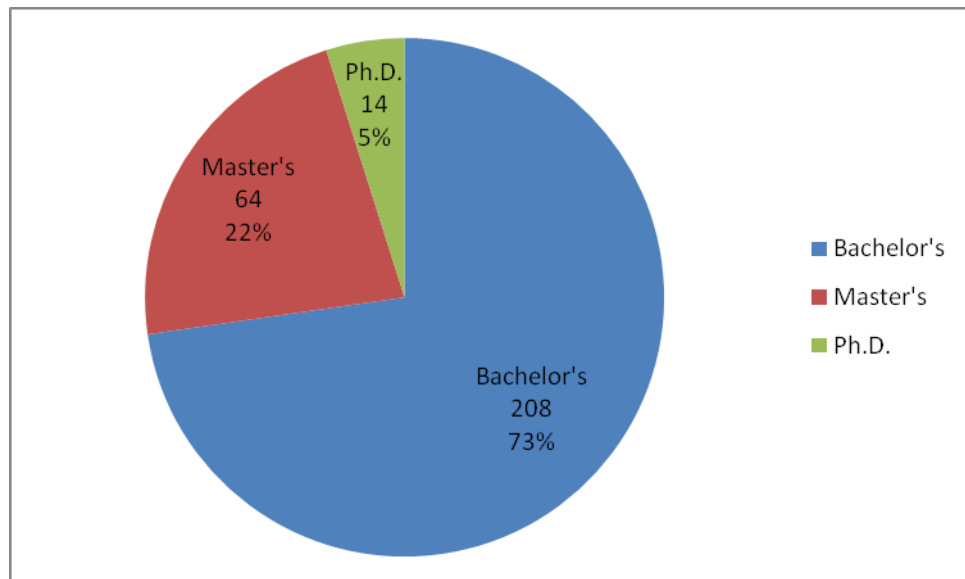
Figure 5.3 What is Your Degree Level?

There were three different levels of degree surveyed, with 208 students with a Bachelor's Degree, 64 students with a Master's and a slight number (14 students) with a Ph.D. Most surveyed, about 73%, were studying for a Bachelor's Degree. And 22% were studying for a Master's Degree. Only a few, 5% surveyed, were studying for a Ph.D. Bachelor's Degree e-learners are the biggest share in every survey universities.
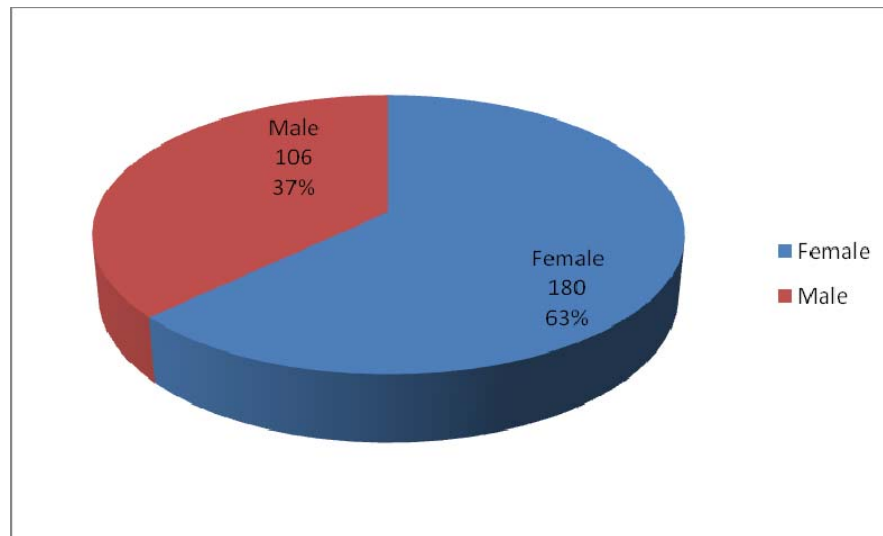
Figure 5.4 What is Your Gender?

There were 180 female students and 106 male students surveyed. Most were females, at 63% of those surveyed, and only 37% of the surveyed were male students. This may imply that the number of female students is increasing in Thai learning compared to the number of male students. Moreover, the range of age of the e-learners is indicated below in Table 5.2.

Table 5.2 What is Your Age?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20-35 Years	223	78.0	78.0	78.0
	20 Years or Less	20	7.0	7.0	85.0
	36-50 Years	39	13.6	13.6	98.6
	More than 50 Years	4	1.4	1.4	100.0
	Total	286	100.0	100.0	
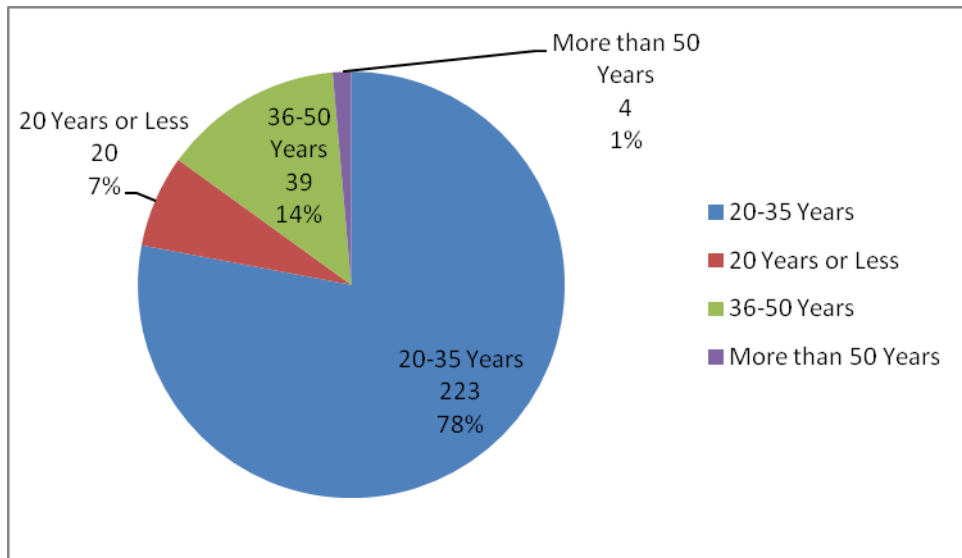
Figure 5.5 What is Your Age?

There were 20 students that were less than 20 years of age, 223 students 20-35 years old, 39 students 36-50 years old, and only 4 students more than 50 years old. Most surveyed, 78%, were students between 20-35 years of age. Fourteen percent surveyed were between 36 and 50 years of age. Seven percent surveyed were 20 years old or less. Only a few, 1% of those surveyed, were 50 years old or more. In addition, the research surveyed full-time students to see if there were any impacts on E-Learning success. Table 5.3 below shows a comparison of full-time and non-full-time students surveyed.

Table 5.3 Are You a Full-Time Student?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Full-Time Student	139	48.6	48.6	48.6
	Not Full-Time	147	51.4	51.4	100.0
	Total	286	100.0	100.0	
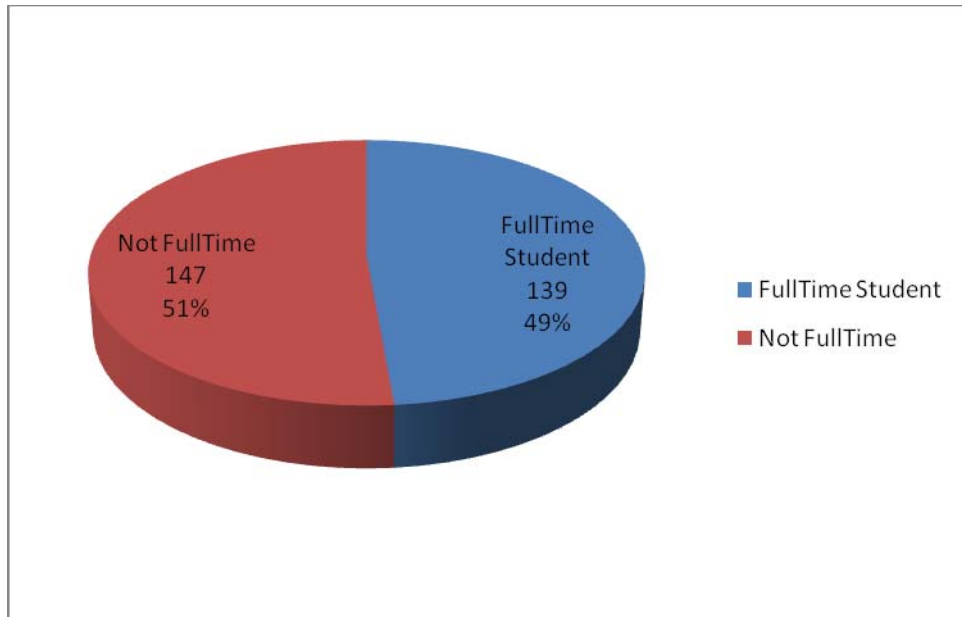
Figure 5.6 Are You a Full-Time Student?

Full-time or non-full-time students were one of the interesting control variables for E-Learning system success. There were 139 full-time students and 147 non-full-time students surveyed. Fifty-one percent surveyed were students that were not studying full time. Forth-nine percent of the surveyed students were studying full time. Next, Table 5.4 shows the results of income range among e-learners.

Table 5.4 What is Your Average Income Per Month?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10,000 Baht or Less	138	48.3	48.3	48.3
	10,001- 20,000 Baht	85	29.7	29.7	78.0
	20,001-30,000 Baht	28	9.8	9.8	87.8
	30,001-40,000 Baht	22	7.7	7.7	95.5
	40,000-50,000 Baht	8	2.8	2.8	98.3
	50,000 Baht or More	5	1.7	1.7	100.0
	Total	286	100.0	100.0	
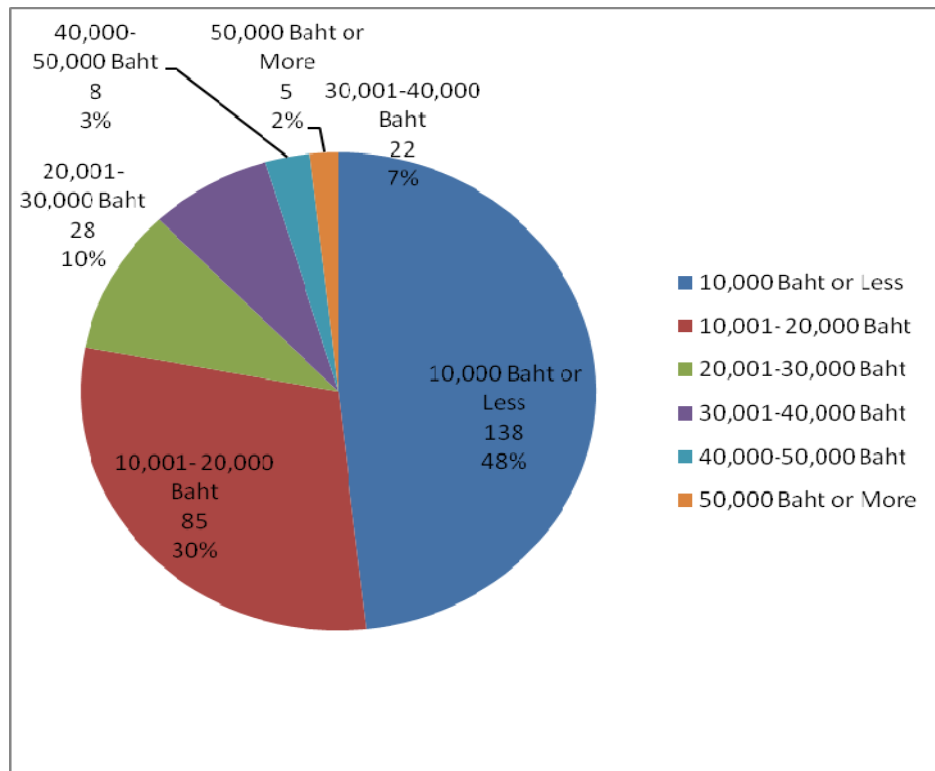
Figure 5.7 What is Your Average Income Per Month?

It is interesting to see how the difference the level of income may affect E-Learning system success and satisfaction. There were many different levels of income per month among surveyed students, with 138 students with an income of 10,000 baht or less, 85 students with an income between 10,001 and 20,000 baht, 28 students with an income between 20,001 and 30,000 baht, 22 students with an income between 30,001 and 40,000 baht, 8 students with an income between 40,001 and 50,000 baht, and 5 rich students with an income of more than 50,000 baht a month. Most surveyed, 48%, were students with revenues of 10,000 baht or less. Thirty percent surveyed were students with revenues between 10,000 baht and 20,000 baht. Ten percent had revenues between 20,000 baht and 30,000 baht, 7% with revenues between 30,000 baht and 40,000 baht, and 3% with revenues between 40,000 and 50,000 baht. Only 2% of surveyed students had revenues of 50,000 baht or more. Furthermore, to understand clearly how frequency and time spent with online class impacted E-Learning success, the author looked into the surveyed data of time online in Table 5.5 below.

Table 5.5 How Long do You Spend Each Time You Connect to the Online Class?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1- 2 hours	160	55.9	55.9	55.9
	3 -5 hours	56	19.6	19.6	75.5
	Less than 1 hour	61	21.3	21.3	96.9
	More than 5 hours	9	3.1	3.1	100.0
	Total	286	100.0	100.0	
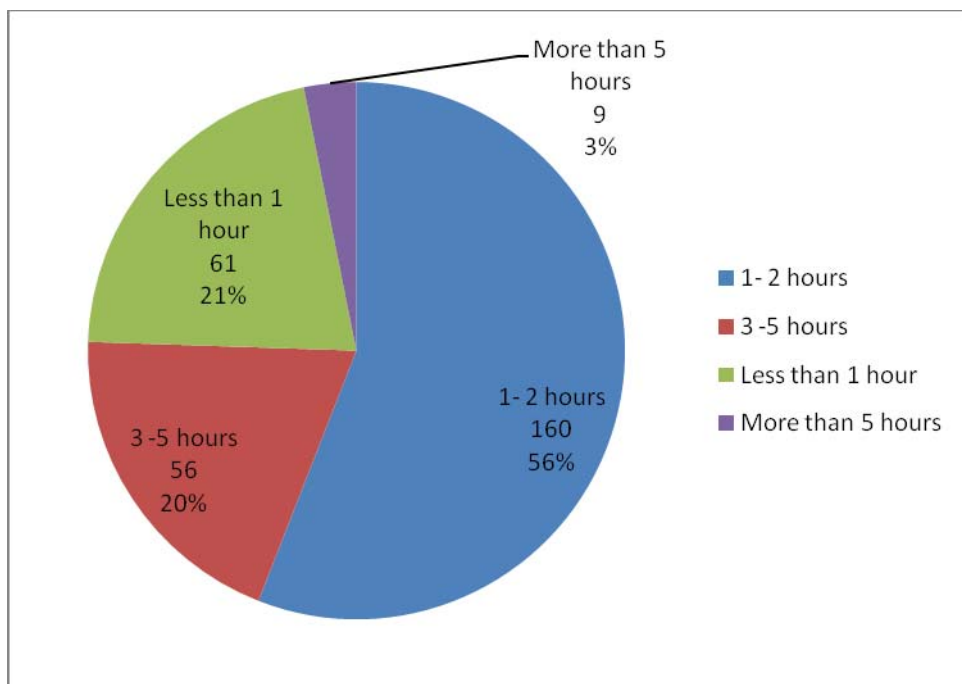
Figure 5.8 How Long do You Spend Each Time You Connect to the Online Class?

Spending more time connected to the online class may influence E-Learning system success and satisfaction. This research surveys how long e-learners usually spend for a connection. There was different time consumption among the surveyed students: 61 students usually spent less than 1 hour each time they connected to the

online class, 160 students usually spent 1 or 2 hours each time, 56 students usually spent 3 to 5 hours each time, and only 9 students usually spend more than 5 hours each time they connected to the online class. Most surveyed, 56%, were students that spent 1-2 hours each time for E-Learning online, while 21% surveyed were students that spent 1 hour or less each time with E-Learning online. Twenty percent surveyed were students that spent between 3 hours and 5 hours each time they studied online. Only a few (3%) spent 5 hours or more each time they studied online. In addition, not only how long each time the students connected to the online class, but also how often e-learners were connected to the online class were investigated, as seen in Table 5.6 below.

Table 5.6 How Often do You Connect to the Online Class?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 -2 days per week	75	26.2	26.2	26.2
	Alternately	27	9.4	9.4	35.7
	Every day	58	20.3	20.3	55.9
	Randomly	126	44.1	44.1	100.0
	Total	286	100.0	100.0	
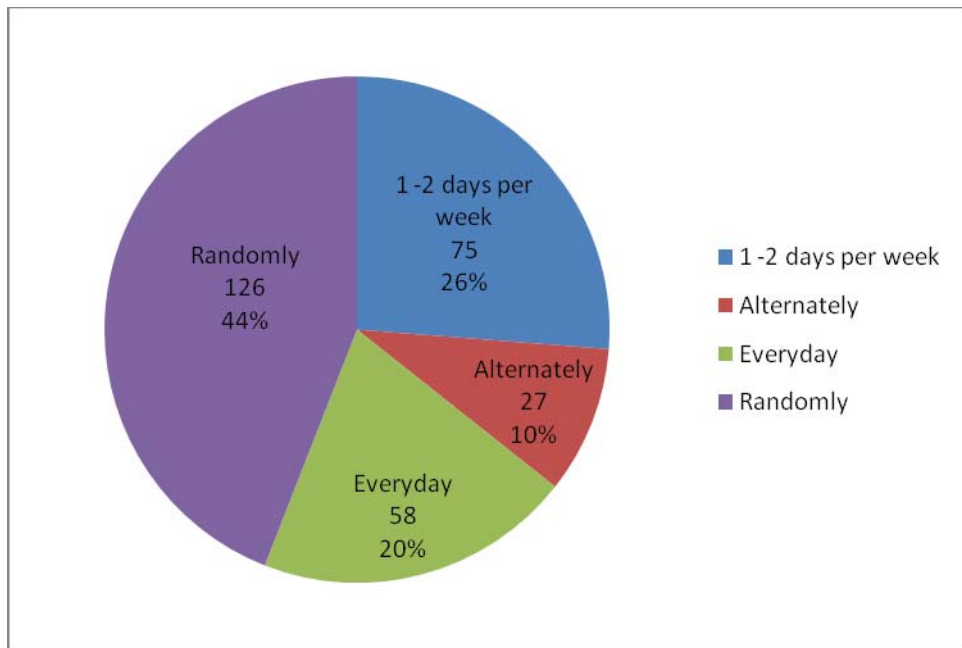
Figure 5.9 How Often do You Connect to the Online Class?

Figure 5.9 shows the proportion of how often e-learners connect to the online class. There were 126 students randomly connected to the online class, 75 students taking 1 or 2 days a week with the class, 27 students studying alternately day by day connected to the online class, and 58 students usually connected class every day. Most surveyed, 44%, were students that used E-Learning online randomly. Twenty-six percent were students that used E-Learning online 1-2 days per week. Twenty percent were students that used E-Learning online every day. Only a few (10%) were students that used E-Learning online alternately.

5.2 Descriptive Statistics of Each Construct

The descriptive statistics of each construct are depicted in Table 5.7. These include mean, maximum, minimum values, and standard deviations. Figure 5.10 illustrates the results in the graph.

Table 5.7 Descriptive Statistics of Each Construct

	N	Minimum	Maximum	Mean	Std. Deviation
IQ (Information Quality)	286	2.0	7.0	5.059	.9667
SQ (System Quality)	286	2.0	7.0	4.96	.961
SVQ (Service Quality)	286	2.0	7.0	4.840	1.0755
AL (Attitude Toward Learning Method)	286	1.25	7.0	4.9857	1.03744
AC (Attitude Toward Cost Effectiveness)	286	1.0	7.0	4.89	1.128
Overall Satisfaction	286	2.0	7.0	4.94	1.121
System Success	286	1.0	7.0	4.90	1.335
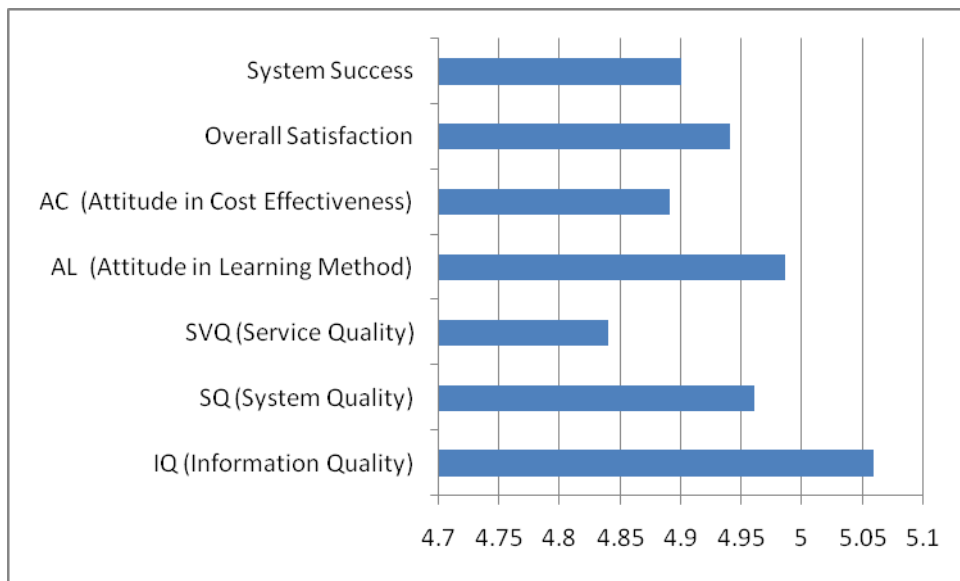
Figure 5.10 Descriptive Statistics of Each Construct

Based on the descriptive statistical data presented in the table above, among the 286 survey students, by considering the various E-Learning factors such as Information Quality (IQ), System Quality (SQ), and Service Quality (SVQ), their mean value was 5.059, 4.96, 4.840, respectively. In addition, attitude factors such as

Attitude toward Learning Method (AL) and Attitude toward Cost Effectiveness (AC) had mean values at 4.98 and 4.89, respectively.

The most important construct was Information Quality, with an average mean of 5.059. And the least important construct was Service Quality, with an average mean of 4.84. Moreover, E-Learners' perceived satisfaction and system success from the online program were not high, with a mean of only 4.94 and 4.90.

This research found out that, for learning by E-Learning, e-learners in Thai public universities still have good satisfaction and overall system success; however, they were still far away from high ranking, with some gaps to be improved. According to the average mean of the study, Information Quality was the most important factor and Service Quality as the least. This implies that e-learners focus a good deal on quality of information, such as accurate and reliable content. E-learners want to have E-Learning with exactly the information they need and which is useful for their learning. E-learners also demand standard quality service, that is for example well organized with convenient learning sites. E-Learners' attitudes toward E-Learning methods come in at the second highest rank for the score, and this may imply that most e-learners believe that the online class is useful for their studying and is more effective than the traditional classroom method.

5.3 Results of Other Statistics

5.3.1 Comparison of the Impact of the Open and Closed University

It is very interesting to see how the open and closed university system is related to E-Learning system success and satisfaction as well as other variables. A T-TEST was used to analyze this relationship. The outputs from the SPSS are below:

Table 5.8 Group Statistics for Testing Open-Closed University

	Open-closed U (0-Open , 1-Closed)	N	Mean	Std. Deviation	Std. Error Mean
IQ (Information Quality)	0	134	5.213	1.0414	.0900
	1	152	4.923	.8769	.0711
SQ (System Quality)	0	134	4.97	1.071	.093
	1	152	4.94	.856	.069
SVQ (Service Quality)	0	134	4.996	1.1526	.0996
	1	152	4.703	.9863	.0800
AL (Attitude toward Learning Method)	0	134	5.1729	1.10486	.09545
	1	152	4.8207	.94747	.07685
AC (Attitude toward Cost Effectiveness)	0	134	5.1616	1.1545	9.9734
	1	151	4.6490	1.0511	8.5539
Overall Satisfaction	0	134	5.19	1.171	.101
	1	152	4.72	1.031	.084
Overall System Success	0	134	5.05	1.378	.119
	1	152	4.76	1.285	.104

In the SPSS program, the researcher put "0" for open university and "1" for closed university and ran SPSS with a mean in different factors. To see the data clearly, the researcher transformed output data into the graph in Figure 5.11 below.
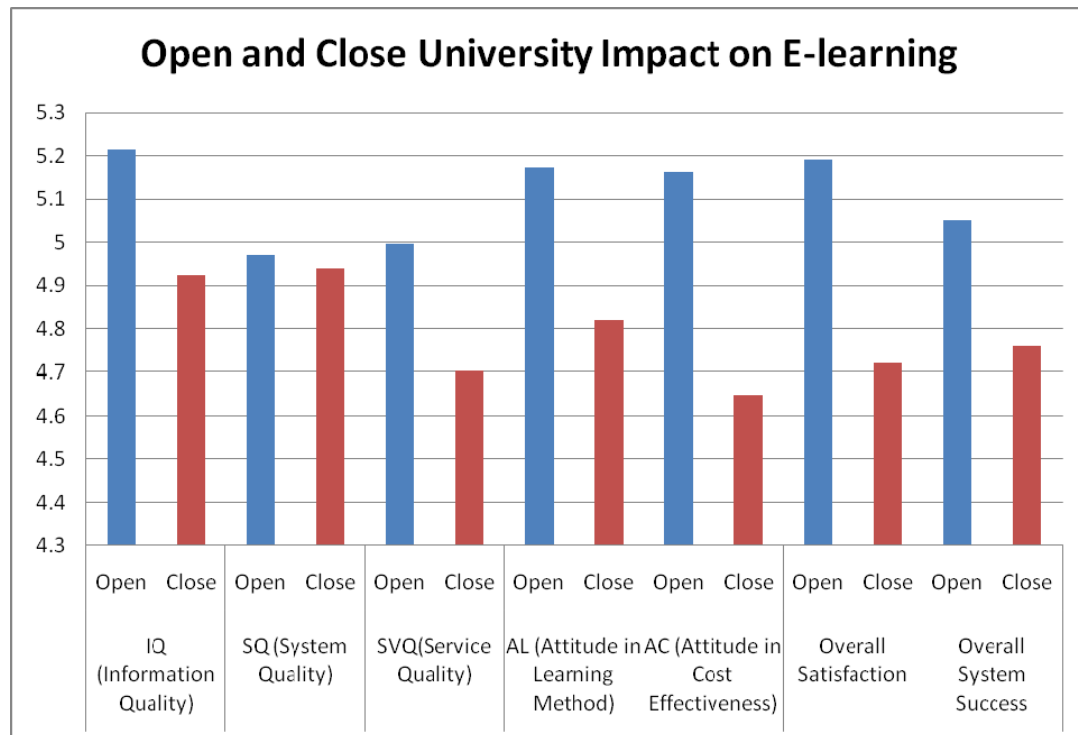
Figure 5.11 Group Statistics for Testing Open - Closed University

To see how the significance of each factor relates to the open and closed type of Universities, the author uses SPSS to analyze and show in Table 5.9 below, where the results of the Statistics for testing open-closed University with many factors by Levene's Test for Equality of Variances and Significance and T-Test for Equality of Means are displayed.

The results show that the variables (open and closed university) exhibit significant difference in terms of IQ (Information Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), and Overall Satisfaction. In contrast, the open-closed university factor was not significantly different in the Overall System Success and SQ (System Quality). According to the average mean of scale for each factor, students in the open university had a stronger rating scale in IQ, SVQ, AL, AC, and Overall Satisfaction Score at 5.19 for Open University and more than 4.72 for the closed university, with a significance at the .05 level (p=0.00).

Table 5.9 Group Statistics for Testing Open-Closed University (F-Value with Sig. t)

Factors	Levene's Test for Equality of Variances		T-Test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
IQ (Information Quality)	4.272	.040	2.524	261.301	.012
SQ (System Quality)	5.496	.020	.272	253.978	**.786**
SVQ(Service Quality)	3.368	.068	2.316	284	.021
AL (Attitude Toward Learning Method)	3.506	.062	2.902	284	.004
AC (Attitude Toward Cost Effectiveness)	4.252	.040	3.902	270.741	.000
Overall Satisfaction	3.026	.083	3.556	284	.000
Overall System Success	.586	.445	1.835	284	**.068**

According to Table 5.9 above, statistically, students in the open university have significant difference from those in the closed university in overall E-Learning satisfaction but not in E-Learning system success. In addition, Students in the Open University have better E-Learning satisfaction than those in the closed university. Students in the open university exhibited significant differences from those in the closed university in many factors, such as Information Quality factors, Service Quality factors, Attitude Toward Learning Method, and Attitude Toward Cost Effectiveness but not System Quality factors.

According to these data results, we may see clearly that E-Learning at the Open University yields more satisfaction and effectiveness than E-Learning at the Close University. Surveyed E-learners give better scores in all factors, as mentioned in Figure 5.11. The least different impact factor among the closed and open universities concerned the System Quality factors, such as user friendly, stable, attractive features, and high speed access for E-Learning. This implies that both open and closed universities have used a similar standard level of system features since technology in programming and designing is easily imitated, replaced or gathered.

However, unlike the System Quality factors, the Information Quality factors were different between the open and closed universities. Open universities seemed to have better answers for e-learners in terms of information. Closed universities may need to improve these factors, such as accurate information, exactly what you need

information, sufficient information, useful information, up-to-date information, and easy to understand.

Similar to the Information Quality factors, closed universities need to improve the following Service Quality factors: customization option, well-organized site, interactivity with other students and Instructors, and help IT support option available. Closed universities still have fewer score of 4.7 out of 7 for their Service Quality factors compared with a score of 5 out of 7 for the open universities.

Nevertheless, closed universities need to explain more to their students about how valuable and beneficial E-Learning is, since the scores of their Attitude Toward Learning Method and cost effectiveness were quite low. Fewer e-learners in closed universities think that E-Learning is cost effective compared e-learners in open universities, and they almost see no benefit to using E-Learning as a new way of learning compared to the traditional classroom.

5.3.2 Comparison of the Impact of Gender

In addition, the author analyzed the T-Test regarding the gender issue to see if there were significant differences between male and female students. The results are shown in Table 5.10 below:

Table 5.10 Group Statistics for Testing Gender

	Gender (0-Female , 1-Male)	N	Mean	Std. Deviation	Std. Error Mean
IQ (Information Quality)	0	180	5.069	1.0072	.0751
	1	106	5.042	.8980	.0872
SQ (System Quality)	0	180	4.95	.996	.074
	1	106	4.97	.902	.088
SVQ(Service Quality)	0	180	4.912	1.1054	.0824
	1	106	4.717	1.0160	.0987
AL (Attitude toward Learning Method)	0	180	5.0287	1.09203	.08140
	1	106	4.9127	.93798	.09110
AC (Attitude toward Cost Effectiveness)	0	179	4.94	1.193	.089

Table 5.10 (Continued)

	Gender (0-Female , 1-Male)	N	Mean	Std. Deviation	Std. Error Mean
	1	106	4.81	1.010	.098
Overall Satisfaction	0	180	4.99	1.146	.085
	1	106	4.85	1.076	.105
System Success	0	180	4.94	1.291	.096
	1	106	4.83	1.411	.137

To see how the significance of each factor related to gender, the author used the SPSS to analyze as shown in Table 5.11 below. The results show that the variables (male or female) exhibited no significant difference regarding IQ (Information Quality), SQ (System Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), Overall Satisfaction, and System Success with a significance at the .05 level.

Table 5.11 Independent Samples Test for Testing Gender

Factors	Levene's Test for Equality of Variances		T-Test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
IQ (Information Quality)	2.925	.088	.220	284	.826
SQ (System Quality)	1.943	.164	-.228	284	.820
SVQ(Service Quality)	1.770	.184	1.486	284	.138
AL (Attitude Toward Learning Method)	4.349	.038	.949	247.152	.343
AC (Attitude Toward Cost Effectiveness)	4.667	.032	.983	249.692	.326
Overall Satisfaction	.239	.625	1.060	284	.290
System Success	.454	.501	.664	284	.507

These results imply that the control variable "gender" has no impact on E-Learning satisfaction or system success. Male and female students are similar in terms of outcomes from learning through E-Learning.

5.3.3 Comparison of the Impact on E-Learning by Full-Time Study

To know more about the control variables, the author analyzed the surveyed data to see if students who were taking full-time online course had different results from non-full-time students. The researcher analyzed the T-Test with the full-time factor to see if there were significant differences between them. The results are shown in Table 5.12 below:

Table 5.12 Group Statistics for Testing Full-Time/Non Full-Time Studying

	Full-Time (0-Not ,1-Full)	N	Mean	Std. Deviation	Std. Error Mean
IQ (Information Quality)	0	147	5.215	.9208	.0759
	1	139	4.893	.9895	.0839
SQ (System Quality)	0	147	5.05	1.026	.085
	1	139	4.86	.881	.075
SVQ(Service Quality)	0	147	5.114	.9870	.0814
	1	139	4.550	1.0923	.0926
AL (Attitude toward Learning Method)	0	147	5.2092	1.02120	.08423
	1	139	4.7494	1.00499	.08524
AC (Attitude toward Cost Effectiveness)	0	147	5.15	1.151	.095
	1	138	4.61	1.037	.088
Overall Satisfaction	0	147	5.11	1.117	.092
	1	139	4.76	1.101	.093
System Success	0	147	5.12	1.242	.102
	1	139	4.67	1.396	.118

The SPSS results are shown in Table 5.13 below. It shows the results of the Statistics for testing Full-Time/Non-Full-Time students with many factors using Levene's Test for Equality of Variances and Significance and a T-Test for Equality of Means.

Table 5.13 Independent Samples Test for Testing Full-Time/Non-Full-Time
Studying

Factors	Levene's Test for Equality of Variances		T-Test for Equality of Means		
	F	Sig.	t	df	Sig. (2-tailed)
IQ (Information Quality)	1.881	.171	2.846	279.436	.005
SQ (System Quality)	3.397	.066	1.618	281.448	.107
SVQ(Service Quality)	3.011	.084	4.578	277.184	.000
AL (Attitude toward Learning Method)	.138	.711	3.837	283.542	.000
AC (Attitude toward Cost Effectiveness)	1.256	.263	4.171	282.542	.000
Overall Satisfaction	.094	.760	2.640	283.521	.009
System Success	3.421	.065	2.853	275.821	.005

The results of the analysis show that full-time and non-full-time studying have significant difference in most studied factors, except SQ (System Quality). This implies that there is no difference in E-Learners' perception of System Quality among full-time or non-full-time studying. Factors such as user friendly, stable, attractive features, and high speed access for E-Learning have no impact on them. Both full-time and non-full-time e-learners may see the system features in the same way when taking online classes.

5.3.4 Comparison of the Impact of Age

With the ANOVA, we can analyze and see if age, level of degree, income, and how often to connect exhibit any significant differences in the studied factors. For this the author used dummy variables, such as 1- for 20 years or less, 2 - for 20-35 years old, 3- for 36-50 years old, and 4 - for more than 50 years old. The results by Descriptives and ANOVA are shown in Table 5.14 and 5.15, respectively, below.

Table 5.14 Descriptives for Testing Age (Dummy)

		N	Mean	Std. Deviation	Std. Error
IQ (Information Quality)	1	20	4.550	.9599	.2146
	2	223	4.964	.9554	.0640
	3	39	5.808	.6242	.1000
	4	4	5.583	.6310	.3155
	Total	286	5.059	.9667	.0572
SQ (System Quality)	1	20	4.65	1.116	.250
	2	223	4.91	.940	.063
	3	39	5.38	.896	.143
	4	4	5.00	1.061	.530
	Total	286	4.96	.961	.057
SVQ(Service Quality)	1	20	4.270	1.0286	.2300
	2	223	4.746	1.0525	.0705
	3	39	5.610	.8472	.1357
	4	4	5.400	1.0832	.5416
	Total	286	4.840	1.0755	.0636
AL (Attitude toward Learning Method)	1	20	4.4875	1.36323	.30483
	2	223	4.8666	.94194	.06308
	3	39	5.8440	.95306	.15261
	4	4	5.7500	.50000	.25000
	Total	286	4.9857	1.03744	.06135
AC (Attitude toward Cost Effectiveness)	1	20	4.42	1.174	.263
	2	222	4.75	1.024	.069
	3	39	5.94	1.051	.168
	4	4	5.00	1.805	.903
	Total	285	4.89	1.128	.067
Overall Satisfaction	1	20	4.65	1.226	.274
	2	223	4.78	1.054	.071
	3	39	5.95	.857	.137
	4	4	5.75	1.258	.629
	Total	286	4.94	1.121	.066
System Success	1	20	4.35	1.309	.293
	2	223	4.78	1.326	.089
	3	39	5.79	1.031	.165
	4	4	5.50	1.000	.500
	Total	286	4.90	1.335	.079

The results show that E-learners of 36-50 years of age give the best average scores on all factors, ranging from 5.38 to 5.95 out of 7. In contrast, e-learners of 20 years of age or less had the least score on all factors, ranging from 4.35 to 4.65 out of 7. This implies that e-learners 36-50 years old have the best satisfaction and system success in their E-Learning. In order to create better E-Learning, the developers may need to focus on young e-learners regarding Service Quality factors, such as customization option, well-organized site, interactivity with other students and instructors, and the help IT support option available. Young e-learners are likely to interact with others and have their own way of learning or so called "customization".

In addition, the ANOVA results by SPSS are shown in Table 5.15 below. It shows the significance of each factor related to age of e-learners.

Table 5.15 ANOVA for Testing Age (Dummy)

		Sum of Squares	df	Mean Square	F	Sig.
IQ (Information Quality)	Between Groups	30.150	3	10.050	12.000	.000
	Within Groups	236.165	282	.837		
	Total	266.315	285			
SQ (System Quality)	Between Groups	9.298	3	3.099	3.443	.017
	Within Groups	253.865	282	.900		
	Total	263.163	285			
SVQ(Service Quality)	Between Groups	32.853	3	10.951	10.405	.000
	Within Groups	296.812	282	1.053		
	Total	329.666	285			
AL (Attitude toward Learning Method)	Between Groups	39.196	3	13.065	13.771	.000
	Within Groups	267.544	282	.949		
	Total	306.740	285			
AC (Attitude toward Cost Effectiveness)	Between Groups	52.128	3	17.376	15.774	.000
	Within Groups	309.538	281	1.102		
	Total	361.666	284			
Overall Satisfaction	Between Groups	50.003	3	16.668	15.261	.000
	Within Groups	307.987	282	1.092		
	Total	357.990	285			
System Success	Between Groups	41.917	3	13.972	8.453	.000
	Within Groups	466.142	282	1.653		
	Total	508.059	285			

The results of the analysis show that "Age" has a significant difference in IQ (Information Quality), SQ (System Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), Overall Satisfaction, and System Success with a significance at the .05 level. Older E-learners (ranging from 36 to 50 years and more than 50 years of age) tend to be more satisfied with the overall E-Learning and system success than e-learners of young ages (ranging from 20 years or less and 20-35 years old).

5.3.5 Comparison of the Impact of Level of Degree

To analyze whether the level of degree has any impact on E-Learning, the author used dummy variable such as 1- Bachelor's Degree, 2 – for Master's, and 3- for Ph.D. The results by Descriptives and ANOVA are shown in Table 5.16 and 5.17, respectively, below.

Table 5.16 Descriptives for Testing Level of Degree

		N	Mean	Std. Deviation	Std. Error
IQ (Information Quality)	1	208	4.925	.9661	.0670
	2	64	5.471	.8297	.1037
	3	14	5.167	1.0722	.2866
	Total	286	5.059	.9667	.0572
SQ (System Quality)	1	208	4.88	.954	.066
	2	64	5.26	.933	.117
	3	14	4.75	.961	.257
	Total	286	4.96	.961	.057
SVQ(Service Quality)	1	208	4.693	1.0543	.0731
	2	64	5.359	.9721	.1215
	3	14	4.643	1.1693	.3125
	Total	286	4.840	1.0755	.0636
AL (Attitude toward Learning Method)	1	208	4.7957	1.02226	.07088
	2	64	5.5781	.93103	.11638
	3	14	5.1012	.65956	.17627
	Total	286	4.9857	1.03744	.06135

Table 5.16 (Continued)

		N	Mean	Std. Deviation	Std. Error
AC (Attitude toward Cost Effectiveness)	1	207	4.69	1.061	.074
	2	64	5.48	1.173	.147
	3	14	5.17	.931	.249
	Total	285	4.89	1.128	.067
Overall Satisfaction	1	208	4.76	1.098	.076
	2	64	5.48	1.023	.128
	3	14	5.07	1.141	.305
	Total	286	4.94	1.121	.066
System Success	1	208	4.73	1.343	.093
	2	64	5.42	1.051	.131
	3	14	5.07	1.774	.474
	Total	286	4.90	1.335	.079

Table 5.17 ANOVA for Testing Level of Degree

		Sum of Squares	df	Mean Square	F	Sig.
IQ (Information Quality)	Between Groups	14.797	2	7.399	8.325	.000
	Within Groups	251.517	283	.889		
	Total	266.315	285			
SQ (System Quality)	Between Groups	7.860	2	3.930	4.357	.014
	Within Groups	255.303	283	.902		
	Total	263.163	285			
SVQ(Service Quality)	Between Groups	22.286	2	11.143	10.259	.000
	Within Groups	307.379	283	1.086		
	Total	329.666	285			

Table 5.17 (Continued)

		Sum of Squares	df	Mean Square	F	Sig.
AL (Attitude toward Learning Method)	Between Groups	30.160	2	15.080	15.430	.000
	Within Groups	276.581	283	.977		
	Total	306.740	285			
AC (Attitude toward Cost Effectiveness)	Between Groups	31.633	2	15.816	13.514	.000
	Within Groups	330.034	282	1.170		
	Total	361.666	284			
Overall Satisfaction	Between Groups	25.620	2	12.810	10.907	.000
	Within Groups	332.370	283	1.174		
	Total	357.990	285			
System Success	Between Groups	24.142	2	12.071	7.059	.001
	Within Groups	483.918	283	1.710		
	Total	508.059	285			

The ANOVA result confirms the significant results shown in Table 5.17 above. The results of the analysis show that Level of Degree exhibits a significant difference in IQ (Information Quality), SQ (System Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), Overall Satisfaction, and System Success, with a significance at the .05 level. Master's Degree students re the most satisfied with overall E-Learning and system success. Bachelor's Degree students are the least satisfied among these levels of degree.
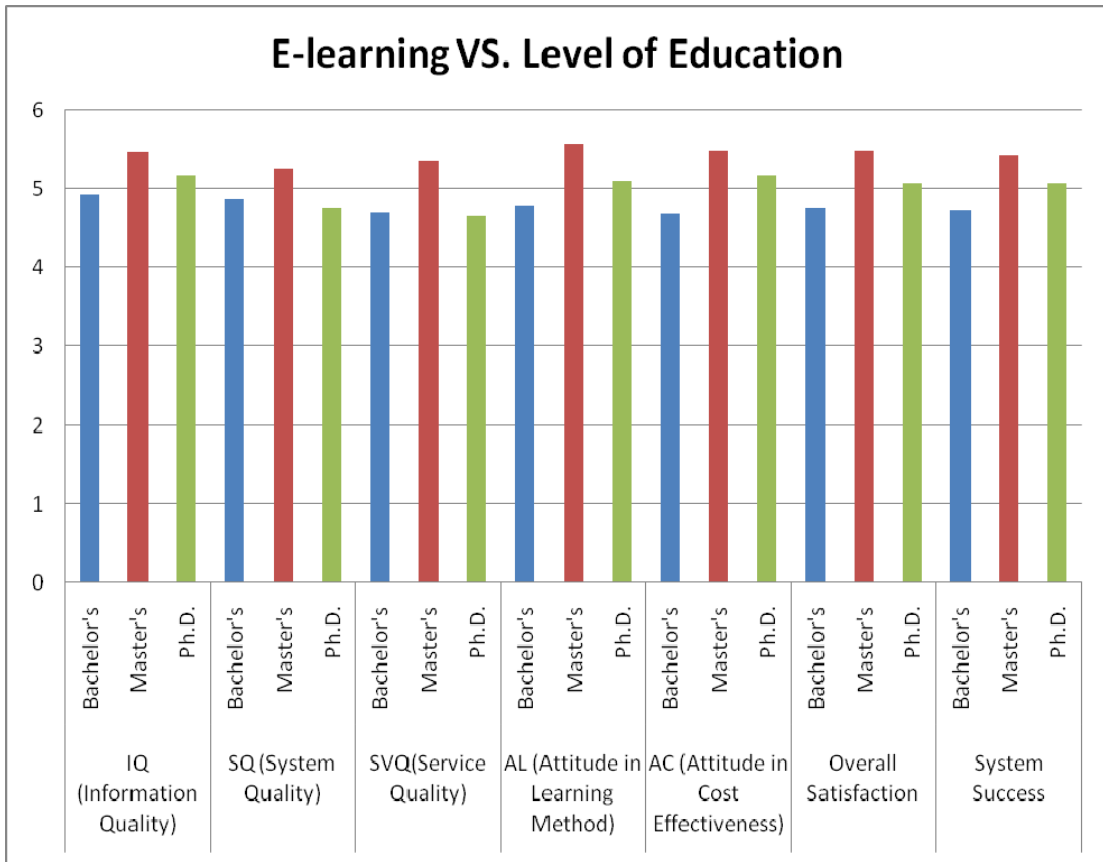
Figure 5.12 E-Learning VS. Level of Education

To illustrate more, Figure 5.12 shows how each factor impacts E-Learning by scores. In another words, the results show that E-learners with a Master's Degree exhibited the best average scores on all factors, ranging from 5.26 to 5.58 out of 7. In contrast, e-learners with a Bachelor's Degree exhibited the least scores on all factors, ranging from 4.69 to 4.92 out of 7. This implies that e-learners with Master's Degree had best satisfaction and system success in their E-Learning. To improve an E-Learning program, focus on E-Learners' Attitude toward cost effectiveness and Service Quality factors may be necessary, for example, the customization option, well organized site, interactivity with other students and instructors, and help IT support option available.

5.3.6 Comparison of the Impact on E-Learning of Income

To analyze the income per month of students, the author used dummy variables such as 1- 10,000 baht or less, 2 – for between 10,001 and 20,000 baht , 3- for between 20,001 and 30,000 baht , 4 -30,001 and 40,000 baht, 5- for 40,001 and 50,000 baht , and 6- for more than 50,000 baht a month. The results are shown below.

Table 5.18 Descriptives for Testing Income

		N	Mean	Std. Deviation	Std. Error
IQ (Information Quality)	1	138	4.954	.9086	.0773
	2	85	5.037	.9295	.1008
	3	28	5.137	1.2130	.2292
	4	22	5.477	.9924	.2116
	5	8	6.000	.3450	.1220
	6	5	4.533	1.1571	.5175
	Total	286	5.059	.9667	.0572
SQ (System Quality)	1	138	4.87	.970	.083
	2	85	5.04	.754	.082
	3	28	4.96	1.386	.262
	4	22	5.08	.891	.190
	5	8	5.69	.914	.323
	6	5	4.30	.959	.429
	Total	286	4.96	.961	.057
SVQ(Service Quality)	1	138	4.619	1.0513	.0895
	2	85	4.976	.9306	.1009
	3	28	5.136	1.4101	.2665
	4	22	5.100	1.0342	.2205
	5	8	5.700	.9502	.3359
	6	5	4.440	1.0040	.4490
	Total	286	4.840	1.0755	.0636
AL (Attitude toward Learning Method)	1	138	4.7083	1.03214	.08786
	2	85	5.1520	.93118	.10100
	3	28	5.2321	.89992	.17007
	4	22	5.3864	1.19952	.25574
	5	8	6.2500	.53452	.18898
	6	5	4.6500	.76240	.34095
	Total	286	4.9857	1.03744	.06135

Table 5.18 (Continued)

		N	Mean	Std. Deviation	Std. Error
AC (Attitude toward Cost Effectiveness)	1	137	4.59	1.085	.093
	2	85	4.96	.906	.098
	3	28	5.26	1.028	.194
	4	22	5.74	1.364	.291
	5	8	5.83	1.543	.546
	6	5	4.40	1.382	.618
	Total	285	4.89	1.128	.067
Overall Satisfaction	1	138	4.72	1.067	.091
	2	85	5.02	1.046	.113
	3	28	4.93	1.331	.252
	4	22	5.68	.995	.212
	5	8	6.00	.926	.327
	6	5	4.80	1.304	.583
	Total	286	4.94	1.121	.066
System Success	1	138	4.68	1.362	.116
	2	85	4.99	1.180	.128
	3	28	5.11	1.571	.297
	4	22	5.23	1.307	.279
	5	8	5.75	.886	.313
	6	5	5.40	1.673	.748
	Total	286	4.90	1.335	.079

The results show that E-Learners with an income between 40,001 and 50,000 baht give the best average scores on all factors, ranging from 5.6 to 6.25 out of 7. This implies that these E-Learners' income range has the best satisfaction and system success in E-Learning. Next, the ANOVA results are show in Table 5.19 below. It shows the significance of each factor related to the income of e-learners.

Table 5.19 ANOVA for Testing Income

		Sum of Squares	df	Mean Square	F	Sig.
IQ (Information Quality)	Between Groups	14.043	5	2.809	3.117	.009
	Within Groups	252.272	280	.901		
	Total	266.315	285			
SQ (System Quality)	Between Groups	8.506	5	1.701	1.870	.100
	Within Groups	254.657	280	.909		
	Total	263.163	285			
SVQ(Service Quality)	Between Groups	18.985	5	3.797	3.422	.005
	Within Groups	310.680	280	1.110		
	Total	329.666	285			
AL (Attitude toward Learning Method)	Between Groups	31.550	5	6.310	6.420	.000
	Within Groups	275.191	280	.983		
	Total	306.740	285			
AC (Attitude toward Cost Effectiveness)	Between Groups	40.682	5	8.136	7.072	.000
	Within Groups	320.984	279	1.150		
	Total	361.666	284			
Overall Satisfaction	Between Groups	28.628	5	5.726	4.868	.000
	Within Groups	329.361	280	1.176		
	Total	357.990	285			
System Success	Between Groups	17.858	5	3.572	2.040	.073
	Within Groups	490.201	280	1.751		
	Total	508.059	285			

The results of the analysis show that income has a significant difference in IQ (Information Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), and Overall Satisfaction with a significance at the .05 level. However, there was no significant different for SQ (System Quality) or System Success at the .05 level.

5.3.7 Comparison of the Impact on E-Learning of How Often the System Is Used

To analyze how often use or connect online has any effect on E-Learning, the author used dummy variables such as 1- randomly connect, 2 - 1 or 2 days a week connect, 3- alternately day by day connect, and 4 - every day connect. The Descriptives and ANOVA results are shown below.

Table 5.20 Descriptive for Testing How Often Online Classes Used

		N	Mean	Std. Deviation	Std. Error
IQ (Information Quality)	1	126	4.923	.9169	.0817
	2	75	5.096	.9777	.1129
	3	27	5.210	.9921	.1909
	4	58	5.236	1.0265	.1348
	Total	286	5.059	.9667	.0572
SQ (System Quality)	1	126	4.75	.901	.080
	2	75	5.09	.942	.109
	3	27	5.06	.868	.167
	4	58	5.18	1.080	.142
	Total	286	4.96	.961	.057
SVQ (Service Quality)	1	126	4.717	1.0133	.0903
	2	75	4.848	1.1342	.1310
	3	27	5.067	1.1923	.2295
	4	58	4.990	1.0645	.1398
	Total	286	4.840	1.0755	.0636
AL (Attitude toward Learning Method)	1	126	4.9008	1.11089	.09897
	2	75	4.8867	.96676	.11163
	3	27	5.1389	.98872	.19028
	4	58	5.2270	.95740	.12571
	Total	286	4.9857	1.03744	.06135
AC (Attitude toward Cost Effectiveness)	1	126	4.73	1.142	.102
	2	75	4.92	1.166	.135
	3	27	4.90	.910	.175
	4	57	5.20	1.098	.145
	Total	285	4.89	1.128	.067

Table 5.20 (Continued)

		N	Mean	Std. Deviation	Std. Error
Overall Satisfaction	1	126	4.80	1.036	.092
	2	75	5.04	1.071	.124
	3	27	4.93	1.357	.261
	4	58	5.12	1.229	.161
	Total	286	4.94	1.121	.066
System Success	1	126	4.75	1.308	.117
	2	75	4.95	1.384	.160
	3	27	5.00	.961	.185
	4	58	5.12	1.464	.192
	Total	286	4.90	1.335	.079

The results show that E-learners with an "every day connect online class" provide the best average scores on most factors, ranging from 4.99 to 5.23 out of 7. In contrast, e-learners with "randomly connect" gave the least scores on all factors, ranging from 4.71 to 4.92 out of 7. This implies that e-learners with an "every day connect online class" had best satisfaction and system success in their E-Learning. In order to make E-Learning better, the developers may need to focus on how to encourage e-learners to connect more online by improving Service Quality factors (least score: 4.71), such as customization option, interactivity with other students and instructors, and help IT support option available.

Table 5.21 ANOVA for Testing How Often Online Classes Used

		Sum of Squares	df	Mean Square	F	Sig.
IQ (Information Quality)	Between Groups	4.845	3	1.615	1.742	.159
	Within Groups	261.470	282	.927		
	Total	266.315	285			
SQ (System Quality)	Between Groups	9.804	3	3.268	3.637	.013
	Within Groups	253.359	282	.898		
	Total	263.163	285			

Table 5.21 (Continued)

		Sum of Squares	df	Mean Square	F	Sig.
SVQ(Service Quality)	Between Groups	4.583	3	1.528	1.325	.266
	Within Groups	325.083	282	1.153		
	Total	329.666	285			
AL (Attitude toward Learning Method)	Between Groups	5.655	3	1.885	1.765	.154
	Within Groups	301.085	282	1.068		
	Total	306.740	285			
AC (Attitude toward Cost Effectiveness)	Between Groups	9.042	3	3.014	2.402	.068
	Within Groups	352.624	281	1.255		
	Total	361.666	284			
Overall Satisfaction	Between Groups	5.063	3	1.688	1.348	.259
	Within Groups	352.927	282	1.252		
	Total	357.990	285			
System Success	Between Groups	6.245	3	2.082	1.170	.322
	Within Groups	501.815	282	1.779		
	Total	508.059	285			

The results of the analysis show that "How Often Students connect online" has a significant difference in IQ (Information Quality), SVQ (Service Quality), AL (Attitude Toward Learning Method), AC (Attitude Toward Cost Effectiveness), and Overall Satisfaction and System Success, with significance at the .05 level. However, there as no significant difference for SQ (System Quality) at the .05 level. In other words, this implies that System Quality factors such as User Friendly, Stable, Attractive Features, and High Speed Access for E-Learning have no impact on "How Often Students connect online."

1) Correlation Analysis

In this study, the researcher analyzed the surveyed data by correlation analysis to see how the variables related to each other. The results of the Pearson Correlation Analysis (Bivariate) including Mean, Max, Min, and SD from the SPSS, are displayed in the table below.

Table 5.22 Pearson Correlation for Studied Variables

Variables	Overall Satisfaction	IQ (Information Quality)	SQ (System Quality)	SVQ(Service Quality)	AL (Attitude Toward Learning Method)	AC (Attitude Toward Cost Effectiveness)	SYS (System Success)
IQ	.667						
SQ	.538	.751					
SVQ	.613	.697	.684				
AL	.667	.673	.552	.608			
AC	.608	.615	.480	.600	.702		
SYS	.648	.629	.539	.545	.670	.590	
TP(Open)	-.206	-.150	-.016*	-.136	-.170	-.229	-.108*
Mean	4.94	5.059	4.96	4.840	4.9857	4.89	4.90
SD	1.121	.9667	.961	1.0755	1.03744	1.128	1.335
Min	2.0	2.0	1.5	2.0	1.3	1.0	1.0
Max	7.0	7.0	7.0	7.0	7.0	7.0	7.0
N	286	286	286	286	286	286	286

Note: *TP (Type of University, OpenClose) Variable is not Significant at the 0.05 Level.

This correlation was significant at the 0.05 level for all the variables except TP (Type of University, Open-Closed)* SQ (System Quality) and TP (Open-Closed)*SYS (System Success). Most variables were moderate correlations (> 0.5), for example, Overall Satisfaction with Information Quality, and Overall Satisfaction with Attitude Toward Learning Method. Some variables were even exhibited a high correlation (>0.7), such as Information Quality and Service Quality, Attitude toward Learning Method, and Attitude toward Cost Effectiveness. The results imply that there was no significant correlation for Type of University and E-Learning System Success, but type of University had strong correlation with other factors, such as Overall Satisfaction, Information Quality, Service Quality, Attitude toward Learning method, and Attitude toward Cost effectiveness. The negative values in table 5.22

above show that the open university had a better positive relation with these factors than the closed university. Next, the regression analysis will be conducted in order to predict the models.

2) Regression Analysis for E-Learners' Satisfaction Model

This research has proposed a model of analysis for E-Learners' satisfaction. To illustrate clearly, the proposed model is shown in the equation (1) below.

$$SAT = b_0 + b_1 IQ + b_2 SQ + b_3 SVQ$$
$$+ b_4 AL + b_5 AC + b_6 TP + b_7 SYS \qquad \text{------ (1),}$$

where

	SAT	=	E-Learners' satisfaction
	IQ	=	Information Quality
	SQ	=	System Quality
	SVQ	=	Service Quality
	AL	=	Attitude toward Learning Method
Cap	AC	=	Attitude toward Cost Effectiveness
	TP	=	Type of public university
	SYS	=	Overall System Success

and b_0, b_1, b_2, b_3, b_4, b_5, b_6, and b_7 are the coefficients.

Regression analysis by SPSS was used to predict a model of E-Learning satisfaction. The results by SPSS in full form of analysis, such as Descriptive Statistics, Regression Model Summary, ANOVA, and Coefficients for Regression Analysis are shown in Table 5.23, Table 5.24, Table 5.25, and Table 5.26.

Table 5.23 Descriptive Statistics for Regression Analysis (E-Learning Satisfaction)

	Mean	Std. Deviation	N
Overall Satisfaction	4.94	1.121	285
OpenCloseU (0-Open , 1-Close)	.53	.500	285
IQ (Information Quality)	5.063	.9663	285
SQ (System Quality)	4.96	.961	285
SVQ(Service Quality)	4.843	1.0762	285
AL (Attitude toward Learning Method)	4.9892	1.03761	285
AC (Attitude toward Cost Effectiveness)	4.89005847953217 E0	1.12848252341132 2E0	285
Overall System Success	4.90	1.336	285

Table 5.24 Model Summary for Regression Analysis (E-Learning Satisfaction)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.768[a]	.589	.579	.728

Table 5.25 ANOVA[b] for Regression Analysis (E-Learning Satisfaction)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	210.434	7	30.062	56.776	.000[a]
	Residual	146.668	277	.529		
	Total	357.102	284			

Table 5.26 Coefficients[a] for Regression Analysis (E-Learning Satisfaction)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.557	.269		2.071	.039
	Open-Closed (0-Open , 1-Close)	-.162	.090	-.072	-1.802	.073
	IQ (Information Quality)	.258	.081	.222	3.168	.002
	SQ (System Quality)	-.020	.074	-.017	-.267	.790
	SVQ(Service Quality)	.162	.063	.155	2.569	.011
	AL (Attitude toward Learning Method)	.209	.069	.194	3.042	.003
	AC (Attitude toward Cost Effectiveness)	.091	.058	.092	1.563	.119
	Overall System Success SYS	.202	.047	.241	4.312	.000

Note: a. Dependent Variable: Overall Satisfaction

As regression analysis was used, we can predict how E-Learners' satisfaction related to other factors. By inserting the unstandardized coefficients derived from Table 5.26, with significance at the level .05, we can conclude the predicted model in equation 2) below. It is the model that explains the relationship of E-Learners' satisfaction.

$$SAT = 0.557 + 0.258 \, IQ + 0.162 \, SVQ + 0.209 \, AL + 0.202 \, SYS \quad --- (2)$$
$$(2.071) \quad (3.168) \quad (2.569) \quad (3.042) \quad (4.312)$$

R=.768, R-Square = .589, SEE =.728, F = 56.776, Sig. of F =. 000

The results of the regression analysis show that there is a relationship for E-Learners' satisfaction with other main factors,, such as Information Quality, Service Quality, Attitude Toward Learning Method, and System Success, with a significance

level of .05. The E-Learners' satisfaction can be predicted by equation (2). The significance level of .05 shows a constant value of 0.557, an Information Quality value of 0.258, a Service Quality value of 0.162, an Attitude toward Learning Method value of 0.209, and a System Success value of 0.202.

There are all positively related factors, which mean that, for example. if the unit score of Information Quality factor increases by 1, it will generate E-Learners' satisfaction by more than 0.258. The most influential factor was Information Quality, and the least influential factor was Service Quality. E-Learning developers can use these models to increase their E-Learners' satisfaction by mainly adjusting these factors: Information Quality, Service Quality, and Attitude toward Learning Method.

3) Regression Analysis for E-Learning System Success Model

This research has proposed a model of analysis for E-Learning system success. The model is shown in equation (3) below.

$$SYS = b_0 + b_1\,IQ + b_2\,SQ + b_3\,SVQ$$
$$+ b_4\,AL + b_5\,AC + b_6\,TP \qquad\qquad ------ (3),$$

where are,

SYS	=	Overall System Success
IQ	=	Information Quality
SQ	=	System Quality
SVQ	=	Service Quality
AL	=	Attitude Toward Learning Method
AC	=	Attitude Toward Cost Effectiveness
TP	=	Type of public university

and b_0, b_1, b_2, b_3, b_4, b_5, and b_6 are coefficients.

The Regression Analysis by SPSS as used to predict a model of E-Learning system success. The results by SPSS in full form of analysis, such as Descriptive Statistics, Regression Model Summary, ANOVA, and Coefficients for Regression Analysis, are shown next in Table 5.27, Table 5.28, Table 5.29, and Table 5.30 respectively.

Table 5.27 Descriptive Statistics for Regression Analysis (E-Learning System Success)

	Mean	Std. Deviation	N
Overall System Success	4.90	1.336	285
Open-Closed (0-Open, 1-Closed)	.53	.500	285
IQ (Information Quality)	5.063	.9663	285
SQ (System Quality)	4.96	.961	285
SVQ(Service Quality)	4.843	1.0762	285
AL (Attitude toward Learning Method)	4.9892	1.03761	285
AC (Attitude toward Cost Effectiveness)	4.89005847953217E0	1.128482523411322E0	285

Table 5.28 Model Summary for Regression Analysis (E-Learning System Success)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.724[a]	.524	.513	.932

Table 5.29 ANOVA[b] for Regression Analysis (E-Learning System Success)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	265.605	6	44.268	50.928	.000[a]
	Residual	241.644	278	.869		
	Total	507.249	284			

Table 5.30 Coefficients[a] for Regression Analysis (E-Learning System Success)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1 (Constant)	-.589	.343		-1.717	.087
Open-Closed (0-Open , 1-Close)	.064	.115	.024	.559	.577
IQ (Information Quality)	.285	.103	.206	2.764	.006
SQ (System Quality)	.129	.094	.092	1.366	.173
SVQ (Service Quality)	.039	.081	.031	.482	.630
AL (Attitude toward Learning Method)	.459	.084	.357	5.487	.000
AC (Attitude toward Cost Effectiveness)	.183	.074	.155	2.480	.014

Note: Dependent Variable: Overall System Success

As we used regression analysis, we can predict how E-Learning system success is related to other factors. By inserting Unstandardized Coefficients derived from Table 5.30, with a significance at level .05, the author conclude the predicted model in equation 4) below. It is the model that explains the relationship of E-Learning system success and other related variables.

$$SYS = \quad 0.285\ IQ + 0.459\ AL + 0.183\ AC \quad\quad -- (4)$$
$$(2.764) \quad (5.487) \quad (2.480)$$

R=.724, R-Square = .524, SEE =.932, F = 50.928, Sig. of F =. 000

E-Learning system success can be predicted by equation (4). With a significance level at .05, it shows no constant value, with an Information Quality value of 0.285, an Attitude Toward Learning Method value of 0.459, and an Attitude Toward Cost Effectiveness value 0.183. This shows that there is a relationship of E-Learning system success with factors such as Information Quality, Attitude Toward Learning Method, and Attitude Toward Cost Effectiveness.

There are all positively related, which implies that, for example, if the unit score of Attitude Toward Learning Method factor increases by 1, it will generate E-Learning system success by more than 0.459. The most influential factor was Attitude Toward Learning Method. E-Learning developers can use this model to increase their E-Learning system success by adjusting these influential factors, such as Information Quality, Attitude toward Learning Method, and Attitude toward Cost Effectiveness.

5.4 Hypothesis Relationship Results

Table 5.31 Summary of Results of Hypothesis Testing

Hypotheses	Relationship	Results
H01	E-Learners' satisfaction is positive related to information quality.	Supported
H02	E-Learners' satisfaction is positive related to system quality.	Supported
H03	E-Learners' satisfaction is related to service quality.	Supported
H04	E-Learners' satisfaction is positive related to E-Learners' attitude toward learning method.	Supported
H05	E-Learners' satisfaction is positive related to E-Learners' attitude toward cost effectiveness.	Supported
H06	E-Learners' satisfaction is positive related to the types of public university.	Supported
H07	E-Learning system success is positive related to information quality.	Supported
H08	E-Learning system success is positive related to system quality.	Supported
H09	E-Learning system success is related to service quality.	Supported
H10	E-Learning system success is positive related to E-Learners' attitude toward learning method.	Supported
H11	E-Learning system success is positive related to E-Learners' attitude toward cost effectiveness.	Supported
H12	E-Learning system success is not related to the types of university.	Not Supported
H13	There are significant differences in E-Learners' satisfaction and E-Learning system success.	Supported
H14	E-Learners' individual background is significantly related to E-Learning satisfaction and system success.	Partial Supported

From the summary table above, it be seen that the results indicate that most of all research hypotheses were supported by empirical tests from the data collected from e-learners to measure their satisfaction and E-Learning system success outcomes. However, there were two unsupported results in E-Learning System Success, which were not related to the types of public university and some individual backgrounds.

In summary, this chapter described the data characteristics of the respondents. A reliability analysis of the constructs in the study and Cronbach's alpha were provided to confirm the reliability of each construct. In addition, this study conducted correlation, T-Test, ANOVA as well as Regression analysis for the two proposed regression models. Both regression models passed the significance requirements at the 0.05 level. Also, according to the findings of this empirical study, the results from these analyses were used to respond to the research hypotheses and the research hypotheses were mostly supported.

CHAPTER 6

CONCLUSION

This research has been motivated by the desire to gain a better understanding of how to improve E-Learning applications in Thai public universities. The primary contribution of this study is to find out how to define, assess, and promote E-Learning success and satisfaction. In this context, this study achieved significant progress towards developing a conceptual regression model for measuring e-learner satisfaction and E-Learning system success. The results identify the success factors influencing E-Learners' satisfaction within six different categories: Information Quality, System Quality, Service Quality, Attitude toward Learning Method, Attitude toward Cost Effectiveness, and Types of public university. In these six different categories there are 24 success factors for evaluating E-Learning satisfaction and system success. Each factor is quantified by a survey question. The overall satisfaction and system success of E-Learning can be evaluated as a cumulative sum of all of these. The proposed regression model in this study as independent from country-specific features since the study was conducted with students in Thai public universities. Reliability tests have been applied with reliability analysis.

In addition, this research summarizes the results of the study, the theoretical and practical contributions, and makes recommendations and suggestions for further study. The study begins with the resource-based view by focusing on resources, particularly quality and attitude factors. However, many constructs were introduced in order to measure their significance regarding E-Learners' satisfaction and system success outcomes, as well as the understanding the factors affecting them. The findings of this study have never been arrived at by prior researchers regarding the type of Thai public university or attitude among e-learners regarding cost effectiveness and learning method.

According to the findings of this study, with the data of students in selected Thai public universities, most of the hypotheses were supported by this empirical test. E-Learners' satisfaction and E-Learning System Success were influenced by Information

Quality, System Quality, Service Quality, Attitude toward Learning Method, Attitude toward Cost Effectiveness, and Type of public university. In addition, this study also includes the control background variables of students, such as age, level of degree, gender, etc. The empirical results showed that there are no significant effects for type of public university on E-Learning system success. However, type of public university had significant effects on E-Learners' satisfaction.

6.1 Conclusion of the Study

This aim of this research was to answer the five main research questions listed below:

6.1.1 "What is the Level of the Satisfaction of E-Learners and E-Learning System Success for Students Who Take E-Learning Classes in the Thai Public University?"

The purpose of the first question was to see the level of the satisfaction of e-learners and E-Learning system success in the Thai public university. According to the average mean of the scores, Overall E-Learners' satisfaction was 4.94 and system success was 4.90. These E-Learners' perceived satisfaction and system success from the online program as not high. To see clearly how strong the scores are, we can use the table below.

Table 6.1 Rating Range from 7- Likert Scale

Rating Range and Meaning			Variable (Mean)	
From	To	Explanation	Overall Satisfaction	System Success
1.00	1.86	Very Strongly Disagree		
1.86	2.71	Strongly Disagree		
2.71	3.57	Disagree		
3.57	4.43	Neutral		
4.43	5.29	Agree	x	x
5.29	6.14	Strongly Agree		
6.14	7.00	Very Strongly Agree		

6.1.2 "What are the Key Factors That Affect E-Learner Satisfaction When Learning Online?"

The purpose of the second question of this research was to investigate the influence of affecting factors on E-Learners' satisfaction. The results indicate that Information Quality, System Quality, Service Quality, Attitude toward Learning Method, Attitude toward Cost Effectiveness, and Type of public university exercised a statistically significant positive influence on E-Learners' satisfaction, with a correlation (at 0.05 significant level) of .667, .538, .613, .667, .608, .648, -.206, respectively (the details of analysis are discussed in chapter four). The results showed that most factors positively related to the outcomes. The type of public university correlation -.206 showed that open university type had better E-Learners' satisfaction than the closed university type.

6.1.3 "How do the Types of Public University Affect E-Learners Who Take E-Learning Classes?"

This is a new research finding unexplored by any prior researchers. The results show that the variable (open and closed university) exhibits a significant difference regarding the satisfaction of e-learners. From the average mean of scores, Overall E-Learners' Satisfaction was 5.19 for open university, which was more than 4.72 for the closed university with a significance at the .05 level (p=0.00). However, students in the open university exhibit no significant difference from those in the closed university in terms of E-Learning system success.

6.1.4 "What are the Key Factors That Affect E-Learning System Success When Learning Online?"

The purpose of this question was to investigate the influence of the affecting factors on E-Learning system success. The results indicate that Information Quality, System Quality, Service Quality, Attitude toward Learning Method, Attitude toward Cost Effectiveness had a statistically significant positive influence on E-Learners' satisfaction, with a correlation (at the 0.05 significance level) of .629, .539, .545, .670, .590, respectively (the details of the analysis discussed in chapter four). The results show that most factors positively related to the outcomes, except type of public university, which was not significant at the 0.05 level.

6.1.5 "What is the Relationship of the Factors Affecting E-Learners' Satisfaction?"

Regression analysis was used to answer this question. There was a relationship of E-Learners' satisfaction with other main factors. The results show that Information Quality, Service Quality, Attitude toward Learning Method, and System Success had a positively relationship with these factors, with a significance at the .05 level and acceptable R=.768, R-Square = .589,SEE =.728, F= 56.776, Sig. of F =. 000. Based on Equation 2) from Chapter four, the most influential factor for E-Learners' satisfaction was Information Quality, with a coefficient of .258. Next as Attitude toward Learning Method, with a coefficient of .209, and Overall System Success with a coefficient of .202, and also the least coefficient but significant .162 for Service Quality factors. There was also predicted constant value in this model for .557.

6.2 Contributions of the Study

As stated in the first chapter of this research, the theoretical and practical contributions of this research were great in enhancing the study in the areas of the resource-based theory and E-Learning satisfaction and system success.

6.2.1 Theoretical Contribution

This study was based on the resource-based theory. Williamson (1999) stated that the resource-based view is tautological and not subject to empirical test. Priem and Butler (2001) have also argued "that one of the limitations of the resource-based view was that it lacked guidelines for empirical study." However, this study has shown that the successful empirical test of resource-based theory can be conducted and the research can achieve all of its objectives.

The contribution of this research has proven that the resource based view has guidelines in that empirical tests can be conducted based on the theory. The study provides an integrated framework for modeling the constructs contributing to E-Learners' satisfaction and system success. The empirical test results show that the resource-based view can support the study. The resource-based view of this research can lead to understanding the results of E-Learners' satisfaction that can be achieved

by focusing on internal and external resources of the organization. Yet, this research has provided an empirical test to support the fact that the resource-based view can be tested empirically and has suggested results to meet the objectives of the research.

Barney (1991) has stated that "these productive resources cannot be transferred from organization to organization without costs," meaning that resources are difficult to be moved. However, this research proposes the application of a new way of learning by using high information technology such as websites and the internet. These resources can easily flow from organizations to other organizations online. In addition, the theory states the importance of resources such as the VRIN model (valuable, rare, non-substitutable, and imperfectly imitable). According to the resource-based view, the university with high investment in development programs may introduce new or better resources, such as more Information Quality, System Quality, and Service Quality as well as improvements in the E-Learners' attitude. In this case, the open university is rare and yields better satisfaction, which the closed university may find it is difficult to imitate.

Prior research in resource-based theory did not highlight the high information technology in today's new education era. This research confirmed the idea that IT resources introduced into educational organizations relate to better performance or outcomes. To conclude the theoretical contributions of the resource-based theory, this study clearly identifies the aspects of the internal and external resources of the organization. The resource-based view has studied and identified many resources for universities in order to understand the role of the resources used for their online classes. In addition, this research provides foundations for many well-integrated factors regarding the outcomes of E-Learning system success and E-Learners' satisfaction.

6.2.2 Practical Contribution

The study achieved its goal in providing practical contributions in two aspects First, this research represents a new unexplored study in E-Learning for the Thai public university in relation to the open and closed systems. Most research has focused only the E-Learning success factors, which are internal resources and not external ones, and has never discussed the Thai public university. This type of

university will demonstrate results related to the overall performance of E-Learning, and these results indicate that the open university in Thailand has better resources and overall outcomes, especially regarding E-Learners' satisfaction. Now, the universities can understand how the factors studied affect outcomes for their students, and the closed university can improve some of the affecting factors in reducing the gaps in outcomes.

Second, the study shows guidelines for E-Learning class developers or any institutions that would like to create a successful online class. The results of the study can be used for designing best satisfaction and system success for E-Learning courses and improving these courses by focusing on the key factors affecting them. In this way, the developers can arrange and manage the use of their resources more efficiently in order to achieve better outcomes. Since there are still few E-Learning classes among Thai universities, they can also better manage their online classes to increase E-Learning in Thailand for the new high technology education era.

6.3 Limitations of the Study and Future Research

Obtaining E-Learning data for Thai universities was very challenging, since E-Learning in Thailand is still new and some universities have not implemented it yet. Most universities still implement only partial E-Learning courses that blend online and face-to-face delivery, but are not 80-100% online. Moreover, during the process of the data collection, the researcher found it to be difficult to obtain data from some universities due to their privacy regulations. Without the university IT Support Department, it would have been truly difficult to reach the student taking online classes since they were not likely to come to the schools. However, the researcher got kindly support from universities that helped the researcher to obtain the data: Chulalongkorn University, Kasetsart University, Sukhothai Thammathirat Open University (STOU), and Ramkhamhaeng University. For further study, researchers can try to investigate greater numbers of Thai universities in different sections, such as private universities. Moreover, these study as cross-sectional, which may have made it difficult to explain the long-term impact of E-Learning satisfaction and system success. Only one semester (three months) was taken for the survey. Also, the

generalizability was limited because it was a study of E-Learning in the Thai public university not other business firm industry. Further study may aim to study the satisfaction and system success of other business firms' E-Learning and with a greater variety of factors.

BIBLIOGRAPHY

Alderman, B. and Fletcher, S. 2005. **The Role of Interaction in Enhancing Achievement and Student Satisfaction in an Online Course: A Rubric Analysis**. Canberra: University of Canberra.

Allen, I.Elaine and Seaman, Jeff. 2005. **Growing by Degrees: Online Education in the United States, 2005**. The Sloan Consortium. (November) Retrieved October 10, 2010 from http://sloanconsortium.org/publications/survey/ pdf/growing_by_degrees.pdf

Argyris, C. 1995. Action Science and Organizational Learning. **Journal of Managerial Psychology.** 10 (6): 20-26.

Assumption University, Thailand. 2010. **College of Internet Distance Education, Assumption University of Thailand Website**. Retrieved December 17, 2010 from http://www.elearning.au.edu/

Attila, Nagy. 2004. **E-Learning**. Published in a Series of E-Content Reports by ACTeN, June 2004. Retrieved December 5, 2010 from http://www.digital-economy.com/ressources/studies/ACTeN/e-learning.pdf

Babbie, E. R. 1999. **The Practice of Social Research**. Belmont, California: Wadsworth Publishing.

Balbieris, Giedrius. 2002. Reshaping E-Learning Content to Meet the Standards. **Informatics in Education**. 1, 1: 5-16.

Barney, J. B. 1986. Strategic Factor Markets: Expectations, Luck and Business Strategy. **Management Science**. 32 (10): 1231–1241.

Barney, J. B. 1991. Firm Resources and Sustained Competitive Advantage. **Journal of Management.** 17 (1): 99–120.

Bertea, Patricia. 2009. **Measuring Students' Attitude Towards E-Learning: A Case Study.** The 5th International Scientific Conference E-Learning and Software for Education Bucharest, April 09-10, 2009.

Blum, Fields and Jodi, S. Goodman. 1994. Organizational-Level Determinants of
Women in Management. **Academy of Management Journal**. 37: 241-
268.

Bretz, Robert D., Jr. 1989. College Grade Point Average as a Predictor of Adult
Success: A Meta-Analytic Review and Some Additional Evidence. **Public
Personnel Management.** 18 (1): 11-22.

Brigham, E. and Ehrhardt, M. 2005. **Financial Management: Theory and Practice**.
11th ed. Australia: South-Western.

Brookes, N. J.; Morton, S.C.; Dainty, A. R. J. and Burns, N. D. 2006. **Social
Processes, Patterns and Practices and Project Knowledge
Management: A Theoretical Framework and an Empirical
Investigation**. **International Journal of Project Management.** 24, 6
(August): 474-482.

Brooks, Ashley. 2009. **What is the Purpose of E-Learning?** Retrieved December
5, 2010 from http://www.ehow.com

Carchiolo, Vincenza. 2003. **Courses Personalization.** In An E-Learning
Environment, Proceedings of the 3rd IEEE International Conference on
Advanced Learning Technologies (ICALT'03) 0-7695-1967-9/03 2003
IEEE

Chaisson, John. 2004. **Integrating Learning into the Life of the Enterprise,
Skillsoft Research Center** Retrieved October 10, 2010 from
http://www.developers.net/skillsoftshowcase, 2004

Charbonnier, Francis M. 2006. **An Objective Study of Oregon Student
Achievement–Achievement Gaps–Accountability–NCLB–
Competitiveness Initiative.** McMinnville School Board Member, June
14, 2006.

Christophe, R.; Christophe, B.; Laurent, F. and Martine, H. 2006. **Improving Web
Site Usability for a Better E-Learning Experience.** University of Lyon,
France: PRACTICE, Villeurbanne. Retrieved December 10, 2010
http://www.formatex.org/micte2006/pdf/891-895.pdf

Chunhaphong Thaioopatum. 2006. **E-Learning.** Retrieved March 5, 2006 from
http://thaicai.com/articles/elearning5.html

Ckie Kasemsan. 2005. **Getting to Know LMS**. Retrieved December 10, 2010 from
    http://elearning1.dpu.ac.th/info3/technology/index.php

Clark, R. E. 1994. Media will Never Influence Learning, Educational Technology.
    Research and Development. 42, 2: 21-29.

Conlan, Owen. 2002. **Towards a Standards-Based Approach to E-Learning**
    Personalization Using Reusable Learning Objects. Dublin, Ireland:
    Trinity College.

Davis, F. D. 1989. Perceived Usefulness, Perceived ease of Use, and User
    Acceptance of Information Technology. **MIS Quarterly**. 13, 3: 318–340.

Delaney, J. T. and Huselid, M. A. 1996. The Impact of Human Resource
    Management Practices on Perceptions of Organizational Performance.
    Academy of Management Journal. 39 (4): 949-969.

DeLone, William H. and McLean, Ephraim R. 1992. **Information System Success:**
    The Quest for the Dependent Variable.

DeLone, William H. and McLean, Ephraim R. 2003. The DeLone and McLean
    Model of Information Systems Success: A Ten-Year Update. Journal of
    Management Information Systems. 19, 4 (4/Spring): 60.

Dierickx, I. and Cool, K. 1989. Asset Stock Accumulation and Sustainability of
    Competitive Advantage. **Management Science**. 35, (12): 1504–1511.

DiMaggio, Paul J. and Walter, P. 1983. The Iron Cage Revisited: Institutional
    Isomorphism and Collective Rationality in Organizational Fields.
    American Sociological Review. 48: 147-160.

Dobbin, Frank et al. 1993. Equal Opportunity Law and the Construction of Internal
    Labor Markets. **American Journal of Sociology**. 99: 396-427.

Dolog, Peter. 2004. **Personalization in Distributed E-Learning Environments**.
    Proceedings of the 13th International World Wide Web Conference on
    Alternate Track Papers & Posters.

E-Learning Advisory Group. 2002. **Highways and Pathways: Exploring New**
    Zealand's E-Learning Opportunities. Wellington: Ministry of
    Education.

E-Learning Guild. 2005. **The E-Learning Accessibility and Section 508 Report**. Research Report. Retrieved January 15, 2010 from http://www.e learning guild.com

Farrell, C. and Song, Jae, H. 1988. Strategic Uses of Information Technology. **SAM Advanced Management Journal.** 53: 10-16.

Galletta, D. F. and Lederer, A. L. 1989. Some Cautions on the Measurement of User Information Satisfaction. **Decision Sciences.** 20 (3): 419-438.

Goodstein, Jerry D. 1994. Institutional Pressures and Strategic Responsiveness: Employer Involvement in Work-Family Issues. **Academy of Management Journal**. 37: 350-382

Graf, Hagen. 2005. **How to Build an E-Learning Community? Germany ACT 2005, Johannesburg, ZA, Aitec 2005**. Retrieved December 10, 2010 from http:// machm-it.org

Hair, J. F.; Black, W. C.; Babin, B. J.; Anderson, R. E. and Tatham, R. L. 2006. **Multivariate Data Analysis.** 6th ed. Englewood Cliffs: Prentice Hall.

Hall, Ricard H. and Tolbert, Pamela S. 2005. **Organizations: Structures, Processes, and Outcomes.** Upper Saddle River, N.J.: Pearson Prentice Hall.

Herd, Janner. 2006. **The Leaping E-Learning Community Online Networked Learning.** London: National College School Learning.

Hisham, N.; Campton, P. and FitzGerald, F. 2004. A Tale of Two Cities: A Study on the Satisfaction of Asynchronous E-Learning Systems in Two Australian Universities. In **Beyond the Comfort Zone: Proceedings of the 21st ASCILITE Conference. Perth, 5-8 December**. R. Atkinson, C.McBeath, D. Jonas-Dwyer and R. Phillips, eds. Pp.395-402.

Hislop, D. 2002. Mission Impossible? Communicating and Sharing Knowledge ViaInformation Technology. **Journal of Information Technology**. 17: 165-177.

Hoopes, D. G.; Madsen, T. L. and Walker, G. 2003. Guest Editors' Introduction to the Special Issue: Why is There a Resource-Based View? Toward a Theory of Competitive Heterogeneity. **Strategic Management Journal**. 24: 889–902.

Hoskisson, Robert E.; Hitt, Michael A.; Ireland, R. Duane and Harrison, Jeffrey S. 2008. **Competing for Advantage.** 2nd ed. Australia: Thomson South-Western.

Huseyin, Tanriverdi. 2005. Information Technology Relatedness, Knowledge Management Capability, and Performance of Multibusiness Firms. **MIS Quarterly**. 29, 2: 311-334.

ICF Consulting. 2002. **Five Essentials for E-Learning Success.** International Journal on E-Learning. 5, 2 (Summer): 265–274.

Johnson, A. and Ruppert, S. 2002. An Evaluation of Accessibility in Online Learning Management. **LibraryHi Tech**. 20 (4): 441–451.

Kalpesh, Patel. 2001. **A High-Technology Architectural Odyssey**. Hongkong: Western Morning News Hongkong and Shanghai Bank.

Kapp, Karl, M. 2004. **Speed Is King: Rapid Creation and Deployment of Enterprise E-Learning Solutions.** Macromedia, Inc. Retrieved October 10, 2010 from www.adobe.com/resources/elearning/whitepapers.html

Kelly, Brian. 2004. Developing a Holistic Approach for E-Learning Accessibility. **Canadian Journal of Learning and Technology.** 30, 3 (Fall / Autumn). Retrieved December 15, 2010 from http://www.ukoln.ac.uk/web-focus/papers/cjtl-2004/html/

Keown, A. J.; Martin, J. D.; Petty, J. W. and Scott, D. F. 2002. **Financial Management Principles and Applications.** 9th ed. Upper Saddle River York, N.J.: Prentice Hall.

Kettinger, William J. and Lee, Choong C. 1997. **Pragmatic Perspectives on the Measurement of Information Systems Service Quality**. MIS Quarterly. 21.2 (June): 223-240.

Lee, H. and Choi, B. 2003. Knowledge Management Enablers, Processes, and Organizational Performance: An Integrative View and Empirical Examination. Journal of Management Information Systems. 20, 1: 178-228.

Liaw, S. S. 2004. Considerations for Developing Constructivist Web-Based Learning. **International Journal of Instructional Media**. 31: 309-321.

Liaw, S. S. and Huang, H. M. 2000. An Investigation of Users Attitudes Toward Search Engine as an Information Retrieval Tool. **Computers in Human Behaviour**. 19, 6: 751-765.

Liebowitz, Jay. 2005. Linking Social Network Analysis with the Analytic Hierarchy Process for Knowledge Mapping in Organizations. Journal of Knowledge Management. 9 , 1: 76-86.

Lin, Carol Yeh-Yun and Chen, Mavis Ti-Ching 2007. Does Innovation Lead to Performance? An Empirical Study of SMEs in Taiwan. **Management Research News.** 30, 2: 115-132.

Little, Priscilla M. D. 2004. **Redefining After-School Programs to Support Student Achievement Outcomes.** Conferences and Presentations July 27, 2004 Harvard Family Research Project, Harvard Graduate School of Education.

Mahoney, J. T. and Pandian, J. R. 1992. The Resource-Based View Within the Conversation of Strategic Management. **Strategic Management Journal**. 15, (5): 363–380.

McDonald, M. L. and Westphal, J. D.. 2003. Getting by with the Advice of Their Friends: CEOs' Advice Networks and Firms Strategic Responses to Poor Performance. **Administrative Science Quarterly.** 48: 1–32.อ้างหน้า 46

McKinney, V.; Yoon, K. abd Zahedi, F.M. 2002. The Measurement of Web-Customer Satisfaction: An Expectation and Disconfirmation Approach. Information Systems Research. 11 (3): 296-315.

MihaelaDinsoreanu. 2006. **Mobile Agent Based Solutions for Knowledge Assessment in E-Learning Environments**. Computer Science Department Technical University of Cluj-Napoca Baritiu 26-29, RO-3400 Cluj-Napoca, Romania.

Miller, Michael. 2005. **Usability in E-Learning, Learning Circuits**. Retrieved January 15, 2005 from http://www.learningcircuits.org

Ministry of Education. Office of the Higher Education Commission. 2008. **Higher Education Development Plan 10th (2008-2011).** Bangkok: Ministry of Education. Office of the Higher Education Commission.

Ministry of Education. Office of the Higher Education Commission. 2010. **Thailand Cyber University Project**. Retrieved December 10, 2010 from http://www.thaicyberu.go.th

National Alliance of Business. 2000. Will E-Learning Transform Corporate Training? **WorkAmerica.** 17, 9 (November)

Neuman, W. L. 2003. **Social Research Methods: Qualitative and Quantitative Approaches**. 5th ed. Boston: Allyn & Bacon.

Nichols, M. 2003. A Theory for E-Learning. **Educational Technology & Society**. 6 (2): 1-10. Retrieved March 14, 2006 from http://ifets.ieee.org/periodical/6-2/1.html

Office of Science and Technology Development Agency (NSTDA). **What is E-Learning**. Retrieved March 14, 2006 from http://www.thai2learn.com/home.php?page=whatE-Learning&hi=900

Oliver, R. L. 1993. A Conceptual Model of Service Quality and Service Satisfaction: Compatible Goals, Different Concepts. **Advances in Services Marketing and Management.** 2: 65-85.

Parasuraman, A.; Zeithaml, V. and Berry, L. 1985. A Conceptual Model of Service Quality and Its Implications for Future Research. **Journal of Marketing**. 49: 41-50.

Parker, M. B. 2002. **Three Pillars of Technology-Enhanced E-Learning**. Proceedings 4th Annual World Wide Web Conference, University of Stellenbosch. 4-6 September.

Passerini, K. and Granger, M. J. 2000. A Development Model for Distance Learning Using the Internet. **Computers & Education.** 34: 1-15.

Pattama Nopparat. 2006. **New Way of Education: E-Learning**. Retrieved October 15, 2010 from http://www.E-Learning.dss.go.th/ppt/E-Learning.htm

Peteraf, M. A. 1993. The Cornerstones of Competitive Advantage: A Resource-Based View. **Strategic Management Journal.** 14, (3): 179–191.

Pitt, L. F.; Watson, R. T. and Kavan, C. B. 1995. Service Quality: A Measure of Information Systems Effectiveness. MIS Quarterly. 19 (2): 173-187.

Plaisent, Michel. 2004. Evaluating E-Labs' Experimentation. **Electronic Journal on E-Learning**. 2, 1 (February): 195-202.

Priem, R. L. and Butler, J. 2001. Is the Resource-Based "View" a Useful Perspective for Strategic Management Research? **The Academy of Management Review**. 26 (1): 22-40.

Ray, J. Tsai. 2006. An Integrative Model to Predict the Continuance Use of
    Electronic Learning Systems: Hints for Teaching. **International Jl. on E-**
    Learning. 5 (2): 287-302.

RMIT University. Retrieved February 10, 2011 from http://www.rmit.edu.au

Roach, Virginia. 2006. Satisfaction with Online Learning: A Comparative
    Descriptive Study. **Journal of Interactive**. 5, 3 (Winter): **317-332.**

Rosenberg, Marc J. 2001. **E-Learning: Strategies for Delivering Knowledge in**
    the Digital Age. New York: McGraw-Hill.

Rumelt, Richard P. 1984. Towards a Strategic Theory of the Firm. In **Competitive**
    Strategic Management. Robert Lamb, ed. Englewood Cliffs, N.J.:
    Prentice-Hall. Pp.556-570.

Sandrock, Jorg and Vo, Kiet 2004. E-Learning Community Integration with Web
    Services. In **Multikonferenz Wirtschaftsinformatik (MKWI).** Vol.1.
    Germany: Essen. Pp.72–83. Retrieved November 10, 2010 from
    http://www.im.uni-karlsruhe.de/Default.aspx?PageId=354&lang=
    de&mid=405&dm=14&cmd=show&ids=125; http://www.im.uni-
    karlsruhe.de/Publications/MKWI04%20elearning%20communities%20san
    drock%20vo%20-%20MKWI%2004.pdf

Sathima Patomviriyavong. 2006. E-Learning Operational Risk Assessment and
    Management: A Case Study of the M.Sc. In **Management Program**.
    Sathima Patomviriyavong, Boonyarat Samphanwattanachai and
    Thanomsak Suwannoi Third International Conference on E-Learning for
    Knowledge-Based Society, August 3-4, 2006, Bangkok, Thailand.

Scardamalia, M. and Bereiter, C. 1992. An Architecture for Collaborative
    Knowledge Building. In **Computer-Based Learning Environments and**
    Problem Solving. E.D. Corte, M.C. Linn, H. Mandl and L. Verschaffel,
    eds. Berlin: Springer-Verlag. Pp. 41-66.

Scott**,** W. Richard and Davis, Gerald. 2006. **Organizations and Organizing:**
    Rational, Natural and Open Systems Perspectives. International ed.
    US: Pearson Higher Education.

Shepherd, Clive. 2002. **In Search of the Perfect E-Learner, E-Learning's Greatest Hits**. Retrieved December 17, 2010 from http://www.fastrak-consulting.co.uk/tactix/features/elearner.htm

Shepherd, Clive. 2003. **Endgame-Encouraging Completion in E-Learning, E-Learning's Greatest Hits by Clive Shepherd**. Retrieved December 17, 2010 from http://www.fastrak-consulting.co.uk/tactix/features/ elearner.htm

Sloman, Martyn. 2003. Developing the E-Learning Community, Chartered Institute of Personnel and Development Issue. **Human Resource Development International**. 6, 2 (June): 259-272.

Somchai Numprasertchai and Igel, B. 2005. Managing Knowledge through Collaboration: Multiple Case Studies of Managing Research in University Laboratories in Thailand. **Technovation**. 25: 1173–1182.

State Education and Environment Roundtable. 2005. **The EIC Model™ and Student Achievement**. Retrieved December 31, 2005 from http://www.seer.org

State of Illinois. 2002-2007. Digital-Age Learning. In **Five-Year Technology Plan, 2002-2007.** Illinois: State of Illinois.

Storey, T. 2004. Can the Power of Technology Improve Teaching and Learning? And What Role will Libraries Play in This Rapidly Emerging Field of E-Learning? **OCLC Newsletter**. 265: 8-10.

Styliadis, Athanasios D. 2006. Personalized E-Learning Implementation-The GIS Case. **International Journal of Computers, Communications & Control.** l, 1: 59-67.

Sunee Rasakeitsak. 2010. **Components of Online Learning System**. Retrieved November 19, 2010 from http://cc.swu.ac.th/ccnews/content/ e1624/e1628/e2829/e2851/index_th.html. (In Thai).

Supachai Sukhanin. 2002. **Open E-Learning World, Learning by Internet.** Bangkok: SEED. (In Thai).

Supachai Sukhanin and Konanok Wongpanich. 2005. **E-Learning.** Retrieved, December 12, 2010 from http://elearning.utcc.ac.th/main/Page1.htm; http://elearning.utcc.ac.th/main/Page7.htm. (In Thai).

Surasit Wankairoj. 2006. **E-Learning Solution**. Retrieved January 5, 2011 from
    http://www.thai2learn.com. (In Thai).

Tai, Luther. 2008. **Corporate E-Learning: An Inside View of IBM's Solutions**:
    University of Pennsylvania. London: Oxford University Press.

Tanomporn Luahacharatsang. 2005a. **E-Learning System.** Retrieved December 31,
    2005 from http://www.northbkk.ac.th/Content/Student/ELearning.html

Tanomporn Luahacharatsang. 2005b. **Meaning of E-Learning**. Retrieved October
    30, 2005 from http://www.tsu.ac.th (In Thai).

Tasso, C. 2004. **Content Based Personalization for Asynchronous**
    Communication Tools: The If Forum System. Artificial Intelligence
    Laboratory-InfoFactory Group University of Udine, Udine, Italy, 2004.

Teece, D. J.; Pisano, G. and. Shuen, A. M. Y. 1997. Dynamic Capabilities and
    Strategic Management. **Strategic Management Journal**. 18: 509-533.

University of California, Berkeley. California Institute of Technology. 2010.
    Overview of Project Caltech Core Curriculum and Academic
    Achievement Evaluation and Planning Project. Caltech, Subcontractor
    for the University of California, Berkeley. Retrieved December 15, 2010
    from http://diversity.caltech.edu/ dpg_reports/irvine03/core.pdf

Utumporn Jamornmann. 2004. Techniques for Assessing Students' E-Learning
    Achievement. **International Journal of the Computer, the Internet and**
    Management. 12, 2 (May-August): 26-31.

Wang, Q. 2006. Quality Assurance-Best Practices for Assessing Online Programs.
    International Journal on E-Learning. 5 (2): 265-274.

Wernerfelt, B. 1984. The Resource-Based View of the Firm. **Strategic**
    Management Journal. 5 (2): 171–180.

Williams, L. J.; Edwards, J. R. and Vandenberg, R. J. 2003. Recent Advances in
    Causal Modeling Methods for Organizational and Management Research.
    Journal of Management. 29 (6): 903-936.

Wordpress. 2002**. ITC International Business Division: Ensuring e Learning**.
    Retrieved September 3, 2002 from http://wordpress.org

Yamane, Taro. 1967. Elementary Sampling Theory.Englewood Cliffs, N.J.:
    Prentice-Hall.

APPENDIX

QUESTIONNAIRE

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Examining the Integrated Influence of Quality and Attitude Factor on E-Learners' Satisfaction and E-Learning System Success in Thai Public University

กรุณากรอกแบบสอบถาม เพื่อใช้ในงานวิจัย รวม 40 ข้อ ขอขอบพระคุณทุกท่านที่กรุณาตอบแบบสอบถาม

Please answer in this questionnaires for Research (40 questions). Thank you very much for your kind.

1. ท่านเคยเรียนผ่าน **e-learning** หรือไม่ ? *

   Have you ever study the program by e-learning?

   ☐ เคยเรียน (Yes)

   ☐ ไม่เคยเรียน (No)

   1.1 (ถ้าท่านเคยเรียน e-learning) ท่านเรียนใน มหาวิทยาลัยใด

   Which university have you studied ?

   [   ]

   1.2 (ถ้าท่านเคยเรียน e-learning) ท่านเรียนในหลักสูตรใน สาขาวิชาใด

   Which area/major have you studied ?

   [   ]

   1.3 (ถ้าท่านเคยเรียน e-learning) ระดับการศึกษาที่ท่านเคยเรียน e-learning ?

   Which degree have you ever been studying?

   ☐ ต่ำกว่าปริญญาตรี (Lower bachelor's)

   ☐ ปริญญาตรี (Bachelor's)

   ☐ ปริญญาโท (Master's)

   ☐ ปริญญาเอก (Ph.D.)

1.4 (ถ้าท่านเคยเรียน e-learning) ผลการเรียน (เกรด (1-4)) ของท่าน ในหลักสูตร e-learning ที่ท่านเรียนล่าสุด

How is your latest grade on e-learning ?

[   ]

2. **เพศของท่านคือ ? ***

Your gender ?

☐ ชาย (Male)

☐ หญิง (Female)

3. **อายุของท่านคือ ? ***

Your age ?

☐ ต่ำกว่า 20 ปี (Less than 20 Years)

☐ 20-35 ปี (Years)

☐ 36-50 ปี (Years)

☐ มากกว่า 50 ปี (More than 50 Years)

4. **ขณะเรียน e-learning นี้ เป็นนักศึกษา Full-Time หรือไม่ ***

Are you full-time student ?

☐ นักศึกษา full-time

☐ นักศึกษา ไม่ Full-Time (Not full-time)

5. **รายได้ต่อบุคคล เฉลี่ย ต่อเดือน โดยประมาณ ? ***

What is your salary monthly?

☐ น้อยกว่า/เท่ากับ 10,000 บาท (baht)

☐ 10,001- 20,000 บาท (baht)

☐ 20,001-30,000 บาท (baht)

☐ 30,001-40,000 บาท (baht)

☐ 40,001-50,000 บาท (baht)

☐ มากกว่า 50,000 บาท (baht)

6. **ส่วนใหญ่ท่านใช้ Internet แบบใด ในการ Connect เข้าสู่ระบบการเรียน e-learning (สามารถเลือกได้มากกว่า 1 ข้อ)** *

How do you use Internet? (Can choose more than one choice)

- ☐ ที่บ้านโดย ระบบ Dial Up (Dial Up at Home)
- ☐ ที่บ้านโดยระบบ Internet ADSL ความเร็วสูง (ADSL HIGH SPEED at Home)
- ☐ ใช้อินเทอร์เน็ตที่สถานที่ศึกษา (INTERNET at School)
- ☐ ใช้อินเทอร์เน็ตที่สถานที่ทำงาน (INTERNET at Work)
- ☐ ใช้อินเทอร์เน็ตที่สถานที่ให้บริการ (INTERNET at Any Service Providers)
- ☐ Other: _____

7. **ระยะเวลาโดยเฉลี่ย แต่ละครั้งในการใช้ เมื่อ Connect เพื่อเข้าสู่ระบบการเรียนการสอนผ่านออนไลน์นี้** *

How long are you studying each time you connect ?

- ☐ ไม่ถึง 1 ชั่วโมง (1hr or less)
- ☐ 1- 2 ชั่วโมง (hrs)
- ☐ 3 -5 ชั่วโมง (hrs)
- ☐ มากกว่า 5 ชั่วโมง (More than 5 hrs)

8. **ความถี่โดยเฉลี่ย ในการเข้า Connect เพื่อเข้าสู่ระบบการเรียนการสอนผ่านออนไลน์ บ่อยเพียงใด?** *

How often do you connect to online class ?

- ☐ ทุกวัน (Everyday)
- ☐ วันเว้นวัน (Alternatively)
- ☐ 1-2 วัน ต่อสัปดาห์ (one or two day a week)
- ☐ ไม่แน่นอน (Connect เมื่อว่าง) (Randomly)

9. **ช่วงเวลาส่วนใหญ่ในการใช้ เมื่อ Connect เพื่อเข้าสู่ระบบการเรียนการสอนผ่านหลักสูตรออนไลน์นี้ (สามารถเลือกได้มากกว่า 1 ข้อ)** *

What time do you like to connect ?

- ☐ 00.00 - 03.00 น.
- ☐ 03.00 - 06.00 น.
- ☐ 06.00 - 09.00 น.
- ☐ 09.00 - 12.00 น.
- ☐ 12.00 - 15.00 น.

ท่านมีความคิดเห็นต่อปัจจัยด้านคุณภาพ ในการเรียนการสอนผ่านระบบออนไลน์ของหลักสูตรนี้ มากน้อยเพียงใด ?

What do you think that quality in many various factors do affect your studying by e-learning?

(เห็นด้วยอย่างยิ่ง (Strongly Agree) = 7, เห็นด้วยมากๆ = 6, เห็นด้วยมาก = 5, เห็นด้วยปานกลาง = 4, เห็นด้วยน้อย = 3, เห็นด้วยน้อยมาก = 2, ไม่เห็นด้วย (Strongly Disagree) = 1

10. ข้อมูลที่ได้รับจากออนไลน์ มีความแม่นยำ และ ถูกต้อง น่าเชื่อถือ *

The data is accurate and reliable.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

11. เนื้อหาในหลักสูตรออนไลน์ที่เคยเรียน ตรงกับความต้องการของท่าน *

This e-learning provides information that is exactly what you need.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

12. เนื้อหาในหลักสูตรออนไลน์ เป็นข้อมูลที่มีประโยชน์ *

The e-learning provides information that is relevant to learning.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

13. เนื้อหาในหลักสูตรออนไลน์นี้ มีข้อมูลที่เพียงพอต่อการเรียนรู้ของท่าน *

This e-learning provides sufficient information

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

14. เนื้อหาในหลักสูตรออนไลน์นี้ เป็นข้อมูลที่อัพเดท ทันสมัยถึงปัจจุบัน *

This e-learning provides up-to-date information

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

15. เนื้อหาในหลักสูตรออนไลน์นี้ เป็นข้อมูลที่ง่ายต่อการเข้าใจ *

This e-learning provides information that is easy to understand.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

16. ระบบการใช้งานที่แสดง ในหลักสูตรออนไลน์นี้ มีความง่ายในการใช้งาน *

The system is user-friendly. The web-based learning site functions well all the time.

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

17. ระบบการใช้งานในหลักสูตรออนไลน์นี้ มีการใช้งานที่มีเสถียรภาพสม่ำเสมอ *

The system is always available.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

18. ระบบการใช้งานมีฟังก์ชั่นที่เป็นประโยชน์ ที่ทำให้ท่านรู้สึกสนใจในการเรียนรู้ *

The system has attractive features that appeal to users.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

19. ระบบการใช้งานในหลักสูตรออนไลน์นี้ มีความรวดเร็วด้านการเปิดและดาวน์โหลดข้อมูล และ ภาพต่างๆ *

The system provides high-speed information access. The web-based learning site can quickly load all the text and graphics

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

20. เว็บการเรียนการสอนนี้ มีบริการที่สามารถตอบสนองความต้องการเฉพาะท่านได้ (Customization) *

The web-based learning site can meet the specific needs of each learner (Customization).

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

21. เว็บการเรียนการสอนนี้ มีบริการที่ทำให้ท่านสะดวกสบายในการใช้งานและเรียนรู้ *

The web-based learning site provides the services you need, with comfortable using the services provided by the web-based learning site.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

22. เว็บการเรียนการสอนนี้ มีบริการที่ดีที่ทำให้ท่านสามารถติดต่อและแลกเปลี่ยนความคิดเห็น กับผู้เรียนด้วยกัน *

The e-learning system makes it easy for you to access the shared content from the learning community.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

23. เว็บการเรียนการสอนนี้ มีบริการที่ดีที่ทำให้ท่านสามารถติดต่อและแลกเปลี่ยนความคิดเห็น กับอาจารย์ผู้สอน *

The e-learning system makes it easy for you to discuss questions with your lecturers and/or tutors.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

24. เว็บการเรียนการสอนนี้ มีบริการที่ดีที่ทำให้ท่านสามารถติดต่อขอความช่วยเหลือต่างๆ กับ หน่วยงาน **IT Service** ของหลักสูตรได้ง่าย *

The e-learning system makes it easy for you to contact and get help from IT Service Support

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

ท่านมีความคิดเห็นต่อปัจจัยด้านทัศนคติ ในการเรียนการสอนผ่านระบบออนไลน์ของหลักสูตรนี้ มากน้อยเพียงใด ?

What do you think that Attitude in many various factors do affect your studying by e-learning?

เห็นด้วยอย่างยิ่ง (Strongly Agree) = 7, เห็นด้วยมากๆ = 6, เห็นด้วยมาก = 5, เห็นด้วยปานกลาง = 4, เห็นด้วยน้อย = 3, เห็นด้วยน้อยมาก = 2, ไม่เห็นด้วย (Strongly Disagree) = 1)

25. เว็บการเรียนการสอนระบบออนไลน์นี้ เป็นช่องทางการศึกษาที่ดีมากกว่าระบบห้องเรียน *

Do you agree that "E-learning is more efficient than traditional teaching method ?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	▢	▢	▢	▢	▢	▢	▢	เห็นด้วยอย่างยิ่ง (Strongly Agree)

26. ท่านมีความคิดเห็นอย่างไรต่อประโยชน์ของการเรียนรู้ผ่านหลักสูตรออนไลน์ *

Do you agree that online class is useful for your studying?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	▢	▢	▢	▢	▢	▢	▢	เห็นด้วยอย่างยิ่ง (Strongly Agree)

27. ท่านมีทัศนคติที่ดี และ มีใจที่จะเรียนระบบการเรียนรู้ออนไลน์ *

Do you agree that students should have good attitude and willing in online class?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	▢	▢	▢	▢	▢	▢	▢	เห็นด้วยอย่างยิ่ง (Strongly Agree)

28. ท่านคิดว่า ผู้สอนที่ท่านสัมผัสมีทัศนคติที่ดี และ มีใจที่จะสอน ในหลักสูตรออนไลน์ *

Do you agree that instructors have good attitude and willing in online class?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	▢	▢	▢	▢	▢	▢	▢	เห็นด้วยอย่างยิ่ง (Strongly Agree)

29. ท่านคิดว่าการศึกษาออนไลน์มีความคุ้มค่าทางการเงินโดยรวม ดี *

You have good attitude in overall cost of e-learning ?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

30. ท่านคิดว่าความคุ้มค่าทางการเงินในการใช้จ่ายอุปกรณ์เสริมนอกสถานศึกษาเพื่อศึกษาออนไลน์มีความเหมาะสม *

You have good attitude toward to cost of equipment required by online class ?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

31. ท่านคิดว่าหลักสูตรออนไลน์มีความคุ้มค่าด้านการเงิน มากกว่า หลักสูตรปกติ (ไม่ออนไลน์) *

Do you think that you spend overall cost of e-learning cheaper than cost of traditional class room learning?

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

ท่านมีความพึงพอใจ ต่อผลสำเร็จที่ได้รับ ในการเรียนการสอนผ่านระบบออนไลน์ของหลักสูตร มากน้อยเพียงใด ?

(เห็นด้วยอย่างยิ่ง = 7, เห็นด้วยมากๆ = 6, เห็นด้วยมาก = 5, เห็นด้วยปานกลาง = 4, เห็นด้วยน้อย = 3, เห็นด้วยน้อยมาก = 2, ไม่เห็นด้วย = 1)

32. ท่านมีความพึงพอใจโดยรวม ในการเรียนรู้หลักสูตรออนไลน์อย่างไร *

Do you overall satisfy with your online class?

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

33. ในการเรียนรู้หลักสูตรออนไลน์ ท่านคิดว่า มีประโยชน์ต่อท่านมาก *

I think the system is very helpful

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

34 . ท่านมีความพึงพอใจที่ได้รับประสบการณ์จากการเรียนรู้หลักสูตรออนไลน์ *

You are pleased with the experience of using the e-learning system.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

35. การที่ท่าน เรียนรู้ในหลักสูตรออนไลน์ ถือเป็นการตัดสินใจอันชาญฉลาด *

Your decision to use the e-learning system is a wise one.

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

36. ระบบการเรียนการสอนออนไลน์นี้ มีผลด้านบวกต่อการเรียนรู้ของท่าน *

The system has a positive impact on your learning

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

ไม่เห็นด้วยอย่างยิ่ง   ☐ ☐ ☐ ☐ ☐ ☐ ☐   เห็นด้วยอย่างยิ่ง

(Strongly Disagree)   (Strongly Agree)

37. ระบบการเรียนการสอนออนไลน์นี้ โดยรวม มีประสิทธิภาพที่ดี *

Overall, the performance of the system is good.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

38. ท่านคิดว่า ระบบการเรียนการสอนออนไลน์นี้ โดยรวม เป็นระบบที่ ประสบความสำเร็จ *

Overall, the system is successful.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

39. ท่านคิดว่า ระบบการเรียนการสอนออนไลน์นี้ มีความสำคัญที่ช่วยในการเรียนรู้ และทำให้ท่านได้รับความรู้อย่างดี *

The system is an important and valuable aid to you in the performance of your class work.

	1	2	3	4	5	6	7	
ไม่เห็นด้วยอย่างยิ่ง (Strongly Disagree)	☐	☐	☐	☐	☐	☐	☐	เห็นด้วยอย่างยิ่ง (Strongly Agree)

40. ข้อเสนอแนะอื่นๆ เกี่ยวกับ การเรียนหลักสูตร ผ่าน e-learning

Please put any recommendation to your online class ?

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BIOGRAPHY

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ACADEMIC BACKGROUND   Bachelor (Civil Engineering),

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