DEVELOPMENT OF AN ELEARNING MODEL ON QUALITY MANAGEMENT FOR AVIATION INDUSTRY

By
DARAWAN SUMRANWONG

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in eLearning Methodology
December 2011
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Submitted to the Graduate Degree Program in eLearning Methodology, Graduate school of eLearning of Assumption University of Thailand in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

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DEVELOPMENT OF AN ELEARNING MODEL ON QUALITY MANAGEMENT FOR AVIATION INDUSTRY

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ABSTRACT

This research presented a developed eLearning model on quality management system for aviation industry according to Aerospace Standard (AS9100). The objectives of this research were (1) to create an eLearning model as a quality management learning tool for aerospace industry in Thailand, (2) to refine the model based upon suggestions provided by learners and external experts and (3) to measure opinion of eLearning users in Thailand toward the developed eLearning model. The population was workforce who works in aerospace industry in Thailand. The cluster sampling technique was applied. There were 65 participants involved in this research. The research instruments were the questionnaires and interview aviation firms operating in Thailand. The data were analyzed using t-test. From data analysis of the satisfaction level on the model, it shown that mean was 4.49 on sufficient accessibility, 4.32 on satisfaction level in general and 4.20 on simply usage. The respondents identified their opinion concerning a developed eLearning model on quality management system for an aviation industry may result in other learning organizations by responding post-test questionnaire. A total of 65 respondents answered the question. A majority (44.4%) of the respondents reported ‘agree’, 31.7% was ‘extremely agree’. Mean was 4.08, and the standard
deviation was 0.74 The result of the research stated that the eLearning model based upon AS9100 included four main parts: Technology-Individual-Management-Environment or TIME model. “T” is from ‘technology’, it concerned four elements which are innovation, functionality, accessibility, and compatibility. “I” represents ‘Individual’ part represents usability, attitude, competency, and comprehensiveness. “M” means ‘management’ which contains inspiration, encouragement, leading change, and, resource management. And, “E” means ‘environment’, it contains infrastructure, pedagogy, and, communication.

**Keywords:** AS9100; AS9100 standard; Aviation Industry; eLearning; Quality Management System
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CHAPTER I
INTRODUCTION

1.1 Background of the Study

An importance driver for organizations to enhance staff’s competency is “Learning”. A learning technique that supports a wide spectrum for learners is “eLearning”. The interest of many communities across the world that applies eLearning to their organizations is continuously growing. They rely more and more on eLearning application to support their learning system.

In 21st century, eLearning system has been progressed in development of web technologies and the forms of learning materials have been enriched substantially using multimedia technologies. Nowadays, some software platforms are developed to support eLearning technologies such as WebCT, Tool Book, or, Learning Space to make eLearning more and more sufficient including increase rapid transfer of learning content. eLearning standards for achieving accessibility via online technical specifications and interface design have been established for the Internet technology, however, it remains to be seen how far eLearning systems are conforming to these standards, and where the conflicts might be between learning features and usability.

A significant key element of the human resource management in aviation industry is to recruit, train, develop, and manage a workforce in an effective manner. In order to accomplish its objective, they need to provide the right manpower with the right skills in the right job at the right time, and to manage his/her career path in support of the organization’s capabilities. To support this
objective, some form of automated learning management system is needed. In term of quality management, there are very few experts in Thailand who is able to support the aviation industry as its specification is not only known about quality management but need to understand nature of aviation industry. Most organization has to recruit manpower with no background in aviation and provide a long period on training instead. This is a cost ineffectiveness way.

The advent of the new technologies has taken the proliferation of artificial environments in eLearning. Most of the efforts have been addressed. Thus, this research proposes the theoretical reflection on the learning processes by studying relevant theories that have been revised from the point-of-view of eLearning and deducing a possible eLearning model. The theoretical reflection, presented in its model and conceptual aspects, finds its application in the realization of an eLearning platform. The developed eLearning model of this research was aligned with the theoretical, architectural, functional, and technological fields.

1.2 Statement of Problem

Aviation industry is an industry that needs competent personnel to perform the right task, especially in quality field. It is not only the Federal Aviation Administration (FAA) regulation but it is also a part of management strategy that the organization shall follow. It’s a huge conflict between the training system and business management in aviation industry. The training administration requires staff to complete the whole training needs program and certified before performing their task as defined on their job description. This take almost a year such as in the past a new programmer in Thai Airways required to train for 6-10
months before allow them to perform their task. It’s a high cost of training. On the other hand, the business management requires staff to be able to perform the assigned task as fast as possible. There is no efficient tool to make training runs faster except eLearning that allow staff to prepare themselves to certify at any time and any place.

In aviation industry, airlines were the first to adopt strong e-commerce model by implementing on line tickets. The saving to transfer desk booking to on line booking is estimated over billion US dollar saving. These huge cost savings have kept the airlines competitive in a period of uncertainty and rising of energy cost. There seems to be no end to the sophistication of these online systems. The reselling of car hire, hotels and insurance has also boomed. Now even have mobile telephone booking by Air Asia. Moreover, Internet access via satellite is even available in-flight. Boeing's Mobile Communications service has deals with a number of major airlines and the service is becoming quite common now. Considering from online sales to online learning, with all of this Internet-based, online activity reshaping the industry, it is hardly surprising that airlines have seen a parallel in the use of eLearning to save costs and increase effectiveness.

In fact, airlines have been pioneers in online learning for nearly a century, picking up on military flight simulators to enthusiastically embrace commercial flight simulators, all on the basis of reducing time, costs and also increasing safety to pilot. The airlines have also taken to eLearning which has appeared across all aspects of learning. It can notice that this industry, shaken externally by online technology has adopted it internally. So what does the future will be for eLearning
in the aviation industry? Some interesting trends have emerged which can reduce costs and effectiveness even further.

Because aviation industry is a business that requires high safety and quality therefore this research decided to consider quality management to be a course content and use it as a tool to deliver quality awareness to staff. Among the quality approaches, there are the most common are official quality management approaches such as European Foundation for Quality Management (EFQM), AS9100, ISO 9001, and Quasi standards such as Sharable Content Object Reference Model (SCORM) or the new Publicly Available Specification (PAS) from the German Institute for Standardization (DIN).

1.3 Research Objectives

This research aimed to investigate the feasibility, suitability, and use of a designed eLearning model on quality management systems to support online and apply for the aviation industry by addressing many issues related to the selection, implementation, and use of eLearning management systems. The objectives of this research are as follows:

1) To create an eLearning model on a quality management learning tool for aviation industry in Thailand.

2) To measure satisfaction of eLearning users in Thailand toward the quality management model.

3) To refine the developed eLearning model based upon quantitative data, and qualitative feedback and suggestions provided by learners and external experts.
1.4 Research Questions

The following research questions were refined to guide baseline for the study and development of research instruments.

1) What represents a useful quality management based model to support eLearning for aviation industry in Thailand?

2) In what applications of the research can feedback and suggestions from external experts be applied to improve development of the designed model about quality management within the context of eLearning?

3) What is the level of satisfaction of eLearning users’ opinions toward the developed eLearning model, before and after implementation?

1.5 Significance of Research

While the aviation industry is developing in Thailand, they also developed skilled man powers in the country. It’s important for learning to develop competent man power to supply for the aviation industry. The aviation industry provides both manufacturing and services to customers as well as transportation and travel-related services for travelers. The aviation industry provides aviation parts and spare parts, air services, and aviation-related services to customers to ensure reaching of safety and quality standards.

Quality as practiced in the aviation industry is presented primarily through the experience of airline and related aviation companies. Developing an effective quality management concept for the aviation industry shall help to strive for modernization, better public management, increased performance and a stronger stakeholder focus.
To start eLearning on quality management for aviation industry as noticed that aviation industry in Thailand still need to improve quality awareness to build solid quality culture by applying quality management strategy. Either some organization is already aware that there is a need to create a better quality management strategy or some are made aware of the potential of quality activities. Therefore developing a quality management is the best fitting one to fulfill the aviation industry needs. The quality strategy or quality model has to be applied to the considered eLearning scenario. However, the organization can decide which quality approaches delivers the most suitable solution. In addition, the quality approaches within the organization which is fitting to the concrete scenario and fulfilling the relevant requirements can be integrated.

A major benefit of using an eLearning model is to facilitate learners at any time, any place, any pace, and anyone accessing to eLearning content. The designed eLearning model allowed for learner registration, delivery of learning activities, learner assessment, and report generation on learner progress and assessment results. Some features include competency management, skills-gap analysis, succession planning, certifications, and resource allocation was developed as well as the basis features.

1.6 Population and Sampling Units

The research was designed for organizations related to aviation industry. Target group was Thai workforce who works in field or other field related to quality management in both manufacturing and service firms of aviation industry
in Thailand. Cluster sampling technique was applied. The researcher selected the organizations to do as prototype for this research after survey.

![Aviation industry in Thailand](image1.png)

![Sampling](image2.png)

**Figure 1-1: Population and sampling concept**

1.6.1 **Population**

The population of this research study can be divided to two main groups as follows;

1) **External experts**

Experts in education and training, aviation, and, quality management were invited to participate.

2) **Engineers and officers who work in the aviation company which include both manufacturing site and aviation services firms in Thailand.**

1.6.2 **Sampling Units**

As sampling is an essential process of qualitative method therefore the objective of the study is to generalize qualitative findings from the sample to the population, then the researcher attempted to select samples that were representatives.
Referred to Anthony J. and Nancy L. (Onwuegbuzie & Leech, 2007), they described that when given a large enough sample, of all sampling schemes, random sampling offers the best chance for a researcher to obtain a representative sample. Thus, if external statistical generalization is the goal, which typically is not the case, then qualitative researchers should consider selecting one of the five random sampling schemes which are simple random sampling, stratified random sampling, cluster random sampling, systematic random sampling, and multi-stage random sampling. Conversely, if the goal is not to generalize to a population but to obtain insights into a phenomenon, individuals, or events, as is most often the case in studies, then the qualitative researcher purposefully selects individuals, groups, and settings for this phase that increases understanding of phenomena. In this situation, the researcher should select one of the purposive sampling schemes.

In this study, the cluster random sampling was applied. That because presently in aviation industry in Thailand, the population is quite small and the list of the population is not completely available yet. In addition, the objective of this study is not to compare the clusters but simply to use them to obtain a sample instead.

In this study, the sampling units were 80 staffs of total target sample size. The cluster was divided to cover all two groups by considering person who have Internet readiness and preferred to be a volunteer to try out and involve to the whole learning processes of the designed model. The reason is that because the gaining of access may probably be quicker when using this concept. In the future this pilot study was expanded to other functions or businesses. The period to take a full model was about 10 hours.
The details of sampling units are as follows.

1) External experts who participated to develop the model were invited ten persons.

2) Engineers and officers who work in the aviation company which include both manufacturing site and aviation services firms in Thailand. 80 staffs from manufacturing sites and services firms were chosen randomly as target population. Before random selection, they were purposive selected from the population who have Internet readiness and volunteer to try out and involve to all eLearning processes of the designed model for 10 hours.

1.7 Definitions of Terms

**Aircraft**: A vehicle that can travel through the air.

**Airplane**: A powered aircraft that derives its lift from the movement of air over fixed lifting surfaces.

**Aero plane**: A power driven heavier than air aircraft that derives support in the atmosphere from the reactions of the air on its surfaces that remain fixed under given conditions of flight.

**Aviation**: The design, development, production, operation, and use of aircraft.

**Dependent variable**: The goal of investigating the degree to which the response on that variable depends on the group to which the subject belongs. It is outcome variable about which comparisons are made.
**Ethnography:** A scientific research strategy which is frequent used in the social science. It is often employed for gathering empirical data on human societies and cultures.

**International Civil Aviation Organization (ICAO):** A specialised organization which sets the standards and recommended practices that foster the safe and orderly development of civil aviation. ICAO is a key industry organization to develop policies and standards, resolve strategic directions on critical issues, coordinate global initiatives, monitoring, analysis and reporting and pursue targeted assistance and capacity building objectives for civil aviation.

**Instrument Flight Rules (IFR):** A regulatory term describing a flight which may be conducted in atmospheric conditions where the pilot cannot fly the aircraft solely by reference to the natural horizon (e.g. in cloud and fog) and must fly only by reference to the aircraft instruments.

**Compliance:** Meeting established criteria, specifications, terms, standards, or regulations.

**Conformance:** An affirmative indication or judgment that a product or service has met the requirements of a relevant specification, contract, or regulation.

**Continuous improvement:** The ongoing improvement of products, services, or processes through incremental and breakthrough improvements.

**Cluster Sample:** A probability sampling method that divide the population into a large number of groups which called as clusters. The sampling units are the subjects in a random sample of the clusters.
Deutsches Institute für Normung (DIN): The German national institute for standardization. It is a Registered German Association which aims to establish standard covering every field of technology.

European Foundation for Quality Management (EFQM): A global non-for-profit membership foundation based in Brussels, Belgium. EFQM membership is for organizations by aim to recognize organizations to implement quality management system and achieve an outstanding of sustainable excellence.

eLearning: The delivery of training course on quality management through the Internet for engineers and officers of Aviation Services Firms and Air Traffic Firms in Thailand. The courseware which comprised of text, images, video, animation and interaction were embedded in the Learning Management System. The duration to complete this courseware was 10 hours approximately.

ELearning Model: The elements and connection of complete eLearning process to achieve objectives of training on quality management through the Internet for engineers and officers of Aviation Services Firms and Air Traffic Firms in Thailand.

Employee involvement: A practice within an organization whereby employees regularly participate in making decisions on how their work areas operate, including making suggestions for improvement, planning, goal setting, and monitoring performance.

International Organization for Standardization (ISO): A voluntary organization whose members are recognized authorities on standards, each one representing one country that give state of the art specifications for products,
services and good practice, helping to make industry more efficient and effective. Developed through global consensus, they help to break down barriers to international trade.

**Process:** The action of taking inputs and transforming them into outputs through the performance of value-added activities.

**Quality:** The degree to which a set of inherent characteristics fulfills requirements. 

**Quality Assurance (QA):** Planned or systematic actions necessary to provide enough confidence that a product or service will satisfy the given requirements.

**Quality Control (QC):** Ongoing effort to maintain the integrity of a process to maintain the reliability of achieving an outcome.

**Quality Control Circle (QCC):** A problem-solving team for quality issues.

**Quality Functional Deployment (QFD):** A systematic for designing a product or service around the expressed requirements of the customer.

**Quality Management (QM):** A method for ensuring that all the activities necessary to design, develop and implement a product or service are effective and efficient with respect to the system and its performance. (Encyclopedia Dictionaries & Glossaries, Babylon translation software, 1997).

**Quality Management System:** Collective policies, plans, practices, and the supporting infrastructure by which an organization aims to reduce and eventually
eliminate non-conformance to specifications, standards, and customer expectations in the most cost effective and efficient manner.

**Statistical Process Control (SPC):** A quantitative system for monitoring process performance and maintaining variability of the process within appropriate limits.

**Statistical Quality Control (SQC):** A quantitative system for monitoring quality performance.

**Stratified Random Sample:** A probability sampling method that divides the population into separate groups, called strata.

**Total Quality Control (TQC):** Feigenbaum’s approach to quality management for managing quality within the organization.

**Total Quality Management (TQM):** A philosophy of management approach for continuously improvement of quality. TQM concept is the quality of products and processes is the responsibility of everyone.

**Variable:** A characteristic that can vary in value among subjects in a sample or population.

**Zero defects:** A quality target focusing on error-free production.

### 1.8 Limitation of Research

This research was scoped on topic in relevant of quality management system and applicable for aviation industry in Thailand only. According to time to do research was limited, the learners did not adapt themselves to the blended learning in the planned schedule before the assessment and survey. This cause decreased the reliability of the data collected. In addition, eLearning was a technological
change within the target organization. It raised some issues, such as low efficiency of carrying out the proposed online process. Some technical problems interrupted and influenced the research. In this case, the researcher considered to review the new target group or re-design the model.

The designed model delivered to target group by Internet. Thus target group was not only people who concerned to quality management but must be people who familiar with Internet and actually use computer.

1.9 Organization of Research Chapters

The following statement describes the organization of research chapters.

Chapter I, Introduction: this chapter provides a background to the study which included a statement of the problem that was to be investigated, research objectives and questions, and described the significance of the research related to the target population and sampling units.

Chapter II, Literature Review: this chapter summarizes the review of concerned issues and also organizes according to the key words for the study. The literature describes in the detail of data analysis, statements of lesson learned, discussion, conclusion and also recommendation for further study.

Chapter III, Research Methodology: this chapter provides a summary of the research design, target population and sampling units, research instrument which support processes to create the eLearning as a quality management learning model. Identify research methodology, proposed data collection and analysis technique.
Chapter IV, Data Analysis Results and Findings: this chapter presents data analysis results, statistical tests that were conducted and findings.

Chapter V, Development of an eLearning Model: This chapter presents the principles for development of an eLearning model. Identify model development process which applied for development of an eLearning model for Aviation industry.

Chapter VI, Conclusions and Recommendation: This chapter summarizes the study and recommend for further research in the field.
CHAPTER II

LITERATURE REVIEW

This chapter provides a conceptual background for this research and strategically position the proposed study within the existing theoretical and empirical literature.

A scholarly review of earlier work relevant to the concerned topic providing appropriate history and recognizing the priority of the work of others in this literature review emphasized to study, gather and organize information to achieve the objectives. This research attempted to apply the theoretical literature to the reality on quality management for aviation industry by focusing on just-in-time learning. The key objective was to identify specific implications from the literature in ways that have the potential to help instructors to clarify their perceptions of the underlying issues associated with eLearning. The implications from readings literature concerned about eLearning apply within the context of quality management in aviation industry in Thailand. Highlights from relevant learning theories and research were reviewed as to develop a model from sources of data were included so as to further illustrate or represent applications from the literature.

The researcher found very few research and case studies concerned to eLearning on quality management. However, the review considered on the following issues which are:
1) Learning theories
2) Quality management
3) eLearning for aviation

2.1 International Research and Case Study in eLearning

2.1.1 Researching the Cognitive Cultures of eLearning

According to Whitworth’s (2007) research describes how eLearning research can account for the nature impact of organizations, in both theory and practice. The research shown that eLearning is not spontaneously generated, but shaped by organized activity (Andrews & Haythornthwaite, 2007). In its turn, it becomes part of environment, and goes on to shape further organized activities. It has been the aim to discuss a range of approaches to studying eLearning as the product of organized activity.

‘Best practice’ in eLearning implementation can include techniques appropriate to the social sphere as well as the technical, but the philosophy remains similar. Models, toolkits or benchmarks are developed to help managers orchestrate the necessary technological and cultural change.

Andrew Whitworth (Andrews & Haythornthwaite, 2007) recommends that eLearning researchers must therefore be aware of how their participants’ and their own ability to develop, understand and use these technologies is partly generated by, and concealed within, existing technologies, organizational forms, and the vested interests that exploit and rely on them. Declaring the eLearning researchers should be interested not only in the technology but in the research processes that produce it is not meant to create a feedback loop akin to a dog chasing its own tail.
Understand cognitive cultures and their role in knowledge production, storage and reproduction within organizations can prevent multiplicity acting as a barrier to progress. Instead, the stock of understanding embedded within cognitive cultures can be productively drawn out, combined with the world views of other stakeholders, and embedded into technologies which benefit all interested parties rather than just an exclusive minority. Inherent assumptions which shape this important technology cannot be left concealed, but must be revealed, understood, communicated and (if necessary) challenged and reworked. Objective science and subjective values thereby validate each other in an atmosphere of continuous double-loop learning.

2.1.1.1 A Theory of Learning for Mobile Age

The industrialized world has undergoing a huge technological and social disturbance. At this century, people are experiencing in social and technological disturbance, with the advance network, Internet and mobile technologies. It’s providing access to information and mobility of knowledge globally.

In the past a school had no access to world information sources; now it has the World Wide Web which become as part of daily life. Learning by network and computer application are become a part of education. Most of school opens Internet sources to allow students from each part of the world to access and be able to study at anywhere and anytime (Mike Sharples, Josie Taylor and Giasemi Vavoula, 2007).
From the research by Vavoula (2005), it showed that 52 per cent of everyday learning episodes involved one or more pieces of electronic technology: mobile and fixed phones, laptop and desktop computers, television and video recorders. To support mobile learning according to their definition, it is not necessary for the device itself to be portable. Definition of mobile learning embraced both learning with portable technology and also learning in an era characterized by mobility of people and knowledge. Vavoula’s studies showed that people create setting for
learning out of technology or resources that are ready to hand (Andrews & Haythornthwaite, 2007).

The research team described that it was particularly interesting that many younger participants were keen on the idea of using the Chat service even though it wasn’t strictly necessary in the trial situation. Chat creates a conversational space within the ‘sacred space’ of the museum, to communicate with multiple participants without anyone else being aware of the scenario were supporting and

Figure 2-2: A Framework for Analyzing Mobile Learning

augmenting the semiotic activities, contributing a much richer experience for visitors. The dialectical shaping behavior emerging in the semiotic level in the control, context and communications nodes as a result of supporting technological underpinning becomes evident. The dialectic is occurring between all three, and from each of those to the corresponding node in the technological space (Andrews & Haythornthwaite, 2007).

2.1.1.2 Adopting quality standards for education and eLearning

Referred to Pawlowski research, it shows how to implement and adapt the quality standard for eLearning ISO/IEC 19796-1 (Ehlers & Martin, Handbook on Quality and Standardisation in E-Learning, 2006). This standard represents a general framework to describe and develop quality management and quality assurance for educational organizations. It provides a framework to develop quality system by considered on the organizations requirements. The Quality Adaptation Model generated to show the steps to develop and implement quality system in organization: The main steps to develop quality system are Context Setting, Model Adaptation, Model Implementation and Adoption, and Quality Development. The steps described how an organization can develop its individual quality system.

If emphasize on quality in field of eLearning, it has become an issue of increasing importance in both researchers’ and practitioners’ communities. A variety of approaches has been developed and implemented successfully within organizations. However, the high number of approached and their different scopes and purposes lead to confusion in the users’ and decision makers’ communities.
Therefore, a quality standard has been discussed and consensually approved in the standardization committee ISO/IEC JTC1 SC36 (International Organization for Standardisation/ International Electrotechnical Commission, Joint Technical Committee 1, Sub-committee 36: Information technology for Learning, Education, and Training).

Quality standards are often misunderstood, especially in the educational community (Pawlowski, 2006). They are perceived as restricting or creativity or huge additional effort. However, new generations of quality standards provide only a basic framework for organization to apply and develop quality systems according to their own system. Quality standard provide harmonized, consensual concepts to manage, assure, or access quality. In the field of learning, education, and training, there are various standards related to education, training and learning which are available for applying to organization.

Referred to Pawlowski research, the following aspects are description of quality standards which help to discriminate quality concepts:

1) Context and Scope: Organization shall focus which context is an approach intended which are the processes covered.

2) Objectives: Organization shall consider the quality objectives which can be achieved by an approach. For example cost reduction, process consistency, learner satisfaction, product reliability.

3) Focus: The quality approach shall focus on organizations/processes, products/services, or competencies.

4) Perspective: For which consignees and from which perspective was a quality approach designed.
5) Methodology: Decide methods and instruments are used which can be benchmarking, criteria catalogue, guidelines, information provision.

6) Metrics: Identify indicators and criteria are used to measure the success.

The survey of the European Quality Observatory (Ehlers, Hildebrandt, Goertz, Pawlowski, 2005) showed that different user groups have different requirements towards a quality standard. From the results of this survey, a framework for quality systems was developed, defining the levels and components to cover all aspects of quality. It suggests that an organization planning to implement a Quality System should discuss and consider the following aspects:

1) Quality Culture: Quality should be anchored in the culture of an organization. Key aspects of this are a quality vision, reflecting the meaning of quality for all areas of an organization. A quality policy and strategy generated by top management show the long-term objectives of an organization’s quality system.

2) Quality Awareness covers the attitude of the organization’s staff towards quality. Every staff member should be aware of its individual contribution towards the overall quality of an organization.

   Management should support activities to build quality awareness.

3) Quality Management covers all activities the planning, steering, implementing, and improving quality in organizations.
4) Quality Assurance covers all activities to evaluate, control, and measure quality in organizations. This is to assure quality related to products and services.

5) Quality Components cover several aspects of quality which can be the quality of process, products/services, competencies of staff members, and all components related to quality.

![Figure 2-3: Levels of Quality Systems](image)

To implement a quality system within an organization, various alternatives for all parts of the system can be considered. A quality standard should cover all necessary aspects of a quality system.

### 2.1.1.3 eLearning Tools Evaluation based on Quality Concept Distance Computing.

From a general point of view, eLearning can be used to increase the interaction between instructors and students and also to make the learning experience more learners’ centered. In spite of this, the approach can generate
some issues, since trainees may feel less motivated on learning. Hence, the success of an on-line course from a learner point of view depends upon an excess of factors, e.g. “the quality of content, the applicability or relevance of learning style or pedagogy to the unit's objectives and the on-line environment, and the quality of the on-line environment itself”. Meanwhile, it was a few numbers of analyses regarding researches on the quality of educational opportunities that Internet-based distance learning presents.

This study is aimed to introduce a new set of quality evaluation indicators for eLearning courses based on the computational process of three known metrics: the Euclidian, Hamming and Levenshtein distances. The “distance” calculus was applied to standard evaluation templates, determining a reference point in the evaluation of the eLearning course quality vs. the optimal concept(s). The final case study highlight how the projects developed within Leonardo da Vinci II Programme, during 2000 – 2006 period, with Romanian contractors, are more or less closer/ broader from an “optimal” eLearning platform (Caramihai & Severin, 2009).

About the European eLearning perspective and the Leonardo da Vinci programme, it shown that the European point of view regarding eLearning was adopted by the European Commission and has identified four priority descriptions of action:

1) improvement of infrastructures and equipment,

2) a training drive at all levels

3) development of quality content and training services on the basis of different reference models,
4) networking of schools in Europe.

Some situation overviews have noticed a retard of objectives attainment in European Member States, but eLearning projects have shown positive return on investment.

So, many organizations are currently reluctant to make the strategic decisions required to embrace eLearning for staff training. Largely, the eLearning European market and its offerings have matured not only concerning quality content, management and delivery, but also in terms of eLearning vendors to position offerings into the market. Some statistics per European countries as development, topics, and tendencies were detailed. The quality assessment of eLearning resources and eLearning offerings, in general, is an as important issue as the eLearning courseware and the interest for establishing an on-line evaluation methodology links the tutors, the managers, the learners, all the above-mentioned specialists. Actually, the Leonardo da Vinci programme was integrated in the Lifelong Learning Programme, financed for the period 2007-2013 and focused mainly on the same track – the vocational training (VET) policies in Europe. According to the provisions of the Council Decision 1999/382/EC adopted to finance the Leonardo da Vinci programme second phase, the period 2000 – 2006 was covered through three calls for proposals: 2000 – 2002, 2003 – 2004, and 2005 – 2006. The particular objectives of the Leonardo da Vinci Programme, as established by the European Commission were:
1) To improve the people’s competencies.

2) To develop capability on accommodation for integrating organizational and technological changes and to improve quality of training.

3) To reinforce contribution to training to the innovation process.

In the same time, the specific measures linked to the Programme can be structured as following:

1) Procedure A: Mobility;

2) Procedure B: Pilot projects (PP) including, Language competences (LA), Transnational networks (NT);

3) Procedure C: Thematic actions (TH), Reference materials (RF), Complementary Actions.

Pilot projects are intended to stimulate the process of innovative technology and to enhance the quality of training. The projects develop tangible products by using new information and communication technologies where appropriate, and intangible products: new approaches in training, new training methods, and new policies linked to professional development.

The General Directorate for Education & Culture, responsible, among other European financing initiatives, for the Leonardo da Vinci Programme, has established a set of results/outputs assessment indicators. Among these descriptors, respectively the indicators proposed for results delivered in electronic format, one might select / adapt those appropriate indicators for eLearning resources as pilot projects results / outcomes. These final (qualitative) indicators can be briefly presented in Table 2-1.
Table 2-1: Final products: Qualitative indicators-Final stage

<table>
<thead>
<tr>
<th>ASSESSMENT GRID → PROCESS ↓</th>
<th>COMMUNICATION &amp; MEDIA USED</th>
<th>EVALUATION</th>
<th>TECHNOLOGY / AUDIO-VIDEO AND ELECTRONIC SUPPORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final stage (Conducting the training course)</td>
<td>- quality of interaction between material and target group / course participant, - choice of media with respect to content</td>
<td>- assessment criteria and procedures, - ongoing and final assessment tests, - quality of feedback with respect to answers to self-assessment questions, - measurement of pathway target groups/course participants level of satisfaction</td>
<td>- material organization, - quality of image definition, - complementarity between sound and image aesthetics</td>
</tr>
</tbody>
</table>

Source: Caramihai and Severin (2009)

Integrating learning, education and training concepts in the general approach of quality assurance, control and management framework, the related standards should be considered. Quality control should be included in the results / products construction stage to enable assessment in accordance with aims, targets, values and strategic elements. A “reference” document drawn-up should be recommended. In the same time, tools should be built to measure: the pedagogical
effectiveness, the effectiveness of technological tools and the educational support, the learners and others parties satisfaction and the cost per person.

In a broader sense, a more structured assessment approach should be carried out considering different times (analysis, construction, drawing up and conducting training course), by different participants (trainee, trainer, client company, sponsors or financiers, managers etc.) in order to assess the effects of the eLearning (assessment of satisfaction, assessment of learning, assessment of possible transfer to working situations). Several criteria and techniques may be suggested for each product development stage, as seen in Table 2.2.
## Final Products: Qualitative Indicators

(United European Commission Procedure)

<table>
<thead>
<tr>
<th>Assessment Grid ↓</th>
<th>Aims</th>
<th>Targets</th>
<th>Criteria</th>
<th>Techniques</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analysis stage</td>
<td>- coherence in relation to the aims and objectives of the participants</td>
<td>- sponsors or financiers</td>
<td>- operative nature of the partnerships</td>
<td>- analysis of documents, interviews, analysis grid</td>
</tr>
<tr>
<td></td>
<td>- balance between skills/requirements of the project</td>
<td>- managers</td>
<td>- rationalization of costs</td>
<td>- satisfaction rating, log books</td>
</tr>
<tr>
<td></td>
<td>- conducting of the project</td>
<td>- learners</td>
<td>- conformity with aims and expectations</td>
<td>- iterative approach</td>
</tr>
<tr>
<td></td>
<td>- adjustment of resources to learners’ characteristics</td>
<td>- designers</td>
<td>- acceptance by the participants</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- adjustment of the system to the constraints of the participants</td>
<td>- trainers</td>
<td>- navigation through resources</td>
<td>-</td>
</tr>
<tr>
<td>Construction stage</td>
<td>- acceptability of tools</td>
<td>- learners</td>
<td>- educational effectiveness</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- usability of tools</td>
<td>- trainers</td>
<td>- monitoring of the elements of the contract</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- ergonomic quality</td>
<td>- content</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- technical reliability of the platform</td>
<td>- producers</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- adherence</td>
<td>- technicians</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Drawing up stage</td>
<td>- co-management</td>
<td>- tutors</td>
<td>- tests of prototypes, questionnaire / interview</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- Adjustment of the service to learners’ requirements and method of learning</td>
<td>- actual use of collaborative work systems</td>
<td>- statements of the difficulties of learners and trainers/produces</td>
<td>-</td>
</tr>
<tr>
<td>Conducting the training course</td>
<td>- quality of formalization tools</td>
<td>- tutors</td>
<td>- statistics of connection times, identification of critical cases</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- speed and relevance of adjustments to the course</td>
<td>- actual use of collaborative work systems</td>
<td>- recovery of experience (KEX)</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>- number of “calls for help”</td>
<td>- actual use of collaborative work systems</td>
<td>- analysis of mistakes</td>
<td>-</td>
</tr>
</tbody>
</table>

Source: Cramahai and Severin (2009)
As it can be seen from both tables, quality eLearning approaches can be helpful for educational organizations but in the meantime there are quasi-different. The main issue is linked to the difficulty to compare (in a standard manner) the results obtained through both methods and to decide which of them is more appropriate to be used in the field.

In accordance with the quality criteria and regulations established by the European Commission (EC), a number of pilot projects with Romanian contractors were financed, respectively 8 projects in 2000 exercise, 6 projects in each 2001, 2002, 2003 and 2003 exercise, 3 in 2004 and 2 in 2006. These projects have proposed different innovative training programmes developed in European transnational partnerships. The topics, the developed products and the partnership expertise implementing the project are detailed in the application form, further part of the financing agreement. The Romanian National Agency has the role to assess the projects final deliverables using the EC’s assessment grid and to allocate the financial envelope in accordance to the products quality.

2.1.2 Quality in eLearning: Use and dissemination of quality approaches in European eLearning. A study by the European Quality Observatory.

Referred to the study by Ulf-Daniel Ehlers and team, it shows that there are numerous quality strategies and quality concepts in the European environment, and that the competence to use these varies extensively among those involved in eLearning. However, it is this competence which determines the degree to which strategies and concepts of quality development are implemented (Ehlers, Goertz, Hildebrandt, & Pawlowski, 2005).
The research team described that quality in eLearning has a twofold significance in Europe:

First, eLearning is associated in many discussion papers and plans with an increase in the quality of educational opportunities, ensuring that the different shift to the information society is more effective. This context is called ‘quality through eLearning’. Second, there is a distribution about methods of improving the quality of eLearning itself. This context is called ‘quality for eLearning’.

Quality standards have the purpose of supporting the process of quality management and quality assurance by using a variety of methods. These methods are explicitly intended to provide support in application for organization rather than standardization. Referred to the study, it is relevant to consider the appropriate requirements which can be deduced for the current and future design of standards. In the discussion of quality, the term ‘standard’ is often taken to mean exclusively a technological standard or standardized methodology.

![Figure 2-4: Processes of Reference Framework for the Description of Quality Approaches.](Source: Ehlers, Goertz, Hildebrandt, and Pawlowski (2005))
The study shows that there is awareness of eLearning quality throughout Europe, but respondents’ quality competence in eLearning nonetheless varies. Although there is an argument about European reform and harmonization of education among policy-makers, at the level of practical implementation the question arises as to what is commonly ‘European’ in education and training. In the case of quality in eLearning this means enquiring into the peculiarities of a specifically European approach to quality in eLearning. A key question to be clarified by the study in this area was the picture of quality competence in the individual countries or regions. The study shows that the individual dimensions of quality are distributed very unevenly across the regions when it comes to dealing with quality strategies. The investigation focused on two constructs in particular:

1) knowledge of quality, which ascertains the awareness and familiarity with the topic of those who develop, use or learn from eLearning;

2) experience of quality, which looks at length of experience of putting quality development measures into practice.

The study has revealed several requirements which must certainly be taken into account in the future development of standards if a successful solution is to be delivered to organization. The key elements are participation, transparency, familiarity and acceptance, openness, suitability and scalability, harmonization and integration, integrated methodology, quality awareness, measurability.
The study provides guidelines for a future quality action plan in eLearning.

On the basis of the results, and other experience from the EQO (European Quality Observatory) project, the following guidelines should shape the quality of eLearning by 2010:

1) learners must play a key part in determining the quality of eLearning services;

2) Europe must develop a culture of quality in education and training;

3) quality must play a central role in education and training policy;

4) quality must not be the preserve of large organizations;

5) support structures must be established to provide competent, service-oriented assistance for organizations’ quality development;

6) open quality standards must be further developed and widely implemented;

7) interdisciplinary quality research must become established in future as an independent academic discipline;

8) research and practice must develop new methods of interchange;

9) quality development must be designed jointly by all those involved;

10) appropriate business models must be developed for services in the field of quality.
2.1.3 Learning Theory

If talking about “Learning” this term is a process, a change in behavior, or understanding. It can describe as the insatiable curiosity that drives the adolescent person to absorb everything people can see or hear or read in order to improve the efficiency. If consider on manufacturing approach, learning may be examined as a product and also as a process.

About “Learning as product”, it is probably define learning as a change in behavior. In other words, learning is approached as an outcome. This approach has the virtue of highlighting a crucial aspect of learning as change. It apparent clarity may also make some sense when conducting experiments. However, it is rather a blunt instrument. In conclusion, learning as a process is task-conscious or acquisition learning or formalized learning which indicates what happens when the learning takes place.

Referred to Alan Rogers (2003), learning approach is sets out two contrasting approaches: task-conscious or acquisition learning and learning-conscious or formalized learning.

Task-conscious or acquisition learning: Acquisition learning is seen as going on all the time. It is 'concrete, immediate and confined to a specific activity; it is not concerned with general principles' (Rogers 2003: 18). Examples include much of the learning involved in parenting or with running a home. Some have referred to this kind of learning as unconscious or implicit. Rogers (2003: 21), however, suggests that it might be better to speak of it as having a consciousness
of the task. In other words, whilst the learner may not be conscious of learning, they are usually aware of the specific task in hand.

**Learning-conscious or formalized learning**: Formalized learning arises from the process of facilitating learning. It is 'educative learning' rather than the accumulation of experience. To this extent there is a consciousness of learning - people are aware that the task they are engaged in entails learning. 'Learning itself is the task. It involves guided episodes of learning.

When approached in this way it becomes clear that these contrasting ways of learning can appear in the same context. Both are present in education institute. Both are present in families. It is possible to think of the mix of acquisition and formalized learning as forming a continuum.

It is possibly to focus learning by orientation categories which are the behaviorist orientation to learning, the cognitive orientation to learning, the humanistic orientation to learning, and, the social/situational orientation to learning. As with any categorization of this sort the divisions are a bit arbitrary: there could be further additions and sub-divisions to the scheme, and there a various ways in which the orientations overlap and draw upon each other.

The four orientations can be summed up in the following table:
### Table 2-3: Four Orientations Concept to Learning

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Behaviorist</th>
<th>Cognitivist</th>
<th>Humanist</th>
<th>Social and situational</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Learning theorists</strong></td>
<td>Thorndike, Pavlov, Watson, Guthrie, Hull, Tolman, Skinner</td>
<td>Koffka, Kohler, Lewin, Piaget, Ausubel, Bruner, Gagne</td>
<td>Maslow, Rogers</td>
<td>Bandura, Lave and Wenger, Salomon</td>
</tr>
<tr>
<td><strong>View of the learning process</strong></td>
<td>Change in behaviour</td>
<td>Internal mental process (including insight, information processing, memory, perception)</td>
<td>A personal act to fulfil potential.</td>
<td>Interaction /observation in social contexts. Movement from the periphery to the centre of a community of practice</td>
</tr>
<tr>
<td><strong>Locus of learning</strong></td>
<td>Stimuli in external environment</td>
<td></td>
<td>Affective and cognitive needs</td>
<td>Learning is in relationship between people and environment.</td>
</tr>
<tr>
<td><strong>Purpose in education</strong></td>
<td>Produce behavioural change in desired direction</td>
<td>Develop capacity and skills to learn better</td>
<td>Become self-actualized, autonomous</td>
<td>Full participation in communities of practice and utilization of resources</td>
</tr>
<tr>
<td><strong>Educator's role</strong></td>
<td>Arranges environment to elicit desired response</td>
<td>Structures content of learning activity</td>
<td>Facilitates development of the whole person</td>
<td>Works to establish communities of practice in which conversation and participation can occur.</td>
</tr>
<tr>
<td><strong>Manifestations in adult learning</strong></td>
<td>Behavioural objectives Competency - based education Skill development and training</td>
<td>Cognitive development Intelligence, learning and memory as function of age Learning how to learn</td>
<td>Andragogy Self-directed learning</td>
<td>Socialization Social participation Associationalism Conversation</td>
</tr>
</tbody>
</table>

*Source: (Merriam and Caffarella 1991: 138)*
As shown from the above schematic presentation, these approaches involve contrasting ideas as to the purpose and process of learning and education - and the role that educators may take. It is also important to recognize that the theories may apply to different sectors of the acquisition-formalized learning continuum outlined above. For example, the work of Lave and Wenger is broadly a form of acquisition learning that can involve some more formal interludes.

### 2.1.3.1 Theories of Learning and Cognition in Collaboration

Dillenbourg (Dillenbourg et al. 1994) identifies three different theories of learning that could be employed in collaborative learning systems which are:

1) socio-constructivist theory
2) socio-cultural theory
3) shared cognition theory

The above three belong to cognitive developmental approaches which focus on the interactions among peers around appropriate tasks in a given learning environment that may increase the mastery of critical concepts.

The socio-constructivist theory advocates that learners master new approaches of learning through interacting with others. The concept is focused on the reasons for cognitive developments in individuals. The theory aims to interactions rather than actions themselves. A given level of individual development allows participation in certain social interactions which produce new individual states which, in turn, make possible more sophisticated social interactions, and so on (Dillenbourg et al. 1994).
The socio-constructivist approach focuses on the individual's development with respect to the social interaction, without really differentiating or identifying the underlying factors that enhance collaborative learning. Here the social interaction is assumed as a black box that boosts collaborative learning.

The socio-cultural theory focuses on the causal relationship between social interaction and the individual's cognitive development. In this approach, each internal cognitive change is mapped onto a causal effect of a social interaction. About this theory a learner would use the technique(s) that are learned during the collaborative effort with the companion when the learner tries a similar problem independently. That is self-review by the student is the internalization of peer review.

The shared cognition theory is different from the other two theories in the sense that the environment in which learning takes place is given the focus rather than the environment-independent cognitive processes. The environment consists of both physical context and social context. The previous two approaches attributed the learning only to the physical context. The shared cognition approach places the focus squarely on the social context that is claimed to make the collaborations happen and not just the presence of the collaborators.

The following describe advantages of the situated cognition approach:

1) By linking together specific contexts and the knowledge to be learned, peers learn conditions under which the knowledge should be applied.
2) Situations foster creative thinking. Peers often learn how the knowledge they have can be applied in new situations. Situation leads to the acquired knowledge being more practical in nature.

According to this approach, collaboration is viewed as a process of building and maintaining a shared conception of a problem, thus ensuring a natural learning environment.

Figure 2-5: Conscious Competence Learning Model

*Source:* Courtesy of Will Taylor, National College of Natural Medicine, Portland, Oregon, USA, 2007.
2.1.4 Quality Management

2.1.4.1 Quality Concept

In the term of continuous improvement of product and service performance, quality is a key portion. ‘Quality’ is defined in many ways. Some people define quality as superiority. Anyway, quality still related to product features and customer focus. In term of ‘quality’, it composes of various combination features as perfection, consistency, eliminate waste, speed of delivery, compliance to requirements, do it right the first time, produce useable products, customer perception, and finally quality serves total customer needs and satisfaction. This study is designed to provide the user a critical appreciation of key Quality Management tools, techniques and requirement into aviation industry which can be either manufacturing or service organizations.

It can be arguing, then, is that Quality Management can only really be understood through a critical examination of its implementation, and that this necessitates a research design which incorporates an attempt to get close to the action of actual practice. This is not to argue that the strategic dimension should or can be ignored in focusing upon implementation. Some at least of this activity takes place within a context which is framed by wider, especially managerial, considerations relating to such matters as corporate, business unit, human resource management, sales and services, manufacturing, and quality strategies.
2.1.4.2 Historical Development in Quality

1) The Economic Imperative

In Western world, ‘productivity’ was considered as the first priority to manufacture product supply to consumer after the Second World War. Consumer demand product in volume that the need. Every product that manufacture produced could be merchandised. At that time period, manufactures faced pressure on demand to supply to market rather than quality of product and perhaps perceived that they had already compiled to the related standard ultimately. The product characteristic as longevity and reliability during the years following the Second World War were relatively low compared with those of today because level of technology concern to production and manufacturing processes was not advance as today.

In the 1970s, manufactures faced problem with increasing high cost of products and labor due to growth of market. It began to challenge manufacturer to improve process of production to reduce cost. Some manufacturers considered to get lower labor cost and increase pressure on labor to work faster and gain more productive. Some reduced raw material cost through research and development. Some applied advance technology on production process as use of robotics, automation and electronic data processing. Most manufactures adopted various strategies and merged approaches together to improve production process and to reduce cost of manufacturing. In relation to technologically and financially feasible, other manufactures adopted the more conventional approach of proficient to lower cost of manufacturing rather than reducing cost through improving
manufacturing process by relocated manufacturing factory to take advantage of lower labor cost.

Concerned to relocation approach, Manufactures in Europe began to set overseas operations. Western firms have developed operations in the so-called ‘Tiger Economies’ of Asia from the middle of 1960s. Singapore, Taiwan and Hongkong were considered at the first of these to emerge operations. Then location that offered lower cost of labor as Korea, Vietnam, Cambodia, and Indonesia were new land of operation. From the late nineteenth centuries, this phenomenon of chasing low cost of labor can be traced. Manufacturing emerged in the United State with supply of low cost of location and labor. On this approach skill of workforce was still be an issue to develop together with low cost of labor. In addition cost of transportation was substantially reduced. As Cathay pacific Airlines has relocated administration from Hongkong to Australia and UK airline also relocated customer call centre from the Middle of East.

In long term benefit, the new land of operation received work force skill development and country development from technology transferred. The low total manufacturing costs concept impacted economies rate. It should be considered that emergent economies develop work skills and competency of workforce to support manufacturing and services firms.

So much for private industry, but what of the public sector – does the same economic imperative apply? The pursuit of quality is equally important to this sector of every economy. From their behaviour and actions throughout the world, governments can be observed to be dissatisfied with the cost and effectiveness of
many public services. There has been for some years a trend towards privatization, commercialization or agency status of many public sector bodies. Such changes impose on them many of the same commercial constraints faced by private sector, profit-oriented institutions. It seems to be the case that the share of Gross Domestic Product (GDP) absorbed by governments is unacceptable to many voters and potentially damaging to economies, given, for example, the tendency for organizations to relocate from economies with high employment costs to lower-cost ones. An example of this can be seen in the acquisition by BMW of Rover (now largely sold off as MG Rover and seeking survival as an independent manufacturer of sporting cars). Mercedes is believed to be exploring a similar move and has already established assembly plants outside Europe, while other companies have made further substantial investments in the United Kingdom. The current mantra for many is that low taxation equals greater wealth creation, which in turn implies job creation and a satisfied society.

At the same time, in those relatively wealthy established economies such as the United Kingdom, there is a drift of public service consumers away from the public offerings towards private services. This occurs where the public service is perceived to be failing to meet the needs of its consumers. Examples include the apparent trend in the United Kingdom towards private healthcare, or the preference among some parents for grant-maintained schools. If these public services do not address the problems which their users observe, then they must eventually fall into disrepair, either collapsing altogether through lack of public support or offering a second-rate service to the less well off members of the society which supports them, thereby increasing the unit cost of such provision.
The pursuit of quality in their products and services offers these institutions the opportunity to provide services comparable to those available in the private sector. There is nothing inherently ‘better’ about a privately owned and offered service than a public one. It is merely that the economic imperative for survival has traditionally been greater in the private sector.

As power of consumer changed evolution of manufacturing concept, the cost reduction and productivity improvement is the main issue to achieve quality. Consumer becomes a key factor to drive manufacturer to develop their production process to be able to supply good product at lower cost. Quality becomes an essential for manufacturer in a saturated marketplace. From the perspective of the total economy of a nation, it is more cost effective to correct and solve quality problems internally than to transfer jobs to low cost of labor land or to alternative suppliers.

2) Social Imperative

In parallel with the developments in technology over the past fifty years or so has been massive development in our understanding of humankind. Through the works of management writers and practitioners such as Barnard (executive functions), Mayo, Herzberg and McGregor (human psychology), Beer (organizational cybernetics), Ackoff and Checkland (soft systems), management theorists and scientists have become aware of many alternative ways of designing and managing jobs and organizations. However, clinging to the homespun philosophical and short-term arrogance of ‘If it isn’t broke, don’t fix it’, managers and academics have collectively failed to embrace the many possibilities that these
developments in thinking make available to us. Many academics at universities
and colleges continue to teach classical methods either because these are all they
know or because they reject the ‘new’ ideas. Expansion of higher education
opportunities has led to a situation where not all lecturers can be active researchers
in the disciplines which they teach, and with increasing teaching loads they
struggle to keep up to date with emerging ideas. Those who are active researchers
tend to be engaged in those relatively few institutions which are well established
and well-funded. Practically, for managers it is often easier in the short term to
keep things as they are – particularly when the focus is forced onto the short-term
financial performance measures by higher management and external demands.

An equivalent energy is required from the most senior management in terms
of their commitment to supporting the change. Although it is most frequently
expressed in financial terms, the failure of support very often rests in the very
human desire of managers to work with what they understand, deliver what has
worked in the past and seek to preserve their power and position within the
organization. It is a rare manager who will voluntarily relinquish his or her own
power base for the good of the organization. Observing change program is a little
like watching a corrupt game of musical chairs at the senior level: when the music
stops, everybody is sitting in a different place, but there is the same number of
chairs as at the outset! Consequently, the ways in which run organizations and
manage people are often extremely wasteful of the human capabilities and talent
of the majority.

Most cases about quality system are concerned to manufacturing rather than
service organization as the origins of the quality movement and the philosophies,
tools and techniques reviewed in this below section rest in the manufacturing sector. It was manufacturing that addressed the contemporary issue of quality and it might be argued has, at least at one level, ‘solved’ the specific problem of manufacturing quality. The organizational and economic world has, however, changed. In the 1960s, manufacturing was the dominant economic force in every advanced economy; the service sector was relatively small in relation to it, employing small numbers of highly qualified professionals. This situation has substantially changed. In the ‘post-industrial’ or ‘knowledge’ economy, manufacturing is generally high-volume, highly automated, highly specialized, highly important, as already stated, but represents a relatively small proportion of total economic activity and employs a similarly small proportion of the workforce. The service sector is now the dominant employer and generator of economic growth.

The challenge for the service sector is to develop ways of addressing the ‘quality problem’ which are appropriate to the needs of a sector whose principal asset is people and where the application of the skills and knowledge of those people it employs is the key differentiator between ‘good’ and ‘bad’ service. To date, the signs are not encouraging. Many organizations are simply adapting the manufacturing models of quality to the service sector to no great effect.

Whereas addressing quality in manufacturing rested on the resolution of tangible, visible, persistent issues, quality in services is totally different. Service quality is directly measurable only in relation to the tangible aspects of the transaction – did the teller cash the cheque and pass over the right amount of money? This is measurable, verifiable, auditable. Did the teller handle this
customer in the way that she or he wanted to be handled? Opinions might vary; the
teller may well have used the ‘right’ words, but did he or she employ the ‘right’
manner? The teller may think so, the customer may not – neither can irrefutably
prove their viewpoint.

Service quality is, then, intangible and instantaneous. It perishes with the
completion of the transaction and cannot subsequently be verified or audited. It
depends not on what actually happened but on how the parties to the transaction
feel about what happened. The manufacturing models of quality cannot deal with
the problem of service quality because they focus on.

Service quality is, then, intangible and instantaneous. It perishes with the
completion of the transaction and cannot subsequently be verified or audited. It
depends not on what actually happened but on how the parties to the transaction
feel about what happened (Beckford, 2003).

2.1.4.5 Barriers

Concerning to the achievement of quality, there are various barriers. Focus it
on key barriers, those barriers can be grouped to four main issues which are:

1) Systems and procedures
2) Organization culture
3) Organization design
4) Management perspectives

The below table identify what those barriers are, how they arise and how they
can be identified or recognized.
Table 2-4: Main issues of Barriers to Quality

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Systems and procedures</td>
<td>It is systematic approach. The systems and procedures can become fixed – that is, they become ‘frozen’ into the organization such that pressure for change and adaptation meets with high resistance. The reliance on precedent must be open to question if emergent threats are to be neutralized and advantage taken of opportunities, even if such precedents were at one time reliable. Public and personal safety demand that before an aircraft departs, the cockpit crew work through extremely rigorous pre-flight checklists.</td>
</tr>
<tr>
<td>Culture</td>
<td>The development of a quality culture is a critical area of the achievement of quality. Beliefs and values are also often expressed through the rituals, stories and myths of the organization. These are exchanged through both formal and informal processes and may be seen as guiding new entrants towards particular forms of behaviour and attitudes.</td>
</tr>
<tr>
<td>Organization design</td>
<td>The organization chart may be seen as ‘frozen out of history’, revealing whom to blame when things go wrong but not showing how the organization actually works. A number of barriers to achievement of quality can be found in this area. A structure must be created in which the quality function is independent of the production function, and, as shall be seen, where quality is inherent in the product, the process and, importantly, the culture. This leads to a situation where rather than rejects and errors being ‘inspected out’, quality can be ‘baked into’ the product.</td>
</tr>
<tr>
<td>Management perspectives</td>
<td>In order for an appropriate attitude to be developed to quality, it must be recognized as an issue – that is, the lack of quality in a product or service must be acknowledged. Frequently, companies adopt an ostrich-like attitude to quality, finding it easier to blame poor performance on a host of other reasons. Issues such as pricing and margins are often raised, perhaps leading to a focus on manufacturing performance in terms of productivity. Rarely is quality of product or service considered as a potentially primary issue at the outset. It is essential that quality be treated as a potential part of the problem and be considered as a possible cause of decline.</td>
</tr>
</tbody>
</table>
1) Systems and Procedures

Many organizations, in particular those which are medium to large in size and long established, operate through a more or less bureaucratic process. That is to say, they are organized through a hierarchical system of offices or ‘bureaux’ and maintain that organization through formal reports, documents and record keeping. This is not in itself a bad thing; indeed, it is essential to the delivery of a standardized product – particularly in service organizations or those operating through a distributed delivery network such as retail chains or banks. In the absence of a standardized approach, the customer might easily be confused and the organization itself would spiral out of control.

However, problems can arise with such a system. First, the systems and procedures can become fixed – that is, they become ‘frozen’ into the organization such that pressure for change and adaptation meets with high resistance. In this case, it can be difficult to achieve when any changes is needs for reaching customer expectation. This is a barrier to the achievement of quality. It can be recognized when staff uses expressions such as ‘We’ve always done it like that.’ This approach of using precedent as the basis of current decisions is common in many aspects of life, in particular in the practice of law, which relies heavily on past cases and in civil administration.

In the contemporary organizational climate, the reliance on precedent must be open to question if emergent threats are to be neutralized and advantage taken of opportunities, even if such precedents were at one time reliable. Public and personal safety demand that before an aircraft departs, the cockpit crew work
through extremely rigorous pre-flight checklists. These are designed to evaluate every control and safety system to ensure that the aircraft is fit for the flight and that it will not endanger its crew, its passengers or the public at large. This routine is essential and possible. The aircraft, a machine, has a defined and limited number of systems, each of which has two essential conditions, working or not working. Failure or uncertainty in relation to any control or safety critical system means that the aircraft cannot depart.

2) Organization Culture

To achieve world class quality, the development of quality culture is necessary to launch to organizations.

Clutterbuck and Crainer (Clutterbuck & Crainer, 1990, p. 195) described that “it as a set of behavioural and attitudinal norms, to which most or all members of an organization subscribe, either consciously or unconsciously, and which exert a strong influence on the way people resolve problems, make decisions and carry out their everyday tasks”.

Schein, cited by Clutterbuck and Crainer (1990:196), suggests that culture describes the ‘artefacts, values and underlying assumptions’ that govern behaviour within the organization. Entrenched norms of behaviour are some of the most difficult aspects of an organization to change. Where achievement of quality has previously not been considered important in comparison to achievement of some other target, it requires considerable determination and effort to change the established values. Again, a case history can perhaps explain the point. Many companies are currently abandoning the formal dress codes which grew up in the
post-Second World War period, even enjoying ‘Dress-Down Friday’, when smart casual clothes are expected. Perhaps the most famous example of this is IBM, which adopted a ‘uniform’ style of dress for its male employees: grey suit, white shirt, boring tie. Adoption of this dress standard was seen as acceptance by the individual of his subordination to the organization – of his becoming a ‘company’ man. IBM, along with many other organizations, have recently formally abolished the requirement to wear standard office clothes, but how long will it be before the staff themselves accept the change? Fletcher Challenge, one of New Zealand’s largest companies, formally abandoned its dress code in the 1980s, yet the majority of staff still adhere to it. The then chief executive of Fletcher Challenge Steel, who had been in the post for over six years, adopted a very informal style: short sleeves, sometimes an open-necked shirt. This was remarked upon by others within the organization, but did not succeed in changing their approach. Relative to changing attitudes to achieving quality, changing the dress code can be considered as easy. Contrarily, in some, but by no means all, Japanese companies, all employees – up to and including the chief executive – wear common corporate work wear. They argue that this approach helps to reduce or even eradicate differences between grades and enhances communication, and that the sense of uniformity increases the common bond between employees.

‘Politics’ in the organizational context does not usually refer to overt competition between groups with differing ideologies, although this is possible. Normally, it refers to covert competition between various sub-groups in the organization for power – that is, for positions of influence and authority from which they can manage the organization to reflect their own preferences. These
groupings may have their roots in a particular technical or functional ability, for example marketing, finance or production, or in common backgrounds, such as among groups of people who joined the organization at the same time and whose careers developed together, or who share the same school or university background, the same religion, the same home town or the same club tie. Working as a sub-cultural group within the organization’s total culture, such groups often exercise immense, frequently tacit influence. When such groupings are strong in an organization, they may place their interests before those of the organization itself. This presents another barrier to quality. From the perspective of such sub-groups, achievement of quality must come to be seen as a meta-cultural requirement. The interests of the particular group must become aligned with, or subordinated to, the interest of the organization in pursuing quality.

Achievement of quality, particularly in the *Kaizen* (continuous improvement) sense, depends upon an appropriate level of innovation. Creativity (the origination and implementation of new ideas or innovations) is often suppressed in organizations in pursuit of the status quo. This is revealed through the use of such expressions as ‘Don’t rock the boat’ or ‘Yes, you’re right, but in the interests of your career/overtime/colleagues and so on’. A lack of creativity in the organization is not a sign that the people are not creative, since creativity is inherent in all of us. More frequently it is a sign that their creativity is stifled within the organization and thus has become expressed outside the workplace.

Large or successful organizations often emit a hum of satisfaction. They have an air of complacency and contentment with the way things are which can be almost tangible. Such a situation imposes an immense barrier to quality since there
is no apparent compulsion or impetus for change. Frequently such satisfaction is present in organizations which have a short-term focus – perhaps a lack of foresight. They assume that if everything is all right at present, then everything will surely continue to be all right. Disasters and near-disasters frequently overtake such organizations.

3) Organization Design

When discussing organization design, it is not simply the organization structure – the classic pyramidal hierarchy or, more recently, the very flat organization chart – which is to be considered. It must also incorporate the interactions between units, the information and management systems and their total interrelatedness. The organization chart may be seen as ‘frozen out of history’, revealing whom to blame when things go wrong but not showing how the organization actually works. A number of barriers to achievement of quality can be found in this area.

The first, and most frequent, error is what can be called industrialized conflict. This means that an organization has been designed in such a way that conflict between quality and some other characteristic, such as productivity, is inherent. Such a conflict is commonly found where the quality control or quality assurance manager reports to the production manager. In such a case, the need to meet customer orders will often override the need to achieve quality standards. The quality manager is, in effect, redundant since no value is added to the operation of the organization by his or her presence.
This situation, replicated in many organizations, presents a major barrier to quality. A structure must be created in which the quality function is independent of the production function, and, as shall be seen, where quality is inherent in the product, the process and, importantly, the culture. This leads to a situation where rather than rejects and errors being ‘inspected out’, quality can be ‘baked into’ the product.

The second barrier to quality in this context is the design of the organization’s information systems. This does not simply mean the computerized management or executive information system, but the whole of the information generating and processing activity of the organization, both formal and informal. These activities must generate the right information, in the right format, at the right time and deliver it to the right decision maker(s) if it is to be of any benefit. Most frequently, users of information spend much time analyzing and discussing yesterday’s or last week’s errors while paying no attention to today or to the future. While they may be criticized for this, it is as much a function of the design of the information system as a matter of managerial desire. Hindsight is always twenty-twenty, and a common requirement in organizations is for managers to explain what went wrong, to justify mistakes and failures. Such organizations are attempting to manage their past and not their future, perhaps because they find this easier to do – a little like driving a car by looking in the rear view mirror to see where have been!

The next barrier to quality is one of role understanding and articulation within the organization, particularly among the staff involved in the control and development functions: general management, marketing, human resource
management, accounting, strategic planning, and so on. There is a tendency among many such staff to delve down into the operations of the organization, perhaps taking direct control when errors occur or the unexpected happens. While doing so they may be neglecting their own roles within the organization. This ‘fire-fighting’ or ‘crisis’ style of management is seen in many organizations as heroic, with plaudits and awards handed to those who perform in this way. However, as the apocryphal saying goes, ‘When up to armpits in alligators, it’s easy to forget that the original objective was to drain the swamp.

4) Management Perspectives

‘Management perspectives’ is a key driver as it impact on quality to the whole organization. Direction of management is the top will build the attitude to quality in both short term and long term.

To develop an appropriate attitude to quality, it is a must to recognize people that quality always come together with products and services. As an issue to acknowledge people about effect if lack of quality. It is often found the organizations adopt and ostrich-like attitude to quality as finding that easier to lame poor performance on any reasons. When performance decreased, people usually think about alternative option to work out rather than think to solve root cause and improve their own performance. Such as when sales margin decreased, the first solution is normally change market or change sale team. But in the other hand, organization should try to find root cause which may be an internal root cause as sales support team, training system, motivation program, services, characteristic of products itself, or quality. It will be long-term solution in
marketing. Pricing and margin are always issues for management to discuss rather than quality. Even quality of products and services is a potentially key issue at the outset. It is always essential that high quality be eliminated the cause of poor quality and make a possible cause that effect to market decline. A good attitude to quality needs to be developed and maintain continually throughout the organization. Even the management thinks that their products and services is ‘good enough’ to consumers but it may be ‘not enough’ on the strong competitive market.

A further barrier to achievement of quality is a concentrate on short term results. Usually, people think about motivation by salary and wage packages. Often, salary or wage packages and performance bonuses are related directly to current-period performance. Therefore, currently acceptable performance parameters are used as a reason for not addressing the issue of quality. It is often, though not necessarily, the case that a focus on quality, or any other major change programme, will lead to a short-term decline in performance (particularly of productivity) while staff and management adjust to changes. This is known as the ‘hockey stick’ effect. It may be related to a complete change of emphasis, where achieving quality of output needs to override, perhaps for the first time, the achieving of quantity of output. The change required in management attitudes is fundamental, away from pure productivity to productivity with quality. After all, output which is rejected, either internally or by the customer, cannot really be considered output at all – it is waste.

Thus a major barrier to quality may be built into the reward system of the organization. This barrier can be overcome only by changing that system; it cannot
be overcome through exhortations, evangelism, penal action or statistical measurement. Effective change may mean negotiating fresh terms with a variety of stakeholders in the enterprise, from the workforce and their bonus system to the shareholders or providers of equity and loan capital, whose short-term interests may be affected and will need to be addressed.

Management often focuses on ‘output today at all costs’. No real concern with or interest in quality is evident. In order to boost performance, a focus is maintained exclusively on current output. In the event of an apparent or expected shortfall in output, the rate of production is increased in an attempt to compensate. Such increases are usually doomed to failure unless the system of production itself is addressed.

2.1.4.6 Costs of Quality

The costs of quality mean the direct and invisible costs unnecessarily incurred by any organization which does not have an effective quality system in place. Direct costs in this context means those costs arising as a result of the non-achievement of quality and visibly attributable to that fact. Invisible costs in this context mean those costs arising in the organization as a result of not achieving quality but not visibly attributable to that fact – those where the relationship between non-quality and the cost may not have been discerned by the organization.

Any production system for a product or service which is not designed to achieve the quality standard ‘first time, every time’ will incur rework and rectification costs. These are the costs of putting right errors, performing again a
particular task or disassembling and reassembling or scrapping a product. Traditionally, such costs have been treated by organizations as part of the overall cost of production, and a percentage is included in the price of every item sold for the ones that go wrong. Thus acceptance of error is both industrialized and carefully hidden!

In the era of quality, with lean production systems and just-in-time delivery, these costs need to be uncovered, and attention paid to their reduction and eradication. They must be challenged, not accepted. All processes receive inputs in the form of either materials or information from prior steps in the chain. That is to say, each process is the customer of either an internal or an external supplier. If the inputs received are defective, then costs may be incurred in a number of ways.

First, potentially the most damaging, is that entire consignments have to be returned, holding up or stopping production and leading to unfilled orders and lost revenue. A commonly used answer to this is to increase holding stocks (ensuring that there is sufficient to cover a break in supply). Such an approach simply increases stocking costs, reducing the supply of working capital available to the organization and inhibiting its overall performance; it does nothing to solve the quality problem.

Second, is that costs are incurred in validating the quality of goods or information received before it is processed, inspecting out failures from suppliers and, in effect, absorbing part of the suppliers’ operating cost. Costs can also be incurred by not inspecting goods received, leading to the use of defective parts or
information at the next stage of production. This ensures that the final product will be also fail, leading back to rework and rectification.

Third, is that goods received are inspected and defective parts rectified before use. This again generates cost which should have been incurred by the supplier.

Inspection, as an auditing activity, can never be completely eradicated. Reports generated by inspection provide higher-level management with information necessary for them to control and develop the operation. However, inspection is most commonly used as the quality mechanism, the one procedure which attempts to ensure that products and services are being provided at the agreed level. For such an approach to quality to work, it requires at least a statistically valid sampling approach, and 100 per cent confidence requires 100 per cent inspection – an impossible task in nearly all industries. Although frequently attempted, this is rarely successful and always inordinately expensive. It is often impracticable. The level of inspection can be significantly reduced where quality is inherent in both the product and the process. Effective auditing can be substituted. This has a direct impact on both the cost of the activity and its utility.

Invisible costs are much harder to identify and specify, but are nonetheless incurred when quality has not been addressed properly. They may include:

1) dissatisfied customers, who fulfill future needs with an alternative supplier;
2) customer site service and maintenance costs, often operated as a separate business division. The costs of customer service are very often
driven by the inadequacies and failures of the design and manufacturing process;

3) in-process rework costs (costs incurred by reworking unfinished products within a process).

   (1) high staff turnover leading to increased recruitment and training costs as a result of dissatisfied staff leaving;

   (2) capital costs for equipment and warehousing to provide for rectification of defective parts and storage of additional materials;

   (3) reduced availability of internal working capital, leading to unnecessary reliance on loan/overdraft capital.

Such costs are rarely attributed directly to the quality issue. However, they are in an interdependent relationship with all the other factors of the business and so to a large extent they are related to and driven by quality.

2.1.5 E-Learning for Aviation Industry

2.1.5.1 Aviation History

The modern age of aviation began with the first human lighter-than-air flight on November 21, 1783, in a hot air balloon designed by the Montgolfier brothers. The practicality of balloons was limited because they could only travel downwind. It was immediately recognized that a steerable, or dirigible, balloon was required. Jean-Pierre Blanchard flew the first human-powered dirigible in 1784 and crossed the English Channel in one in 1785.
In 1799 Sir George Cayley set forth the concept of the modern airplane as a fixed-wing flying machine with separate systems for lift, propulsion, and control. Early dirigible developments included machine-powered propulsion, rigid frames, and improved speed and maneuverability.

The Wright brothers were the first to fly in a powered and controlled aircraft in 1903. Previous flights were gliders or free flight, but the Wright brothers combined both, setting the new standard in aviation records. Following this, the widespread adoption of ailerons versus wing warping made aircraft much easier to control, and only a decade later, at the start of World War I, heavier-than-air powered aircraft had become practical for reconnaissance, artillery spotting, and even attacks against ground positions.

Aircraft began to transport people and cargo as designs grew larger and more reliable. In contrast to small non-rigid blimps, giant rigid airships became the first aircraft to transport passengers and cargo over great distances. The best known aircraft of this type were manufactured by the German Zeppelin company.

The most successful Zeppelin was the Graf Zeppelin. It flew over one million miles, including an around-the-world flight in August 1929. However, the dominance of the Zeppelins over the airplanes of that period, which had a range of only a few hundred miles, was diminishing as airplane design advanced. The "Golden Age" of the airships ended on May 6, 1937 when the Hindenburg caught fire, killing 36 people. Although there have been periodic initiatives to revive their use, airships have seen only niche application since that time.
Great progress was made in the field of aviation during the 1920s and 1930s, such as Charles Lindbergh's solo transatlantic flight in 1927, and Charles Kingsford Smith's transpacific flight the following year. One of the most successful designs of this period was the Douglas DC-3, which became the first airliner that was profitable carrying passengers exclusively, starting the modern era of passenger airline service.

By the beginning of World War II, many towns and cities had built airports, and there were numerous qualified pilots available. The war brought many innovations to aviation, including the first jet aircraft and the first liquid-fueled rockets.

After WW II, especially in North America, there was a boom in general aviation, both private and commercial, as thousands of pilots were released from military service and many inexpensive war-surplus transport and training aircraft became available. Manufacturers such as Cessna, Piper, and Beechcraft expanded production to provide light aircraft for the new middle-class market.

By the 1950s, the development of civil jets grew, beginning with the de Havilland Comet, though the first widely-used passenger jet was the Boeing 707, because it was much more economical than other planes at the time. At the same time, turboprop propulsion began to appear for smaller commuter planes, making it possible to serve small-volume routes in a much wider range of weather conditions.

Since the 1960s, composite airframes and quieter, more efficient engines have become available, and Concorde provided supersonic passenger service for more
than two decades, but the most important lasting innovations have taken place in instrumentation and control. The arrival of solid-state electronics and increasingly small and powerful computers, have dramatically changed the cockpits of airliners and, increasingly, of smaller aircraft as well. Pilots can navigate much more accurately and view terrain, obstructions, and other nearby aircraft on a map or through synthetic vision, even at night or in low visibility.

On June 21, 2004, Space Ship One became the first privately funded aircraft to make a spaceflight, opening the possibility of an aviation market capable of leaving the Earth's atmosphere. Meanwhile, flying prototypes of aircraft powered by alternative fuels, such as ethanol, electricity, and even solar energy, are becoming more common and may soon enter the mainstream, at least for light aircraft.

It can classify aircraft to two types which are civil transport aircraft and military aircraft.

Civil transport aircraft, there are five major manufacturers which are:

1) Airbus, based in Europe-wide body and narrow body jet airliners
2) Boeing, based in the United State-wide body and narrow body jet airliners
3) Bombardier, based in Canada- regional airliners
4) Embraer, based in Brazil-regional airliners
5) United Aircraft Corporation, based in Russia

Military aircraft is aircraft that build for military purposes. There are several kinds of military aircraft as ground attack aircraft, fighter aircraft, bombers,
projectile, surveillance, cargo transport and helicopter. Aircraft developed based on purpose of use. Manufacturer supply direct to the government’s arsenal follows their capability requirements. Aircraft are produced based on factors as cost, speed, and performance. The military aircraft needs to compile with the local and international standard requirement.

2.1.5.2 Concept of Quality Management in Aviation Industry

Thai aviation is running hot again despite the effect of social and political disruptions and likely to report one of its best years in 2010 on the back of regional economic improvement and growing tourism. (Center for Asia Pacific Aviation). While the aviation industry is developing in Thailand, they also developed skilled man powers in the country. It’s important for learning to develop competent man power to supply for the industry. The aviation industry provides both manufacturing and services to customers as well as transportation and travel-related services for travelers. The aviation industry provides aviation parts and spare parts, air services, and aviation-related services to customers to ensure reaching of safety and quality standards.

Quality as practiced in the aviation industry is presented primarily through the experience of airline and related aviation companies. Developing an effective quality management concept for the aviation industry shall help to strive for modernization, better public management, increased performance and a stronger stakeholder focus.

Referred to the FAA data research, it stated that aviation industry will be growth. Most of the growth over the forecast period results from increased
commercial aircraft activity (up 1.7 percent annually). Air carrier activity is projected to shrink 2.4 percent in 2010 as carriers continue to cut capacity as the unemployment rate continues to rise. In 2011, air carrier activity is projected to increase 0.7 percent as airline capacity begins to rebound, and grows an average of 2.3 percent per year over the forecast period. Commuter/air taxi operations are forecasted to fall 1.9 percent in 2010 then remain flat in 2011. For the balance of the forecast period, commuter/air taxi operations are projected to increase 1.6 percent per year (FAA, 2010).

Aviation industry in this research means both manufacturing, repair station, and services organizations. Aviation manufacturing organization is the organization that produces parts to aircraft both civil and military aircraft. Repair station is an organization that provides maintenance and repair services to aircraft. Aircraft service is an organization that provides service to aviation business as air transport.

According to the training simulators system in the airline industry, it has been a pioneer in eLearning. Physical flight simulators were used as far back as 1910, increased in use during World War I and accelerated massively during World War II. It was in 1948 that the first truly electronic, instrument base simulator was delivered to a commercial airline, Pan Am (Air carrier in United State). In the 50s cameras were used to travel over models of the terrain surrounding airports but it was in the late 60s that hydraulics and digital computers came into play and throughout the 70s and 80s improvements in movement and visual displays continued towards the extremely sophisticated training simulators can see today. This type of training is completely embedded in military and civil airline training
with the FAA certifying different types of simulators on which pilots can rack-up training hours. Astonishing levels of realism have been achieved with full motion simulators. These mimic real sounds, atmospheric conditions, movement and emergencies.

The bottom line is that these simulators, although expensive, save time, money and lives. Time and time again, pilots and other flight crew have recorded their debt to simulator training when they have had to deal with real emergencies.

“Flight simulators as entertainment”. Flight simulators have also made it into the entertainment industry. Computer games such as Microsoft’s Flight Simulator, Pilotwings, FlightGear and Flight Unlimited proved to be incredibly popular consumer games. One of them, Xplane has even been certified by the FAA for training. There has been speculation that the 9/11 pilots used Microsoft Flight Simulator to practice their missions. Indeed, Microsoft delayed the launch of their newer versions of the simulator, removed the twin towers and released a modification that allowed users to remove them from previous versions of the game.

2.1.5.3 Computerized Training and eLearning in Aviation

It can say that “airlines completely online contribution”. As seen from an interesting spin-off from flight simulators has been virtual airlines. These are fictional airlines that mimic the whole commercial structure of a real airline but allow its pilots to fly virtually on various games and networks. Some are completely fictional; others are based on real airlines (with or without their
blessing). There has even been a case where a real airline was taken to court by one of these fictional airlines for stealing its name and livery.

It is long tradition of computerized training in aviation as flight simulation has made it easier for the airline industry to see the benefits of eLearning but there are other strands of computer based learning that have also been tried. CBT (Computer Based Training) has been tried with varied success across a number of training tasks; technical, load control, cabin crew and so on. This pre-Internet computer delivered training was delivered from the hard discs of computers, laser vision discs and CD-ROMs.

There were some very adventurous programmes in the 80s and 90s, including ‘Creating First Impressions’ from British Airways, a laser vision simulation that presented a range of customers at check-in from the impatient businessman through to nervous family. It used video and high levels of interactivity to simulate tickets check-in, baggage check-in, security and computer systems access. All of this has led most major airlines to adopt, to different degrees, eLearning strategies. Different airlines have taken different approaches to eLearning but almost every major airline has been involved in major eLearning initiatives.

Most airlines have put in place an Learning Management System (LMS) infrastructure that attempts to get online learning to the majority of its employees, even at home. The content is usually a mix of generic, customised and bespoke, and it covers a wide range of subjects.

What follows is a set of case studies showing some different approaches to the implementation of eLearning within different airlines. Some have gone for
company-wide eLearning strategies, linked to e-business strategies, others have been more piecemeal. It is certainly the case that almost every major aspect of training within airlines has now been attempted in one airline or another.

From study found that one organisation that has been close to the development of technology based training in the airline industry has been the Aviation Industry CBT Committee (AICC). The AICC is an international association of technology-based training professionals. It has developed guidelines for aviation industry in the development, delivery, and evaluation of CBT and related training technologies. It has provided a focus to:

1) Assist airplane operators in development of guidelines to promote the economic and effective implementation of computer-based training (CBT).

2) Develop guidelines to enable interoperability.

3) Provide an open forum for the discussion of eLearning (and other) training technologies.

These specifications have shaped global eLearning standards and specifications until now.
2.2 Conceptual Framework

![Conceptual Framework Diagram]

Figure 2-6: Conceptual Framework of an eLearning Model on Quality Management

2.3 Research Hypotheses

In this research, the researcher hypothesizes as follows;

1) A developed eLearning model on quality management system for an aviation industry may result in other learning organizations.

2) The satisfaction level results on a designed eLearning model on quality management system for an aviation industry may be in level of good satisfaction level.
2.4 Summary of the Literature Review

It has been argued that computer-based communication is the most fundamental change in communications technology in the last 150 years. The proliferation of the personal computer combined with the Internet has precipitated far-reaching changes in society. Electronic communications and digital networks are transforming the way work and are reshaping personal communication and entertainment. This transformation has had a tremendous effect on the need and opportunity to learn. What are eLearning’s relative advantages and are they compelling enough to force a re-conceptualization of the teaching and learning transaction? eLearning is not simply another technology or add-on that will be quietly integrated or ultimately rejected. ELearning represents a very different category and mode.

A theoretical foundation for teaching and learning will reflect fundamental values and beliefs about an educational experience. It is by making explicit the theoretical elements of an educational experience that reveal the ideals, which imperfectly strive to realize. When adopting new communication technologies with the potential to fundamentally alter the teaching and learning transaction, being clear as to one’s ideals is particularly important. eLearning has become the protagonist for change in education, but the plot needs a purpose.

The Internet and eLearning currently capture public attention and define today’s popular perceptions of educational technology. Yet, it is self-evident that the history of technology in education extends back to the clay tablets, slate drawing boards. Because of this apparent continuum, some educators like to think
of the technologies as being mere tools that are defined and studied as a subset of the way they are used – the instructional design. Others take an opposite approach, defining the educational transaction by the way it is delivered and mediated by a particular technology. Such attempts at defining education, either totally within or totally outside of the tools used to support, deliver, confine and define it, are each only partial and often misrepresentations of the complex context of any formal education transaction. The educational technology that sustains the transaction is but one critical component of the educational context. Technology directly affects the display, the interaction, the cost, and the design of the educational outcomes. But it remains only one of many other factors that include both manifest and latent, or hidden, characteristics of the educational context. Other notable components include the instructional design, the effect of evaluation and accreditation, the personalities, motivations, the teaching and learning styles of participants, and the hidden curricula embedded in all formal education contexts.

The various technologies used to create the context of eLearning. It can be examined the technologies in terms of progressive generations and conclude that all generations exist simultaneously on the Web today. ELearning takes components of each generation, digitizes them and delivers them using a common interface as the Web browser and common transportation protocol as TCP/IP. Integral to the technologies utilized in eLearning is the capacity to support interaction. The future of Web technology focuses on the capacity of the Net to support not only human, but the interaction of agents serving humans.

ELearning is not an experiment. It has moved into the mainstream of higher education includes in-company training and is beginning to be recognized as a
strategic asset. There is also a growing recognition of the pressing need to address inherent deficiencies in higher education related to over-reliance on lectures and information dissemination in our current system. The important implication is that the real value-add is not simply course content, but the quality of the learning experience. In short, the purpose of innovation must be the enhancement of the quality of the learning environment and learning outcomes. Competition will be on quality.

2.5 Discussion

The aviation industry in Thailand is in a crisis situation to put quality into their employee mind at every time doing a job. They spend a lot of budget for training Thai employee because most of training has to attend in aboard and eLearning is not support them yet. To support the development of an eLearning model on quality management for the aviation industry, it is essential to implement a learning-management system that represents an emerging but transforming technology. It is a must to create a system that builds knowledge organically and is consistent with the values and culture of the organization. Therefore, the focus is on interaction and development within industrial communities of inquiry and practice. The question is, what is the technology and infrastructure required to support communities of practice, which could be grown to support broader organization needs? Building upon communities of practice provides the best chance of changing faculty behaviour in the classroom for the better. Building upon personal and disciplinary interests through communities of practice enhances sustainability of a knowledge-management system.
Concurrent with community building must be exploration and experimentation with platforms and tools that can integrate encoded knowledge while recognizing the dynamic socially situated nature of knowledge creation and application. From an industrial perspective, it is also essential that a pilot project be designed that has every chance for sustainability and success, and that the prototypes developed in the pilot will have application across the industry. It is essential that the investment be made in a learning system that will serve the entire institution through access to a portal. For purposes of prototyping, it is very useful to strategically select communities of practice that are of high priority for, and are congruent with, industry goals.

That is, they must have strategic and be manageable in terms of size and focus. It is important to ensure, before implementation, that the initiative is aligned with industry goals and connected with those who have a direct interest in eLearning and knowledge-management systems.

Elearning is at the centre of a transformation in teaching and learning. In times of fundamental change, successful transformation depends not only on vision, strategic planning, and infrastructure development, but also on strong, proactive leadership.

ELearning is distinguished, in a paradigmatic sense, from what went before. It represents a new ‘learning ecology.’ This is not just another add-on, but a technology that is transforming our educational institutions and how conceptualize and experience teaching and learning. The challenge for educators is to create a purposeful community of inquiry that integrates social, cognitive, and teaching presence in a way that will take full advantage of the unique properties of
eLearning; those interactive properties that take learning well beyond the lecture hall and information assimilation. These properties of eLearning are capable of creating a community of inquiry that is independent of time and space and with the combination of interactive and reflective characteristics that can stimulate and facilitate a level of higher-order learning unimaginable to date.

### 2.6 Recommendations

In the coming together of the information era and the need for continuous learning, organizations must be prepared to focus greater attention on the strategic integration of eLearning and need to rediscover their roots and ideals. This may well require constructing and communicating the vision and strategic plan in the face of considerable resistance. To be successful, leaders must understand the dynamics of change and be prepared to start small but successfully. They have to recognize and incubate eLearning as a disruptive technology, while demonstrating how it can meet the challenges and demands of the knowledge era.

Now at the latest century, some thirty years after the advent of the desktop computer, are just beginning to discover the unique multiplicative properties of eLearning. Those are the properties of eLearning that take it beyond imitating old technology and the additive novelty of computer-based media. The additive model is one that replicates the delivery of lectures over a computer and the Internet enhanced with multimedia analogues to the overheads of a lecture. This in no way recognizes the communicative freedom of eLearning (Anderson & Elloumi, 2004).

Technology generally, and eLearning particularly, is a catalyst for communicative creativity and cognitive freedom. However, eLearning’s flexible,
controllable, and multidimensional interactivity, is grounded in a purposeful and highly engaged personal and public search for meaning and understanding. It is a common purpose that creates a viable community of inquiry and the means for the individual to construct meaningful knowledge. The essential ingredient in a functional community of inquiry is clarity and commitment of purpose. While all the technology may be present with the potential to provide an engaging, relevant, and responsive community, this does not just happen.

In an educational context, it is the instructor who takes the lead in defining goals, setting the limiting conditions of the inquiry, and providing the presence to regulate the interaction and development. However, there is also a great deal of unscripted interplay in an eLearning experience that provides for creativity and serendipity. Functional communities have a common purpose, but must also allow new meanings and understandings that recognize the uncertainty of knowledge to emerge. Each learner has the potential, through the power of their ideas, or through delegation, to provide teaching presence. Paradoxically, in a community of inquiry, the focus is the individual and the individual taking responsibility to construct meaning through the stimulation and dynamic of the group.

Noticed that less reliance on lecture halls and increased integration of on-line discussion groups. There will be more simulations of real-world experiences that allow learners to take control and make sense of their decisions. ELearning must be constructed in such a way that learners can fully immerse themselves in the experience. This is not accomplished with a flow of information in one direction, regardless of whether it is to or from the individual. It is in the interaction that a special world of learning is created and where meaning is collaboratively
constructed. It is where the instructor precipitates, monitors, and guides the
dynamic interactions as they unfold, often unpredictably, resulting in wonderfully
diverse learning outcomes. And it is where learners can repurpose activities to
their own particular ends. This is the ultimate state of taking control and
responsibility for one’s learning. This is the uniqueness of eLearning.

The future is for those who are ready to assume control and responsibility for
their learning; those who have acquired the critical thinking and learning abilities
needed to cope with the ‘too much information age.’ Those who have learned to
manage learning and create knowledge; those who are willing to act upon their
learning and who are ready to shape change and not be the victims of it. The future
of education is eLearning and a vision based on a deep understanding of its
potential. It is simply not possible for educational institutions to ignore the
technologies that are revolutionizing most other segments of society, to ignore
developments that have seen the explosion of communities to serve business
practice and personal interests.

There are many reasons for this continuing growth in enrolment in eLearning
courses. Some trainees seek out eLearning courses for the same reasons that have
always motivated distance education trainees, namely, demand for programming
that is more accessible and that can be time shifted to meet the constraints of busy
adult learners. But an even larger motivator is the growing evidence that certain
kinds of eLearning courses can be delivered much more cost effectively than
classroom-based instruction. Though there are many variables that affect the cost
of both campus and Net-based programming. ELearning industry spokesperson,
Brandon Hall, claimed in a 2001 Fortune magazine article that ‘eLearning saves
thirty to sixty per cent in costs over traditional classroom instruction.’ While he provided few details to support the claim, there is a growing sense that eLearning is economically attractive, if only because it significantly reduces the costs of travel, accommodation, and replacement teachers, which account for more than 50 per cent of the cost of classroom instruction.

In aviation industry, leadership is a crucial commodity. There is a core set of leadership values and characteristics required to fully integrate eLearning into the industrial mainstream. The foundational values and personal virtues essential to leading the transformational process are integrity and openness. Successful leaders treat people with fairness, honesty, openness, and respect. These leadership qualities are the confidence in others to provide the key information required to effect worthwhile change.

These values and virtues may be manifested in numerous ways. First, such a leader must have a vision, and must press for it – a dream that recognizes and addresses the realities of larger societal changes and is consistent with the larger goals of the institution. This vision must then be translated into understandable and achievable strategic goals.

Next, the leader must show commitment to action and a willingness to make difficult decisions. Commitment to action reflects decisiveness. Decisiveness is a corollary to change and ‘requires conviction, courage and action, often in the face of controversy and resistance’. It mediates vision and action. Decisiveness represents the courage to move forward with the expectation that adjustments will need to be made. The future can never be predicted and, consequently, surprises
will inevitably occur along the way. A strong leader will expect these setbacks, accept and learn from them, and move on. While innovation is commonplace, true transformation occurs only rarely. Adopting eLearning in its full potential is a transformative process that requires a long-term commitment to overcome the inevitable resistance. Decisiveness is having the courage to make timely decisions, to seize opportunities, invariably without as much information or consultation as is desirable, or even prudent. A leader will listen and reflect very carefully but not be afraid to take the all-essential first step. Innovation and transformation do not emerge from consensus but, rather, consensus results from vision and decisive leadership. Leadership by consensus is an oxymoron.

2.7 Conclusion

The relevance eLearning approach, principle and concept which are useful for eLearning on Quality Management for Aviation Industry are reviewed and examined. The study shows that aviation industry still need eLearning to develop staff’s competency and there is possibility to apply technology technique such as web application to be the way to adapt eLearning to aviation industry. Therefore, the eLearning is able to address the development of workforce’s knowledge and skilled. Moreover, eLearning is highly potential in empowering to the target group. The subjects related to quality management which significant for aviation industry is International standards on quality management as ISO9001:2008 requirement and implementation technique, AS9100 requirement and approach, and other relevance aviation standard requirement.
Based on learning theory, there are many important learning components that should be applied when designing eLearning materials. The online instruction should be developed to instruct learners when they use the Internet to go through the sequence of instruction, to complete the learning activities, and to achieve learning outcomes and learning objectives. To accommodate the different learning styles, a variety of learning activities should be applied. In addition, strategies should be used to allow learners to perceive and attend to the information so that it can be transferred to working memory. Learners use their sensory systems to register the information in the form of sensations. Learners must receive the information in the form of sensations before perception and processing can occur. However, they must not be overburdened with sensations, which could be counterproductive to the learning process.
CHAPTER III

RESEARCH METHODOLOGY

This chapter presents the methodology employed to statistical test. The research design is outlined followed by methodology and strategy, analysis and evaluation, outcomes, and implementation plan. Then, target population and sampling was described. The research instrument construction is presented along with detailed description of instruments used to measure variables. Data collection, processing and analysis were described at the end of this chapter.

3.1 Research Design

A research design provides the basic direction for carrying out the research. Normally, there are three categories of research design which are;

1) Exploration
2) Description
3) Explanation or casual research

In business research, the explanatory category is also known as causal research. These categories differ in several aspects including research purpose, the way research questions or hypotheses are formulated, and the way data are collected. The following describe more details of each category.

1) Exploratory Research

This type of research is typically used when a researcher examines a new interest or when the subject of study itself is relatively new (Babbie, 2004). The major emphasis of exploratory research is on the discovery of ideas and insights
The research questions or assumptions might be obscure because the phenomenon of interest is considerably new and unfamiliar to the researcher. More information is needed to clarify the concept and scope of the study and to make the researcher understand the problem better. The exploratory research could be conducted through a number of techniques including literature review, interviews, Delphi technique, focus group, case study, project test, experience survey, and ethnography.

2) Descriptive Research

Descriptive research is conducted to describe situations and activity. In general, things are described by providing measures of a situation or activity and decretive research by using descriptive statistics. Descriptive statistics include frequency counts, measures of central tendency or mean or mode, and a measure of variation or standard deviation. Description research is employed to provide an accurate snapshot of some aspect of the persons, activities, situations, and environments. The descriptive research design is normally used when a problem is already well structured. It is typically concerned with determining the frequency with which something occurs or the relationship between two variables (Churchill & Iacobucci, 2005). Initial tentative or speculative hypotheses often exist to guide the project. The relationships studied are not causal in nature, but they still have utility in prediction. It can be conducted through sample surveys, an omnibus panel, a true panel, and longitudinal study.
3) Explanatory or Casual Research

The focus of this research design is concerned with determining cause-and-effect relationships, which are studied via experiments (Churchill & Iacobucci, 2005). Explanatory research aims to develop precise theory that can be used to definitively explain the phenomena, which leads to the generalization from the research. In more detail, it tests whether or not some event causes another. This research design is the most intricate, often takes a long time from planning to execution, and can be very expensive. Explanatory research is typically conducted through laboratory and field experiments.

The following figure describes overview of each research design categories.

![Figure 3-1: Research Design Categories in Overview](image)

- **Exploratory Research**
  - Formulate problem more precisely
  - Develop hypothesis
  - Establish priorities for research
  - Eliminate impractical ideas
  - Clarify concepts

- **Descriptive Research**
  - Describe segment characteristics
  - Estimate proportion of people
  - Make specific prediction

- **Casual Research**
  - Provide evidence regarding casual relationship by means of:
    - Concomitant variation
    - Time order in which variables occur
    - Elimination of other explanations

Figure 3-1: Research Design Categories in Overview
However, there are interactions among those three categories of research design which can be described as the following figure.

![Figure 3-2: Interelation of research Designs]

Exploratory research is usually the initial step of research. Exploratory research assists the researcher to narrow scope and refine the questions which lead to successful further descriptive and casual research projects. However, it is not necessary to start the research with exploratory. It depends on what way the research can be sufficient specific in formulating the problem. Descriptive and casual research also can be the beginning to start the research.

In this study, exploratory research design was applied. The first step of the study reviewed of literature about eLearning concept, web technology, quality management and nature of aviation industry. The objective of the study then refined which was leading to specific research question. The planned research involved exploratory study of organizations related to aviation industry in Thailand. The study highlighted and concentrated on eLearning model on quality management system by using specific target group. Target group was scoped on engineers or officers who work in aviation industry located in Thailand which
could be manufacturing sites or services firms. However, this research could be used to open up an area of inquiry and sensitize researchers to the key issues and problems in that field.

Variables include independent variable which was the prototype model and dependent variable which was the effectiveness of the model.

**Table 3-1: Dependent and independent variable of the study**

<table>
<thead>
<tr>
<th>Independent variable</th>
<th>Dependent variables</th>
<th>Context</th>
</tr>
</thead>
<tbody>
<tr>
<td>eLearning model</td>
<td>○ Attitude</td>
<td>Individual</td>
</tr>
<tr>
<td></td>
<td>○ Knowledge background</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Internet experience</td>
<td></td>
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<tr>
<td></td>
<td>○ Usability</td>
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<tr>
<td></td>
<td>○ Competency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Comprehensiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Compatibility</td>
<td>Technology</td>
</tr>
<tr>
<td></td>
<td>○ Functionality</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Innovativeness</td>
<td></td>
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<td></td>
<td>○ Easiness</td>
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<tr>
<td></td>
<td>○ Networking</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Leading change</td>
<td>Management</td>
</tr>
<tr>
<td></td>
<td>○ Inspiration</td>
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<tr>
<td></td>
<td>○ Encouragement</td>
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<tr>
<td></td>
<td>○ Resource management</td>
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<td></td>
<td>○ Organization behavior</td>
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<td></td>
<td>○ Risk management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Communication</td>
<td>Environment</td>
</tr>
<tr>
<td></td>
<td>○ Pedagogy</td>
<td></td>
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<tr>
<td></td>
<td>○ Infrastructure</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Location</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ Colleagues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>○ External pressure</td>
<td></td>
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</tbody>
</table>
The methodology for this research included observation, survey, interview and literature review. During the observation period, the researcher observed all the activities in the course management system, focused on the learners’ response to the eLearning process, especially the eLearning model application. After the period, the researcher conducted the surveys to explore all participants’ perceptions towards the learning technological change, the learners’ learning motivation, the communication quality, etc. The researcher reviewed relevant literature before and after the development, which guided the eLearning model design and the result analysis.

3.1.1 Methodology and Strategy

The proposed steps to carry the development of an eLearning model on quality management would consist of the following three phases.

**Phase 1:** Investigate the suitability of eLearning model that could deliver such a learning system.

**Phase 2:** Be devoted in the design and development of the diagnostic model that could be used by aviation staff.

**Phase 3:** Carry out tests in sample selected organization and evaluate the model, then the results and improvement to the model were examined.
Theoretically, there are two main research methods which are:

1) Quantitative method
2) Qualitative method

Quantitative method refers to the data collection techniques and data analysis to generate numerical data. On the other hand, qualitative method refers to any data collection techniques and data analysis to generate non-numerical data.
Table 3-2: The difference between quantitative and qualitative methods

<table>
<thead>
<tr>
<th>Quantitative Research</th>
<th>Qualitative Research</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Primary purpose is to determine cause-and-effect relationships</td>
<td>- Primary purpose is to describe on-going processes</td>
</tr>
<tr>
<td>- Precise hypothesis is started before the start of the investigation; theories govern the purpose of the investigation in a deductive manner</td>
<td>- Hypotheses are developed during the investigation; question govern the purpose of the investigation; theories are developed inductively</td>
</tr>
<tr>
<td>- The independent variable is controlled and manipulated</td>
<td>- No specific independent variable; study naturally without interference</td>
</tr>
<tr>
<td>- Objective collection of data is a requirement</td>
<td>- Objective collection of data is not a requirement</td>
</tr>
<tr>
<td>- Research design is specified before the start of the investigation</td>
<td>- Research design is flexible and develops throughout the investigation</td>
</tr>
<tr>
<td>- Data are represented and summarized in numerical form</td>
<td>- Data are represented or summarized in narrative or verbal forms</td>
</tr>
<tr>
<td>- Reliability and validity determined through statistical and logical methods</td>
<td>- Reliability and validity determined through multiple sources of information</td>
</tr>
<tr>
<td>- Samples are selected to represent the population</td>
<td>- Samples are purposefully selected or single cases are studied</td>
</tr>
<tr>
<td>- Study of behaviour is in the natural or artificial setting</td>
<td>- Study of behaviour is in the natural setting</td>
</tr>
<tr>
<td>- Use of design or statistical analyses to control for threats to internal validity</td>
<td>- Use of logical analyses to control or account for alternative explanations</td>
</tr>
<tr>
<td>- Use of inferential statistical procedures to demonstrate external validity</td>
<td>- Use of similar cases to determine the generalizability of findings if at all</td>
</tr>
<tr>
<td>- Rely on research design</td>
<td>- Rely on the researcher to come to terms with procedural bias</td>
</tr>
</tbody>
</table>

Source: (Chapman, 2006)
About qualitative field, it offers the possibility to understand the nature of learning in practice. Usually means a single unit of analysis. This might be a company or other form of organization, but it could also be a more aggregated unit of analysis. Chapman (Chapman, 2006) described that qualitative field studies collect data in the domain “field” and employ “qualitative” methodology. The field research is a useful method in the study at hand because it offers the possibility to understand learning in practice. ELearning methodology is a highly enterprise specific concept. Field studies are also particularly appropriate in areas where theories are not well developed. Selecting the case or set of cases depends at least partly on the methodological perspective. The issues involved in selecting cases in the case of theoretical generalizations should reflect the needs of theory development, rather than statistical analysis.

Research strategy refers to the research procedure used to answer research questions and fulfill the purposes of the research. The research strategy is also called codes of observation (Babbie, 2004) the choice of research strategy is guided by the research question (s) and objectives the extent of existing knowledge the amount of time and other resources available and the researcher’s philosophical foundation (Saunders, Lewis, & Thornhill, 2007). It should be noted that on particular research strategy is inherently superior or inferior to another. Each has its own strengths and weaknesses for any particular research situation.

The survey research strategy is the most popular and common strategy for social research including business disciplines (Saunders, Lewis, & Thornhill, 2007). This strategy can be used to answer ‘who’ ‘what’ ‘where’ and ‘how’
question and is mainly used in descriptive and exploratory research. It is generally associated with the deductive research approach. In addition, a survey strategy allows researchers to collect a large amount of data from a substantial population at a very low cost. The data are typically quantitative and gathered by questionnaire. The data can be easily compared and analyzed using various statistical techniques. Survey is usually the preferred research strategy for researchers who are interested in collecting original data to describe a population. That is too large to observe directly. Careful probability sampling provides a group of respondents whose characteristics may be taken to reflect those of the larger population and carefully constructed standardized questionnaires provide data in the same form from all respondents (Babbie, 2004). In more detail a survey strategy provides researchers more control over the research process and it is possible to generate findings that are representative of the whole population at a lower cost than collecting the data for the whole population (Saunders, Lewis, & Thornhill, 2007).

In this research strategy questionnaire construction and sampling procedures were considered because the better they are constructed the more reliable and valid. The data is obtained the quality of respondents and the questions asked affect the research findings which lead to leads to more accurate research generalizations. Nevertheless, a questionnaire is not the only data collection technique in the survey research strategy. Structured observation and interviews can also be employed in survey research but the questionnaire remains the most commonly used tool in survey. Interviewer comes to the target group place and
starts to interview follow the standard format. Using this methodology helps to improve the response rate.

The study is grounded in exploratory and descriptive research designs even though it is possible to apply other research strategies for exploratory and descriptive research. The survey is a common practical research strategy available to measure awareness concepts and perception from a large population as compared to other research strategies. The findings from the survey are typically replicable and are based on statistical probability. The strength of the survey strategy leads to solid research results consequently. The survey research strategy is selected and applied to carry out this study. Quantitative data are required to examine the satisfaction level of the model and 24 proposed determinant factors in term of independent variables from Individual, Technology, Management, and, Environment. The survey uses Internet questionnaire as a tool for data collection because it is sufficient in short time and also low cost. Before issuing questionnaire, its construction and sampling procedures must be properly arranged.

Nevertheless, qualitative method is applied in this study as well. The reasons why this method is considered is that because the research is aim to focus on understanding from respondent’s point of view. In addition, qualitative approach supports explorative oriented and process oriented rather than result oriented. To design an eLearning model the factors concerned to learners and instructor is considered. For learners; a model is easy to accessibility, good usability, accurate, intuition navigation, consistent model, well links, and in good media. For
instructors; a model is designed to be easy to teach, intuition, customization, consistent information, easy to prepare and update.

Figure 3-4: eLearning System Development Flowchart

3.1.1.1 Research Instrument Tools

This research was designed to deliver knowledge regarding to quality management to target group in aviation industry by developing the appropriate tools which might be management tools, media design, software or technology. The researcher examined how eLearning apply to aviation industry, and, would they take advantage of eLearning. The researcher aimed to study learning theories and communication to computer science, media design and informatics then take into practice. It was envisaged the research included a practical research element to investigate questions raised in the study, primarily targeted at eLearning system users across selected organization.
The research methodology used of online questionnaires based on a standard format such as Likert scale model to obtain mainly qualitative responses from users, complemented by interviews and focus groups. The validated questionnaires were used to assess learners’ perception of the quality of the learning experience using. A survey tool developed was piloted before using in the main phase of the study. Learning needs were vary according to the targeted organization requirement, and this needed to be considered when selecting the sample for detailed study. Demographic factors as age, educational level, gender were collected but not be considered in this research.

3.1.1.2 Simulation of eLearning web

To support the implementation phase, the simulate website for eLearning model was designed. The simulate website was designed for supporting both instructor and learners. It opened for one-way and two-way communication as chat room. Before issuing to learners, the eLearning website was verified all components by IT (Information Technology) expert. The researcher revised until it’s sufficient for eLearning model.
Table 3-3: Learners and administration features

<table>
<thead>
<tr>
<th>Learners Features</th>
<th>Administration Features</th>
</tr>
</thead>
</table>
| Enroll and keep track of their progress in various curricula, courses, and other learning events, Access content using assigned media, Complete assessments prior to starting courses so they can target learning time most effectively, and Access reference materials to supplement courses. | **Learner Management**  
Create and issue access to the system, Manage user registrations and profiles, Manage all resources, including classrooms and instructors, Organize administrators and/or students into groups for reporting and content-assignment purposes, and Integrate appropriate support tools—including exercises, reference materials, labs, tests, and collaboration tools. |
| | **Content Assignment**  
Organize courses and events in catalogs that are intuitive and searchable, Target content to the correct individuals or groups, Designate selected content as “required” learning; Create, edit, distribute, and deliver assessments, Develop certification, Deliver online including course setup, syllabus display, and registration and tracking. |
| | **Tracking and Reporting**  
Track and report on student progress and activity, Track and report professional development progress against a predefined set of training goals, Track and report on compliance training deployment, and Verify whether knowledge has been retained after training. |
| | **Content Development**  
Use templates to speed development, and Integrate proprietary courses seamlessly into the learning environment. |
Communication

- Enable communication between administrators and learners,
- Search and identify learners and deliver targeted course, news, references, and other information to continually engage them, and
- Supplement course by integrating specific learning references into the platform and by allowing learners access to external resources.

3.1.2 Analysis and Evaluative methods

To choose an appropriate computer program, there is a number of computer programs are available on the market that can be used to process and analyse research data. The most widely used programs are:

1) Epi Info: This program is for data entry and analysis, which also has a word processing function for creating questionnaires.
2) dBase Plus: This program is developed by dataBased Intelligence, Inc. (dBI) is a data-management program.
3) SPSS which is developed by SPSS Inc., which is a quite advanced Statistical Package for Social Sciences (SPSS Inc.).

The following issues have been considered for analyze and evaluate data:

1) Sorting data,
2) Verification or performing quality-control checks,
3) Data processing, and
4) Data analysis.
An appropriate system for sorting the data is important for facilitating subsequent processing and analysis. It is useful to number the questionnaires belonging to each of these categories separately right after they are sorted.

The quality control check is usually the data have already been checked in the field to ensure that all the information has been properly collected and recorded. Before and during data processing, however, the information should be checked again for completeness. For computer data analysis that was applied to this study, quality control checks of data was also included a verification of how the data has been transformed into codes and subsequently entered into the computer. In order to ensure quality control check in this research, not only expert advisor from Assumption University but also an experienced scientist from Faculty of Science, Chulalongkorn University consulted to provide advice on the statistical software and statistical analysis.

### 3.1.3 Outcomes

The intended final outcomes of the research were:

1) An evidence for the development of an eLearning model for staff working within aviation industry to study the subject of quality management via eLearning technology.

2) An eLearning model application to examine the ways in which eLearning can be applied to aviation industry.
3.1.4 Implementation Plan

To complete the research, the following steps were considered.

![Figure 3-5: Steps of Research Process]

- **Selection**
  - identify problem
  - analysis
  - justification

- **Literature review**
  - literature and other available information
  - history

- **Formulation of research objective**
  - define objectives
  - hypothesis

- **Research methodology**
  - types of study
  - data collection technique
  - data processing and analysis
  - evaluation pilot study

- **Research administration**
  - monitoring
  - identify potential users
  - material, resources, budget plan

- **Research summary**
  - Prepare report paper
Figure 3-6: Implementation Project Plan

<table>
<thead>
<tr>
<th>ID</th>
<th>Task Name</th>
<th>Duration</th>
<th>Start</th>
<th>Finish</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Prepare a research proposal</td>
<td>15 days</td>
<td>11/2/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>2</td>
<td>Submit the research proposal to advisor</td>
<td>1 day</td>
<td>11/2/14</td>
<td>11/2/14</td>
</tr>
<tr>
<td>3</td>
<td>Modify RP to be completed</td>
<td>5 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>4</td>
<td>Design assessment and survey</td>
<td>3 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>5</td>
<td>Submit the assessment and the survey</td>
<td>3 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>6</td>
<td>Integrate based on results of assessment</td>
<td>1 day</td>
<td>12/5/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>7</td>
<td>Literature review</td>
<td>14 days</td>
<td>11/10/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>8</td>
<td>Determine methodology of research analysis</td>
<td>13 days</td>
<td>11/10/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>9</td>
<td>Determine learning technique application</td>
<td>5 days</td>
<td>11/1/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>10</td>
<td>Design an e-learning model</td>
<td>33 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>11</td>
<td>Evaluate an e-learning model</td>
<td>15 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>12</td>
<td>Implement to the organization</td>
<td>30 days</td>
<td>12/10/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>13</td>
<td>Investigate results</td>
<td>15 days</td>
<td>11/20/14</td>
<td>12/15/14</td>
</tr>
<tr>
<td>14</td>
<td>Prepare a research report</td>
<td>39 days</td>
<td>11/19/14</td>
<td>12/15/14</td>
</tr>
</tbody>
</table>
3.2 Target Population and Sample

3.2.1 Population

The population of this research study was divided to two main groups as follows;

1) External experts

Experts in education and training, aviation, and, quality management were invited to participate.

2) Engineers and officers who work in the aviation company which include both manufacturing site and aviation services firm in Thailand.

3.2.2 Sampling Units

As sampling was an essential process of qualitative method therefore the objective of the study was to generalize qualitative findings from the sample to the population, then the researcher attempted to select samples that were representatives.

Referred to (Onwuegbuzie & Leech, 2007), described that when given a large enough sample, of all sampling schemes, random sampling offers the best chance for a researcher to obtain a representative sample. Thus, if external statistical generalization is the goal, which typically is not the case, then qualitative researchers should consider selecting one of the five random sampling schemes which are simple random sampling, stratified random sampling, cluster random sampling, systematic random sampling, and multi-stage random sampling. Conversely, if the goal is not to generalize to a population but to obtain insights
into a phenomenon, individuals, or events, as is most often the case in studies, then
the qualitative researcher purposefully selects individuals, groups, and settings for
this phase that increases understanding of phenomena. In this situation, the
researcher should select one of the purposive sampling schemes.

Basically of the sample reflects the degree of being representative of the
entire population from which it is drawn and how confidently. It can make a
generalization of the better research findings. Sample size can be determined
either by using a statistical formula to establish a more precise degree of being
representative and to allow researchers to have more confidence when
generalizing the findings. A statistical formula can be used to determine a
minimum sample size needed statistically. The data analyzed should be normally
distributed in order to prevent any possible spurious results. Statisticians have
proven that larger the size of a sample, the more closely its distribution. It is the
normal distribution of the population. This relationship is referred as central limit
theorem. In addition a sample size of at least 30 usually resulted in a sampling
distribution for the mean that is very close to a normal distribution (Saunders,
Lewis, & Thornhill, 2007).

According to Saunders et al (2007) when using a statistical formula three
decisions should be made: the degree of confidence the specified level of precision
or the margin of error that can be accepted and the proportion of responses relating
to some particular attribute. The following formula was used to determine the
minimum sample size needed.
\[ n = p\% \times q\% \times (z/e\%)^2 \]

Where \( n \) = the minimum sample size required

\( P\% \) = the proportion of belonging to the specified category

\( q\% \) = the proportion of not belonging to the specified category

\( z \) = the \( z \) value corresponding to the level of confidence required

\( e\% \) = the margin of error required

In this study \( p\% \) and \( q\% \) refer to the proportion of aviation in Thailand since the exact proportion is unknown the worst case percentage of 50% was selected a confidence level of 95% is widely used and Accepted in the research community. It was also employed here and the \( z \) value was 1.96.

The confidence is risk level which based on ideas encompassed under the Central Limit Theorem. The key idea encompassed in the Central Limit Theorem is that when a population is repeatedly sampled, the average value of the attribute obtained by those samples is equal to the true population value. Furthermore, the values obtained by these samples are distributed normally about the true value, with some samples having a higher value and some obtaining a lower score than the true population value. In a normal distribution, approximately 95% of the sample values are within two standard deviations of the true population value.

Table 3.4 presents the different sample sizes at a confidence level of 95%. It is clearly seen that lowering the margin of error requires a larger sample size. However, lowering the margin of error is increasing the precision of estimation of
estimation of the population. In this study a 5% margin of error was selected because it has been used in most studies in business research.

Table 3-4: Different sample size at a confidence level of 95 %*

<table>
<thead>
<tr>
<th>Size of Population</th>
<th>Sample Size (n) for Precision (e) of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>±5%</td>
</tr>
<tr>
<td>30</td>
<td>28</td>
</tr>
<tr>
<td>50</td>
<td>44</td>
</tr>
<tr>
<td>75</td>
<td>63</td>
</tr>
<tr>
<td>100</td>
<td>81</td>
</tr>
<tr>
<td>125</td>
<td>96</td>
</tr>
<tr>
<td>150</td>
<td>110</td>
</tr>
<tr>
<td>175</td>
<td>122</td>
</tr>
<tr>
<td>200</td>
<td>134</td>
</tr>
<tr>
<td>225</td>
<td>144</td>
</tr>
<tr>
<td>250</td>
<td>154</td>
</tr>
<tr>
<td>275</td>
<td>163</td>
</tr>
<tr>
<td>300</td>
<td>172</td>
</tr>
<tr>
<td>325</td>
<td>180</td>
</tr>
<tr>
<td>350</td>
<td>187</td>
</tr>
<tr>
<td>375</td>
<td>194</td>
</tr>
<tr>
<td>400</td>
<td>201</td>
</tr>
</tbody>
</table>

Source: Adapted from (Boyd, 2004)

Besides the above statistical formula other statistical formulas could be used to calculate the sample size using different components such as standard deviation of the Population in this study the standard deviation was unknown therefore other Statistical formulas which require unavailable information were ignored and the
The statistical formula used above was viewed as applicable and sufficient for this study.

From the calculation the minimum sample size required was 44 in order to be representative of the population. However, it is unlikely that a 100% response rate can be achieved thus the highest possible number of responses should be obtained. The exact response rate is unknown but based upon the author’s research experience a 70% response rate is possible thus this study estimated the response rate to be 70% and recalculated a new sample size needed in order to achieve the minimum sample size. This was computed by the following formula and was called the actual sample size (Saunders, Lewis, & Thornhill, 2007).

\[ n^a = \frac{n \times 100}{re\%} \]

Where: 
- \( n^a \) = the actual sample size
- \( n \) = the minimum sample size
- \( re\% \) = the estimated response rate expressed as a percentage

The minimum sample size needed was 44 and the estimated response rate was 80%. These figures were substituted into the above formula.

\[ n^a = \frac{44 \times 100}{60} \]

The actual sample size was 73. However, to simplify and facilitate the administration of questionnaires the number of 73 was used therefore the final sample size for this study was 80. Table 3.5 summarizes the calculated number of sample size discussed above.
Table 3-5: The sample size needed for this study

<table>
<thead>
<tr>
<th>Min. sample size</th>
<th>Est. response rate</th>
<th>Actual sample size</th>
<th>Adjusted sample size</th>
</tr>
</thead>
<tbody>
<tr>
<td>44</td>
<td>60%</td>
<td>73</td>
<td>80</td>
</tr>
</tbody>
</table>

Sampling techniques are divided into two broad categories probability and non-probability. In probability sampling, each unit or element in the sample frame has an equally known, non-zero chance of being included in the sample, which allows for statistical inferences. This allows researchers to answer research questions and to achieve research purposes that require them to estimate statistically the characteristics of the population inferred from the sample. Probability sampling is often associated with the survey and experimental research strategies. In opposite, non-probability sampling, it is not possible to make valid inferences about the population. All non-probability samples rely on personal judgment somewhere in the process, which implies that such samples derived from non-probability sampling are not necessarily representative of the entire population. Researchers may still be able to generalize form non-probability samples about the population, but not from a statistical standpoint. Non-probability sampling is more generally used in case study research (Churchill & Iacobucci, 2005).
Table 3-6: The probability sampling and non-probability sampling

<table>
<thead>
<tr>
<th>Probability sampling</th>
<th>Non-probability sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Simple random sampling</td>
<td>• Quota</td>
</tr>
<tr>
<td>• Systematic sampling</td>
<td>• Purposive</td>
</tr>
<tr>
<td>• Stratified sampling</td>
<td>• Snowball</td>
</tr>
<tr>
<td>• Cluster sampling</td>
<td>• Self-selection</td>
</tr>
<tr>
<td>• Multi stage sampling</td>
<td>• Convenience</td>
</tr>
</tbody>
</table>

Table 3.6 presents sampling techniques in probability and non-probability. The techniques in probability sampling include simple random sampling, systematic sampling, stratified sampling, cluster sampling and multi-stage sampling for non-probability sampling.

To consider on this study, used a survey research strategy probability sampling is more appropriate than non-probability sampling. Because of probability sampling has several advantages over non-probability sampling. Probability sampling supports an explicit statement as to how much variation is introduced.

Probability sampling was therefore applied in this study the following presents a brief description of each probability sampling technique.

1) Simple Random Sampling

This is an approach in which each population member and all possible sample compositions have an equal probability of being selected the implementation is straightforward. At the simplest level for instance a research could put the name of
each person the population on a tag and place the tags in a large bowl. Then, the contents of the bowl would be mixed thoroughly and the research would draw out the desired number for the sample. Researchers can also employ a random number generator rather than using a bowl. Presently, researchers often use computer software to randomly generate a list of samples if the sampling frame is in a digital format. This technique allows researchers to select sample without bias and be able to justify the claim that sample in representative of the whole population. It works well when the sample size needed is over a few hundred. In particular, if a study population covers a large geographical area and face-to-face contact is not required, random sampling is beneficial because random selection means that selected cases are likely to be dispersed throughout the area (Saunders, Lewis, & Thornhill, 2007).

2) Systematic Sampling

This involves systematically spreading the sample through that list of population members. In general, the efficiency of systematic sampling is improved because it lowers costs while maintaining accuracy relative to sample random sampling. The ordering of the list however determines sampling efficiency. A prerequisite for applying systematic sampling is that the units in the population should be ordered in some systematic way but not is a periodic pattern. Similar to simple random sampling systematic sampling is suitable for studies which cover a large geographical area and in which face-to-face contact is not necessary in data collection. The selected samples are likely to be dispersed throughout the area. Furthermore, systematic sampling works well with simple random sampling is only suitable for smaller sample sizes (Saunders, Lewis, & Thornhill, 2007).
3) Cluster Sampling

This sampling is similar to stratified sampling in which a population is divided into sub-groups prior to sampling. The sub-groups are called clusters rather than strata because all members of selected clusters were included in the sample. The process of selecting clusters is usually a simple random technique which makes cluster sampling a probability sampling technique. Nonetheless, this technique normally results in a sample that represented the total population less accurately than stratified random sampling. Therefore, it has limitations with respect to being representative of the population. Normally, cluster sampling is applied when subgroups that are representative of the whole population can be identified.

4) Stratified Sampling

The stratified sampling is a modification of random sampling in which a population is divided into two or more relevant and significant strata based on one or a number of attributes. A simple random or systematic sampling technique is then used to draw samples from each stratum. Consequently, stratified sampling shares many of the advantages and disadvantages of simple random or systematic sampling (Saunders, Lewis, & Thornhill, 2007). This technique improves the representativeness of a sample at least in terms of the stratification variables. The sampling frame may already be divided into strata and if systematic sampling is employed, selected samples are automatically representative according to the proportion of the strata. This sampling is applied when researchers are willing to use simple random sampling or the sampling frame contains a periodic pattern.
5) Multistage Sampling

The multistage sampling is a combination of the above sampling techniques. It is normally employed to overcome problems associated with a geographically dispersed population when face-to-face contact is required or when it is expensive and time consuming to construct a sampling frame for a large geographical area (Saunders, Lewis, & Thornhill, 2007).

In this study, the simple random sampling was applied. That because presently in aviation industry in Thailand, the population was quite small and the list of the population has not been completely available yet. In addition, the objective of this study was not to compare the clusters but simply to use them to obtain a sample instead.

Therefore, the sampling units were 80 staffs of total target sample size. The sampling units were covered all groups by considering person who have Internet readiness and volunteer to try out and involve to the whole learning processes of the designed model. The reason was that because the gaining of access was probably be quicker when using this concept. The period to take a full model is about 10 hours.

The details of sampling units are as follow.

1) External experts who participated to develop the model were invited ten persons.

2) Engineers and officers who work in the aviation company which include both manufacturing site and aviation services firm in Thailand. 80 staffs from manufacturing sites services firms were chosen randomly as target
population. Before random selection, they were purposive selected from the population who had Internet readiness and volunteer to try out and involve to all eLearning processes of the designed model for 10 hours.

### 3.3 Research Instruments and methodology

#### 3.3.1 Research Instruments

To develop eLearning model on quality management for aviation industry, the following instruments and materials were used.

1) **Data sources.** Most of literature reviewed used for this research is mostly obtained from on-line sources as Net library, Google scholar and Google search engine.

2) **Qualitative approach** but where necessary quantitative data collection was conducted.

3) **Documentary evidence, questionnaires and focus group discussions within learners using standardized online questionnaires, telephone or informal interviews with key informants.**

The instrument as content of question was designed for the responses to fill in easily. The structure of questions allowed for statistical analysis to accomplish the research objectives.
3.3.2 Methodology of Research Instruments Construction

3.3.2.1 Validation

The validity of the instrument was accessed to ensure quality of the research study. To confirm content validity of the instrument, an expert who had knowledge and experience in each field of eLearning, quality management, and aviation industry was asked for consult. For accuracy, the content of question was in English and explained to Thai language while orientation target group.

3.3.2.2 Reliability

The reliability of the instrument was also essential to ensure quality of the research study. The data was collected from five quality consultants from Quality Associates Ltd. And using as the pilot study to ensure the reliability of the designed instrument.

3.3.3 Criteria of Research Instruments Standard

Basically, the criteria of research instrument generate demographic data by age, gender and education level. In addition the criteria concerned to the research objectives were designed by categories below:

1) Demographic data
2) ELearning model evaluation
3) Satisfaction level on the model
### Table 3-7: Criteria of Research Instrument Standard

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Model evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td><strong>Technology</strong></td>
</tr>
<tr>
<td>Age</td>
<td>▪ Innovativeness</td>
</tr>
<tr>
<td>Education level</td>
<td>▪ Functionality</td>
</tr>
<tr>
<td></td>
<td>▪ Accessibility</td>
</tr>
<tr>
<td></td>
<td>▪ Compatibility</td>
</tr>
<tr>
<td></td>
<td>▪ Integration</td>
</tr>
<tr>
<td></td>
<td>▪ Network</td>
</tr>
<tr>
<td></td>
<td><strong>Management</strong></td>
</tr>
<tr>
<td></td>
<td>▪ Inspiration</td>
</tr>
<tr>
<td></td>
<td>▪ Encouragement</td>
</tr>
<tr>
<td></td>
<td>▪ Leading change</td>
</tr>
<tr>
<td></td>
<td>▪ Resource management</td>
</tr>
<tr>
<td></td>
<td>▪ Organization</td>
</tr>
<tr>
<td></td>
<td>▪ Relationship</td>
</tr>
<tr>
<td></td>
<td><strong>Individual</strong></td>
</tr>
<tr>
<td></td>
<td>▪ Attitude</td>
</tr>
<tr>
<td></td>
<td>▪ Usability</td>
</tr>
<tr>
<td></td>
<td>▪ Competency</td>
</tr>
<tr>
<td></td>
<td>▪ Comprehensiveness</td>
</tr>
<tr>
<td></td>
<td>▪ Work experience</td>
</tr>
<tr>
<td></td>
<td>▪ Self-efficiency</td>
</tr>
<tr>
<td></td>
<td><strong>Environment</strong></td>
</tr>
<tr>
<td></td>
<td>▪ Infrastructure</td>
</tr>
<tr>
<td></td>
<td>▪ Pedagogy</td>
</tr>
<tr>
<td></td>
<td>▪ Communication</td>
</tr>
<tr>
<td></td>
<td>▪ Colleagues</td>
</tr>
<tr>
<td></td>
<td>▪ Culture</td>
</tr>
<tr>
<td></td>
<td>▪ External pressure</td>
</tr>
<tr>
<td></td>
<td><strong>Satisfaction</strong></td>
</tr>
<tr>
<td></td>
<td>▪ In general</td>
</tr>
<tr>
<td></td>
<td>▪ Sufficient accessibility</td>
</tr>
<tr>
<td></td>
<td>▪ Simply to use</td>
</tr>
</tbody>
</table>
1.3.4 Questionnaire Development

A questionnaire was developed for data collection the questionnaire’s development took two stages which are:

1) A Need Assessment Survey.

Questions were developed based on relevant literature in accordance with the proposed objectives to find out information about organization needs.

Table 3-8: Description of a needs assessment survey questionnaire

<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization needs</td>
<td>Deployment of policy to implement eLearning</td>
</tr>
<tr>
<td>Organization readiness</td>
<td>Staff’s skills</td>
</tr>
<tr>
<td></td>
<td>Staff’s knowledge</td>
</tr>
<tr>
<td></td>
<td>Staff’s motivation</td>
</tr>
<tr>
<td></td>
<td>Use of Internet</td>
</tr>
<tr>
<td>Change of learning methodology</td>
<td>Vision to change learning methodology</td>
</tr>
</tbody>
</table>

2) A Satisfaction Survey Questionnaire.

It was a questionnaire which conducted to determine the accuracy and consistency of the responses. This included telephone interview as well as Internet questionnaires. The reliability and validity of questions were examined the final version was based on feedback from interviews and statistical analyses the final version of questionnaire is presented in appendix. The description of questionnaire contained demographic data, model evaluation and satisfaction level. This
questionnaire was applied for pre-test and post-test to determine level of satisfaction before and after modified the model.

3.3.4.1 Questionnaire Construction and Measurement

The need assessment survey consisted of four sections as defined on Table 3.9 below addition with a section of other comments. The questions were constructed to collect information about organization needs, organization readiness, and, change of learning methodology to eLearning. The proposed hypotheses several types of conceptual measurement scales were developed. The scales were adapted from Likert scales in literature.

Table 3.9: Construction and measurement of need assessment

<table>
<thead>
<tr>
<th>Construction</th>
<th>Description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Organization needs</td>
<td>Deployment of policy to implement eLearning</td>
<td>5-point Likert-type Interval scale (1=strongly disagree to 5=extremely agree)</td>
</tr>
<tr>
<td>Organization readiness</td>
<td>Staff’s skills</td>
<td>5-point Likert-type Interval scale (1=strongly disagree to 5=extremely agree)</td>
</tr>
<tr>
<td></td>
<td>Staff’s knowledge</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Staff’s motivation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of Internet</td>
<td></td>
</tr>
<tr>
<td>Change of learning methodology</td>
<td>Vision to change learning methodology</td>
<td>5-point Likert-type Interval scale (1=strongly disagree to 5=extremely agree)</td>
</tr>
</tbody>
</table>
Table 3-10: Construction and measurement of satisfaction survey questionnaire

<table>
<thead>
<tr>
<th>Demographic</th>
<th>Gender</th>
<th>Nominal scale</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Age</td>
<td>Ordinal scale</td>
</tr>
<tr>
<td></td>
<td>Education level</td>
<td>Ordinal scale</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Model evaluation</th>
<th>Technology</th>
<th>5-point Likert-type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Innovativeness</td>
<td>Interval scale</td>
</tr>
<tr>
<td></td>
<td>Functionality</td>
<td>(1=very low to 5=very good)</td>
</tr>
<tr>
<td></td>
<td>Accessibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compatibility</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Integration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Network</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Management</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Inspiration</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Encouragement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Leading change</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resource management</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organization</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Relationship</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Individual</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Attitude</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Usability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competency</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Comprehensiveness</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Work experience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-efficiency</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environment</th>
<th>Infrastructure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Pedagogy</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Communication</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Colleagues</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Culture</td>
<td></td>
</tr>
<tr>
<td></td>
<td>External pressure</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Satisfaction</th>
<th>In general</th>
<th>5-point Likert-type</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sufficient accessibility</td>
<td>Interval scale</td>
</tr>
<tr>
<td></td>
<td>Simply to use</td>
<td>(1=very low to 5=very good)</td>
</tr>
</tbody>
</table>
3.3.4.2 *Questionnaire*

The questionnaire was pretested and reviewed by expert. The template, formatting, wording, and meaning of questionnaire were reviewed. Adjustments were made based on the returned questionnaires and feedback from the respondents. All recommendations were taken into consideration together with the analysis of returned questionnaires particularly the format of the questionnaire was deemed to be acceptable for respondents. They indicated that one side page was sufficient content. Questions were clear and understandable they suggested adding more details about the organization readiness in the final version.

3.3.4.3 *Characteristics of respondents*

Characteristics of respondent were determined on the satisfaction survey. This section consisted of question relating to demographic and basic information of the respondents. The questions included gender, age, and, education level. A combination of scales was used in this section to analyze results.
Table 3-11: Post-test conceptual measurement of questions

<table>
<thead>
<tr>
<th>Construction</th>
<th>Item description</th>
<th>Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>Gender</td>
<td>Nominal scale (Male, Female)</td>
</tr>
<tr>
<td>Age</td>
<td>Age</td>
<td>Ordinal scale (&lt;25, 25-35, 36-45, 46-60)</td>
</tr>
<tr>
<td>Education</td>
<td>Education level</td>
<td>Ordinal scale (1=Diploma/Certificate, 2=Bachelor degree, 3=Master degree, 4=Doctoral degree)</td>
</tr>
</tbody>
</table>

3.4 Proposed Data Collection, Data Processing and Analysis

3.4.1 Data Collection

In order to achieve a successful research, the project pursued aim to reach the target group involved on quality management in aviation industry in Thailand. This aim leads to the research design as an online eLearning was placed on the designed website, accessible to all Internet users. There may no need for prior registration if applicable. Version is available in English. This instrument is particularly helpful as a filter, so that respondents are automatically directed to the questions that are relevant to them.
3.4.2 Data Processing

For data processing, qualitative data may be collected through open-ended questions in self-administered questionnaires, in individual interviews or through observations during fieldwork. This research concentrated on the analysis of responses obtained from open-ended questions in interviews or self-administered questionnaires. Commonly solicited data in open-ended questions include opinions of respondents on a certain issue and reasons for a certain behavior.

The data can be analyzed in seven steps:

1. Take a sample of questionnaires and list all answers for a particular question.

2. Establish categories, review questionnaires and start giving codes.

3. List the answers, grouping those with the same code together.

4. Interpret each category of answers and give it a label that covers the content of all answers.

5. Check and adjust the categories and labels.

6. Establish a final list of labels for each category and give a code to each label.

7. Code all data and enter to computer.

Figure 3-7: Seven Steps of Data Analysis Process
A plan for the processing of data may include a decision on whether all or some parts of the data should be processed by hand or computer, dummy tables for the description of the problem, the comparison of groups (if applicable) and/or the establishment of relationships between variables, guided by the objectives of the study, a decision on the sequence in which tables or data from different study populations should be analysed, a decision on how qualitative data should be analysed, an estimate of the work-hours for analysis takes, a decision concerning whether additional staff required for the analysis, and an estimate of the actual cost of the analysis. A dummy table contains all elements of a real table, except that the cells are still empty. In this research dummy tables were prepared to describe the study population in order to show the crucial relationships between variables.

In this study, the lists of question for interview the external experts were developed. This questionnaire was reviewed by advisor before issuing to target group. On questionnaire, it comprises of five main parts which are;

1) Gender
2) Age
3) Education level
4) eLearning model evaluation
5) Satisfaction on eLearning model

Section 1-3 represented detail of respondent. Section 4-5 was five-rating-scale questions. The five-rating-scale questions were designed to elicit the level of acceptance idea. The meanings of scale used in these questions are as follows:
The average score of each component was calculated by the sum of each item and then divided by number of respondents. The accepted items need to reach at least 2.51 score. The item that is lower than 2.51 scores was deleted because it is lower than the average score.

### 3.4.3 Data Analysis

In order to answer the research objectives, standard software as Statistical Packages for Social Sciences (SPSS) was used to examine any cross-tabulation, or associations, which emerges through factor analysis. For the qualitative data, a qualitative data analysis software package was used to assist coding, and derivation of themes, from the interview data.

According to the procedures for the analysis of data collected through qualitative and quantitative techniques are quite different. For quantitative data the starting point in analysis is usually a description of the data for each variable for all the study units included in the sample. Processing of data may take place during data collection or when all data has been collected; description and analysis are usually carried out after the fieldwork has been completed. For qualitative data it is more a matter of describing, summarizing and interpreting the data obtained...
for each study unit. To ensure addressing of questions that remain unanswered, this research analyzed data while collecting the data.

To analyze the differences among multiple variables, one-way analysis of variance was applied to analyze the frequency of distribution. The results of the study in answering the research objectives were used as the basis for further eLearning model development.

Additionally, technique for data analysis considered on the following issues;

1) simply to use,
2) perfection,
3) fitness for purpose,
4) adequate return,
5) value added

3.5 Conclusion

In this study, the researcher highlighted and concentrated on development of an eLearning model on quality management system by using specific target group. Target group was scoped on engineers or officers who work in aviation industry located in Thailand which could be manufacturing sites or aviation services firms. Statistical technique for collecting and analyzing data was applied to evaluate the results and explain distinction in more detail. The statistical software as SPSS was used to measurements in a sample selected from a population of interest.
CHAPTER IV
DATA ANALYSIS RESULTS AND FINDINGS

This chapter presents data analysis results and finding. It begins with an explanation and summary of the data analysis process related to research objectives and research questions. Then, a general description of the data was provided. Data collection includes quantitative and qualitative information gathered during the study, and demographic information for target group. Internal consistency reliability is used to demonstrate the reliability of the measurement constructs. Data analysis results are based on a number of data collections in term of statistical process.

4.1 Data Analysis

4.1.1 Data Collection and Response Rate

For pre-test, a sample of 80 staffs from 22 aviation companies was involved. To source the aviation companies, the researcher sourced from the database of the Department of Industrial Works, Ministry of Industry Thailand which is an official governmental organization in Thailand providing a list of industry in the country. Because the aviation category was not classified so the researcher started to group on each business types. Then, listed company related to aviation industry. The data collection was conducted both by Internet-based survey and by telephone. There were 62 questionnaires received within the requested time. The response rate was 77.5%. The non-response was 18 questionnaires. From investigation, the non-responses were because the staffs had changed address, changed telephone, changed to other job, or, in business trip outside Thailand.
For post-test, there were 80 staffs involved in the eLearning model. 65 questionnaires were returned. 15 responses were excluded due to incomplete questionnaires and disappeared. The response rate is 81.25%.

<table>
<thead>
<tr>
<th>Questionnaire</th>
<th>Sent out</th>
<th>Returned</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Need assessment Survey</td>
<td>22</td>
<td>18</td>
<td>81.82%</td>
</tr>
<tr>
<td>2. Pre-test</td>
<td>80</td>
<td>62</td>
<td>77.50%</td>
</tr>
<tr>
<td>3. Post-test</td>
<td>80</td>
<td>65</td>
<td>81.25%</td>
</tr>
</tbody>
</table>

4.1.2 Analysis of Measurement Model

The measurement model was determined for reliability and discriminant validity. The internal consistency reliability was employed by coefficient scores for Cronbach’s alpha. A Cronbach’s alpha above 0.70 is considered acceptable for most research (Nunnally, 1978).

Cronbach’s alpha is designed as a measure of internal consistency. Alpha typically varies between 0 and 1. The closer the alpha is to 1.00, the greater the internal consistency of items in the instrument being assessed. The formula that determines alpha is as follows (George & Mallery, 2000);

\[ \alpha = \frac{kr}{1+(k-1)r} \]

\( k \) is the number of items in the scale, \( r \) is the average correlation between pairs of items.

Cronbach’s alpha is mainly increase as the inter-correlations among test items increase, and is thus known as an internal consistency estimate of reliability of test
scores. Because inter-correlations among test items are maximized when all items measure the same construct, Cronbach's alpha is widely believed to indirectly indicate the degree to which a set of items measures a single uni-dimensional latent construct. However, the average inter-correlation among test items is affected by skew just like any other average. Thus, whereas the modal inter-correlation among test items are equal zero when the set of items measures several unrelated latent constructs, the average inter-correlation among test items are greater than zero in this case. Indeed, several investigators have shown that alpha can take on quite high values even when the set of items measures several unrelated latent constructs. Normally, alpha is most appropriately used when the items measure different substantive areas within a single construct.

A commonly accepted rule of thumb for describing internal consistency using Cronbach's alpha is as follows:

<table>
<thead>
<tr>
<th>Cronbach's alpha</th>
<th>Internal consistency</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha \geq .9$</td>
<td>Excellent</td>
</tr>
<tr>
<td>$.9 &gt; \alpha \geq .8$</td>
<td>Good</td>
</tr>
<tr>
<td>$.8 &gt; \alpha \geq .7$</td>
<td>Acceptable</td>
</tr>
<tr>
<td>$.7 &gt; \alpha \geq .6$</td>
<td>Questionable</td>
</tr>
<tr>
<td>$.6 &gt; \alpha \geq .5$</td>
<td>Poor</td>
</tr>
<tr>
<td>$.5 &gt; \alpha$</td>
<td>Unacceptable</td>
</tr>
</tbody>
</table>

From results of this research instrument earned 0.771, Cronbach’s alpha was 0.771 which meant the survey was acceptable.
4.1.3 Descriptive Data Analysis

4.1.3.1 Demographic Information

From descriptive data analysis by SPSS, results indicate that the respondents were male 62.2% and female 30.8%. Most respondents age were 36-45 years old (46.2%) and followed by 25-35 years old (40.0%). The respondents education level is mostly bachelor degree (60.0%).

Table 4-3: Demographic information of respondents

<table>
<thead>
<tr>
<th>Description</th>
<th>n = 65</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>45</td>
<td>69.2</td>
</tr>
<tr>
<td>Female</td>
<td>20</td>
<td>30.8</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below 25</td>
<td>6</td>
<td>9.2</td>
</tr>
<tr>
<td>26-35</td>
<td>26</td>
<td>40.0</td>
</tr>
<tr>
<td>36-45</td>
<td>30</td>
<td>46.2</td>
</tr>
<tr>
<td>45-60</td>
<td>3</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Education level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diploma/Certificate</td>
<td>3</td>
<td>4.6</td>
</tr>
<tr>
<td>Bachelor degree</td>
<td>39</td>
<td>60.0</td>
</tr>
<tr>
<td>Master degree</td>
<td>21</td>
<td>32.3</td>
</tr>
<tr>
<td>Doctoral degree</td>
<td>2</td>
<td>3.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>65</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure 4-1: The percentage of respondents classified by age

Figure 4-2: The percentage of respondents classified by education level
4.1.3.2 Organization needs

From data analysis of organization needs survey, it shown that 44.6% had moderate level of skills in using the high technology and 55.4% was in good skills level. Most percentage of knowledge level in high technology was in good level (84.6%). Motivation on high technology within the organization was 46.2% in moderate level and 41.5% was very good level. Most staffs had very good skill in Internet (52.3%).

Table 4-4: Organization needs evaluation (n=65)

<table>
<thead>
<tr>
<th>Description</th>
<th>Moderate (%)</th>
<th>Good (%)</th>
<th>Very good (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level of staff’s skill</td>
<td>44.6</td>
<td>55.4</td>
<td>0</td>
</tr>
<tr>
<td>Level of staff’s knowledge</td>
<td>13.8</td>
<td>98.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Level of motivation</td>
<td>46.2</td>
<td>12.3</td>
<td>41.5</td>
</tr>
<tr>
<td>Use of Internet</td>
<td>24.6</td>
<td>23.1</td>
<td>52.3</td>
</tr>
</tbody>
</table>
Staff's skill

Very good, 0

Good, 55.4

Moderate, 44.6

Figure 4-3: The percentage of level of staff's skill

Staff's knowledge

Very good, 1.5

Moderate, 13.8

Good, 98.5

Figure 4-4: The percentage of staff’s knowledge
4.1.3.3 eLearning Model Evaluation

The table 4.5 shows the mean scores and standard deviations of individual factors. In this study, mean below 3.0 was deleted from the model features. In general, it could be said that the target group was likely to have positive perspective to the designed model.
### Table 4-5: Descriptive statistical analysis results (n=65)

<table>
<thead>
<tr>
<th>Construct</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovativeness</td>
<td>3</td>
<td>5</td>
<td>4.12</td>
<td>.650</td>
<td>.422</td>
</tr>
<tr>
<td>Functionality</td>
<td>3</td>
<td>5</td>
<td>4.25</td>
<td>.613</td>
<td>.376</td>
</tr>
<tr>
<td>Accessibility</td>
<td>3</td>
<td>5</td>
<td>4.29</td>
<td>.605</td>
<td>.366</td>
</tr>
<tr>
<td>Compatibility</td>
<td>3</td>
<td>5</td>
<td>4.46</td>
<td>.588</td>
<td>.346</td>
</tr>
<tr>
<td>Integration</td>
<td>2</td>
<td>4</td>
<td>2.88</td>
<td>.893</td>
<td>.797</td>
</tr>
<tr>
<td>Network</td>
<td>2</td>
<td>4</td>
<td>2.83</td>
<td>.720</td>
<td>.518</td>
</tr>
<tr>
<td>Attitude</td>
<td>3</td>
<td>5</td>
<td>4.14</td>
<td>.609</td>
<td>.371</td>
</tr>
<tr>
<td>Usability</td>
<td>3</td>
<td>5</td>
<td>3.94</td>
<td>.726</td>
<td>.527</td>
</tr>
<tr>
<td>Competency</td>
<td>3</td>
<td>6</td>
<td>4.22</td>
<td>.649</td>
<td>.422</td>
</tr>
<tr>
<td>Comprehensiveness</td>
<td>2</td>
<td>4</td>
<td>3.17</td>
<td>.894</td>
<td>.799</td>
</tr>
<tr>
<td>Experience</td>
<td>3</td>
<td>5</td>
<td>3.43</td>
<td>.529</td>
<td>.280</td>
</tr>
<tr>
<td>Self-efficacy</td>
<td>2</td>
<td>4</td>
<td>2.74</td>
<td>.713</td>
<td>.509</td>
</tr>
<tr>
<td>Inspiration</td>
<td>3</td>
<td>5</td>
<td>4.05</td>
<td>.694</td>
<td>.482</td>
</tr>
<tr>
<td>Encouragement</td>
<td>3</td>
<td>5</td>
<td>4.12</td>
<td>.625</td>
<td>.391</td>
</tr>
<tr>
<td>Leading change</td>
<td>3</td>
<td>5</td>
<td>4.11</td>
<td>.640</td>
<td>.410</td>
</tr>
<tr>
<td>Resource management</td>
<td></td>
<td></td>
<td>2.88</td>
<td>.893</td>
<td>.797</td>
</tr>
<tr>
<td>Organization</td>
<td>1</td>
<td>4</td>
<td>2.35</td>
<td>.717</td>
<td>.513</td>
</tr>
<tr>
<td>Relationship</td>
<td>1</td>
<td>5</td>
<td>2.31</td>
<td>.951</td>
<td>.904</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>3</td>
<td>5</td>
<td>4.09</td>
<td>.701</td>
<td>.491</td>
</tr>
<tr>
<td>Pedagogy</td>
<td>3</td>
<td>5</td>
<td>4.00</td>
<td>.612</td>
<td>.375</td>
</tr>
<tr>
<td>Communication</td>
<td>3</td>
<td>5</td>
<td>4.00</td>
<td>.661</td>
<td>.438</td>
</tr>
<tr>
<td>Colleagues</td>
<td>1</td>
<td>4</td>
<td>2.35</td>
<td>.738</td>
<td>.545</td>
</tr>
<tr>
<td>Culture</td>
<td>1</td>
<td>4</td>
<td>2.15</td>
<td>.775</td>
<td>.601</td>
</tr>
<tr>
<td>External pressure</td>
<td>1</td>
<td>4</td>
<td>2.23</td>
<td>.745</td>
<td>.555</td>
</tr>
</tbody>
</table>

#### 4.1.3.4 Satisfaction on eLearning Model

From data analysis of the satisfaction level on the model, it shown that mean was 4.49 on sufficient accessibility, 4.32 on satisfaction level in general and 4.20 on simply usage.
Table 4-6: Data analysis of the satisfaction level (n=65)

<table>
<thead>
<tr>
<th></th>
<th>Satisfy in general</th>
<th>Accessibility</th>
<th>Simply to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>4.32</td>
<td>4.49</td>
<td>4.20</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>.503</td>
<td>.534</td>
<td>.642</td>
</tr>
<tr>
<td>Variance</td>
<td>.253</td>
<td>.285</td>
<td>.413</td>
</tr>
</tbody>
</table>

4.1.4 Hypotheses Test

Hypotheses of this study are as follows;

Hypothesis 0₁: A developed eLearning model on quality management system for an aviation industry may result in other learning organizations.

To test this hypothesis, the actual practice from consultant representatives showed that a developed eLearning model on quality management system is applicable to other organizations that complied with the international QMS standard as ISO 9001:2008.

Table 4-7: Statistic analysis results of H 0₁

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>63</td>
</tr>
<tr>
<td>Missing</td>
<td>2</td>
</tr>
<tr>
<td>Mean</td>
<td>4.08</td>
</tr>
<tr>
<td>Median</td>
<td>4.00</td>
</tr>
<tr>
<td>Std. Deviation</td>
<td>.747</td>
</tr>
<tr>
<td>Variance</td>
<td>.558</td>
</tr>
</tbody>
</table>
The respondents identified their opinion concerning a developed eLearning model on quality management system for an aviation industry may result in other learning organizations by responding post-test questionnaire. A total of 65 respondents answered the question. A majority (44.4%) of the respondents reported ‘agree’, 31.7% was ‘extremely agree’. Mean was 4.08, and the standard deviation was 0.747.

Hypothesis 0₂: The satisfaction level results on a designed eLearning model on quality management system for an aviation industry may in level of good satisfaction level.
The respondents identified their satisfaction level on a designed eLearning model on quality management system for an aviation industry by responding to questionnaire of post-test assessment survey. The question asked, “How do you satisfy a designed eLearning model on quality management system for an aviation industry?” To test this hypothesis, it considered on the mean value from satisfaction survey. The majority of respondents (44.6%) were in level of ‘agree’. Mean was 3.81, and the standard deviation was 0.753. Therefore, the satisfaction level results on a designed eLearning model on quality management system for an aviation industry represent in level of good satisfaction level.
4.2 Conclusion

In conclusion, this chapter described data analysis and the results. The process started from questionnaire survey, data collection and data analysis. The response data was evaluated. Reliability was applied to demonstrate the reliability of the measurement structure. Research results were relied on a number of statistical techniques as descriptive statistics, reliability analysis, t-test analysis and one way ANOVA. Descriptive statistics presented proportion of factors on demographic information of the respondents.
CHAPTER V

DEVELOPMENT OF AN ELEARNING MODEL

This chapter contains relevant approaches used for developing an eLearning model. The chapter begins with introduction and principles for development. Then, describes model development process, executive summary and implication.

5.1 Executive Summary

E Learning is becoming increasingly prominent in tertiary learning methodology. From the survey, almost respondents agreed on the TIME model as mentioned mean was 4.49 on sufficient accessibility, 4.32 on satisfaction level in general and 4.20 on simply usage. However, some are recommend studying a further research specifically as case study within one specific organization. The overwhelming view of respondents of the survey was that eLearning had an extensively positive pedagogic impact in aviation industry. However, few still need top management to allocate budget on eLearning within the organization before implementation. Indirect evidence, including learner satisfaction surveys was satisfied.

In term of investment on eLearning in aviation industry, it has become clear that eLearning induces infrastructure costs. This implies that many conditions that could lead to a higher cost-efficiency of eLearning compared to conventional learning are not met. In this context, reducing overall teaching costs appears as a crucial component of the equation. However, eLearning methodology is still support aviation to reduce travelling cost for their staff on aboard training.
5.2 Introduction to an eLearning model development

In this digital world the computer-based communication is the significant change in communications technology. The electronic technology, Internet, and digital networks are transforming the life style in daily life, working life and also learning life. This transformation has had a tremendous effect on the need and opportunity to learn. There are various advantages of eLearning to force a re-conceptualization of the teaching and learning transaction. ELearning represents a new concept of studying with very different category and mode. ELearning technology proceeds to become a part of learning at all levels. An eLearning fundamental reflects values and beliefs in education. When adopting new communication technologies with the potential to fundamentally alter the teaching and learning transaction, being explicit as to one’s ideals is particularly important. ELearning has become the protagonist for change in education, but the scheme needs a purpose.

5.3 Principles for Development of the eLearning Model

The model was developed to incorporate principles derived from the literature concerning learning theory as sociocultural approach, learning theories and quality management philosophy.

5.3.1 Sociocultural Approach to ELearning

Studied from sociocultural approach to eLearning and development (Gray, Kling, & Barab, 2004), the researcher found that there was the complex set of personal, social, institutional, cultural, and technological issues that concerned to design and facilitate eLearning.
Table 5-1: Overview of four planes and analytic focus

<table>
<thead>
<tr>
<th>Plane</th>
<th>Analytic Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal</td>
<td>How individuals change through involvement in sociocultural activity</td>
</tr>
<tr>
<td>Interpersonal</td>
<td>How people communicate and coordinate their activities</td>
</tr>
<tr>
<td>Community</td>
<td>Patterns of participation in culturally organized activity</td>
</tr>
<tr>
<td>Technology</td>
<td>Use of information and communication technologies by individuals and groups to construct meaning</td>
</tr>
</tbody>
</table>

*Source: Adapted from (Gray, Kling, & Barab, 2004)*

For personal, there is a relationship between trial and error and levels of satisfaction during the learning process which influences their ability to maintain ongoing levels of motivation. Personal recognize the value of learning from their mistakes and prefer learning situations which are hands-on or are task oriented as opposed to those which depend upon memorization. In the researcher’s point of view, personal is ‘individual’.

Interpersonal is correlation between personal and community. In this research, the study was focus on quality management. Therefore, term that most suit for this plane is ‘management’.

Community is a group of interacting people. The process of learning to adopt the behavior patterns of the community is called socialization. The most fertile
time of socialization is usually the early stages of life, during which individuals develop the skills and knowledge and learn the roles necessary to function within their culture and social environment. In general, community is ‘environment’.

Technology directly affects the display, the interaction, the cost, and the design of the educational outcomes. But it remains only one of many other factors that include both manifest and latent, or hidden, characteristics of the educational context. The various technologies used to create the context of eLearning. It can be examined the technologies in terms of progressive generations and conclude that all generations exist simultaneously on the web. ELeaming takes components of each generation, digitizes them and delivers them using a common interface as the Web browser and common transportation protocol as TCP/IP. Integral to the technologies utilized in eLearning is the capacity to support interaction. The future of web technology focuses on the capacity of the Internet to support not only human, but the interaction of features serving humans. ELeaming is not an experiment. It has moved into the mainstream of higher education includes in-company training and is beginning to be recognized as a valued strategic asset. There is also a growing recognition of the pressing need to address inherent deficiencies in higher education related to over-reliance on lectures and information dissemination in our current system. The important implication is that the real value-add is not simply course content, but the quality of the learning experience. In short, the purpose of innovation must be the enhancement of the quality of the learning environment and learning outcomes. Competition is on quality.
5.3.2 Learning Approach

Among the learning approaches that lead the eLearning. It seems that the cognitive theory of multimedia learning is a great approach for eLearning on web-based education practice. Cognitive theory is developed from the relatively new interdisciplinary field of cognitive science. Cognitive science studies the nature of the mind by drawing from research in a number of areas including psychology, neuroscience, artificial intelligence, computer science, linguistics, philosophy, and biology. The term cognitive refers to perceiving and knowing, and cognitive scientists seek to understand mental processes such as perceiving, thinking, remembering, understanding language, and learning (Sorden, 2005). Refer to Cognitive Theory of Multimedia Learning. Mayer (2003) states that multimedia narration and graphical images produce verbal and visual mental representations, which integrate with prior knowledge to construct new knowledge. According to Mayer (2003), the Cognitive Theory of Multimedia Learning is based on several assumptions. First, working memory includes auditory and visual channels. Second, each subsystem of working memory has a limited capacity. Third, humans are knowledge-constructing processors who produce meaningful learning when they attend to relevant incoming information, organize the information in coherent representational structures, and then integrate it with other existing knowledge. Fourth, connections can be made only if corresponding visual and verbal representations are in working memory at the same time (Mayer & Moreno, 2003).
5.3.3 Quality Approach

Since the international organization for standardization was first issued ISO9001, quality has become the center of attention for industry, business, and education. There are many of quality approaches developed by many experts in quality. The research focused on approaches that most concerned to quality management as Total Quality Management (TQM) philosophy, Deming cycle concept, and Quality Management System for Aviation which is AS9100.

5.3.3.1 Total Quality Management

According to Lewis and Smith (1994), they defined Total Quality Management as a management philosophy that embracing all activities through which the needs of the customer and the community, and the objectives of the organization are satisfied in the most efficient and cost effective way by maximizing the potential of all employees in a continuous drive for improvement. (Lewis & Smith, 1994). It can described that TQM is a strategic management tool for managing a process that satisfies the customer in an effective way. Lewis and Smith (1994) applied the metaphor “House of Quality (HQQ)” to introduce the basic concepts of total quality. The roof covered the HQQ is as the social, technical, and management systems. The four pillars in the HQQ are identified as customer satisfaction, continuous improvement, facts, and respect for individuals. The foundation of the HQQ is the four managerial levels: strategy, process, project, and task management. The four corners of the HQQ are identified as mission, vision, values, and goals.
5.3.3.2 Deming cycle

The Deming cycle or PDCA (Plan-Do-Check-Act) cycle was in fact originally developed by Walter A, Shewhart, a Bell Laboratories scientist who was Deming's friend and mentor, and the developer of Statistical Process Control (SPC) in the late 1920s. So sometimes this is referred to as the "Shewhart Cycle". There are also several recent variations on this concept. W. Edwards Deming in the 1950's proposed that business processes should be analyzed and measured to identify sources of variations that cause products to deviate from customer requirements. He recommended that business processes be placed in a continuous feedback loop so that managers can identify and change the parts of the process that need improvements. Deming created a diagram to illustrate this continuous process, commonly known as the PDCA cycle for Plan, Do, Check (Study), Act:
PLAN: Design or revise business process components to improve results

DO: Implement the plan and measure its performance

CHECK: Assess the measurements and report the results to decision makers

ACT: Decide on changes needed to improve the process

About Quality Management System for aviation, AS9100 is the international standard that applied for development of the model. AS9100 is the quality management system standard for the aerospace industry. The first revision developed by Society of Automotive Engineer and European Association of Aerospace Industries. It is important for aerospace industry which includes aviation, space and defense organization must produce, improve, safe, reliable products that meet or exceed customer and applicable statutory and regulatory requirements. The globalization of the industry and the resulting diversity of regional and national requirements and expectations have complicated this objective. Organizations have a challenge of purchasing products from suppliers
throughout the world and at all levels of the supply chain. Suppliers have the challenge of delivering products to multiple customers having varying quality requirements and expectations.

The current version is version ‘c’ which has been established by the IAQG, with representatives from companies in the Americas, Asia/Pacific and Europe. This standard aims to implement initiatives that make significant improvements in quality and reproducibility throughout the value stream. The current version of AS9100 aligns the standard with ISO 9001:2008 and has extra requirements regarding Regulatory Compliance and the following aerospace-sector specific requirements:

- Configuration management
- Design phase, design verification, validation and testing processes
- Reliability, maintainability and safety
- Approval and review of subcontractor performance
- Verification of purchased product
- Product identification throughout the product’s life cycle
- Product documentation
- Control of production process changes
- Control of production equipment, tools and numerical control machine programmes
- Control of work performed outside the supplier’s facilities
- Special processes
- Inspection and testing procedures
- Methods, resources and recording
- Corrective action
- Internal audit requirements
- First article inspection
- Servicing, including collecting and analysing data, delivery, investigation and reporting and control of technical documentation
- Review of disposition of non-conforming product

**Figure 5-3: A Model of Process-Based Quality Management System**

As a result, ISO 9001:2008 is totally encompassed within AS9100 with these additional requirements applied specifically addressing aerospace safety concerns. AS9100 is the standard which considers the role of the Regulatory Authorities. The standard describes detail that directly traceable to FAA Regulations FAR Part 21 (Certification Procedures for Products and Parts), Part 39 (Airworthiness Directives), Part 45 (Identification and Registration Marking), and Part 145 (Repair Stations). However, AS9100 still remains complementary to contractual and applicable law and regulations. Any organization implementing an AS9100 must ensure the additional requirements of their customers, regulatory agencies as FAA, EASA, and national laws are referenced within the systems documentation.
The following is a family of the AS9100 Standards applicable to different areas of the aerospace industry:

**Table 5-2: A family of the AS9100 Standards**

<table>
<thead>
<tr>
<th>AS 9101</th>
<th>Quality System Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 9102</td>
<td>Aerospace First Article Inspection Requirements</td>
</tr>
<tr>
<td>AS 9104</td>
<td>Standard for overall control of Aerospace Scheme</td>
</tr>
<tr>
<td>AS 9110</td>
<td>QMS Requirements for Maintenance Organizations</td>
</tr>
<tr>
<td>AS 9120</td>
<td>QMS Requirements for Distributors</td>
</tr>
</tbody>
</table>

**5.4 The Model Development Process**

The study is applied based on a PDCA (Plan-Do-Check-Act) cycle, starts from planning (introduction). Feasibility study, Needs assessment and Literature review is a planning step. Then ‘do (revise)’ step by developing eLearning model, a QMS courseware, website and multimedia, and promote the designed eLearning system. Next step is ‘check (present)’ step by evaluate application from ‘do’ step. If it is applicable then go to final step which is ‘act (implementation)’ step by conclusion and deploy the designed model to the eLearning system.
Figure 5-4: A Model Development Process Framework

The flowchart below is simplified a model design and implementation process. This began with introducing the concept, identify prospectus of eLearning opportunities from the results of need assessment, study relevant literature concerned to quality management system, web-technology, learning philosophy. Then, develop the QMS course ware and design web-based multimedia interaction. Evaluate application by the instructor’s representatives before design the model. The model was evaluated satisfaction level by learners to identify the applicable status. If applicable, deploy the model to organization. If not applicable, step back to the revise process. Figure 5.5 presents the major necessary elements of an eLearning model on quality management system.
5.5 Detail of the eLearning Model on QMS for Aviation Industry:

TIME Model

The main purpose of the eLearning model is to provide the integrated necessary elements of web-based training environment for learners. It addresses parameters that management considered as today's needs to deliver simply training courses for employees at anytime and anywhere.

From the study, the eLearning model consists of four principal sections which are Technology, Individual, Management, and, Environment (TIME). The core idea to design an eLearning model is systemic design includes sociocultural approach, learning theories and quality management philosophy. Using the realities as a knowledge base, an eLearning model on QMS for aviation industry was created. Some of the elements of the TIME model include the contention that
instructor and management should assist an individual with actualizing potential within appropriate environment.

![The TIME Model of eLearning model on QMS](image)

**Figure 5-6: The TIME Model of eLearning model on QMS**

The framework is suitable to complete existing eLearning concept focusing four dimensions of eLearning.

1) In term of ‘technology’, it concerned four elements which are innovation, functionality, accessibility, and compatibility. Technology is a tool to deliver eLearning to learner. Technology shall have features that present innovativeness, functionality, accessibility, and compatibility. ELearning is a technological tool for teaching and learning that carries this characteristic. It’s possible to say that ‘ELearning goes beyond technology’.

2) The ‘Individual’ part represents usability, attitude, competency, and, comprehensiveness. Individual is learner’s characteristic. The characteristic that support eLearning are usability, attitude, competency, and, comprehensiveness.
3) Management is supporter to deploy eLearning to the organization. To serve effective eLearning the management shall have inspiration, encouragement, and leading change.

4) Environment structure helps learning atmosphere to make eLearning sufficiently. Infrastructure, Pedagogy, and, Communication are sub-part that requires for supporting environment on eLearning.

5.6 eLearning Implementation: Roles and Responsibilities

In the industrial organization as aviation, multiple responsibilities lead to limited time for eLearning implementation. This actual situation was effect to successful learning strategy. Frustrations are bound to occur regardless of other changes in the learning system if there is a lack of skills, low self-efficacy, and lack of responsibility. Training time has traditionally been reserved and guarded, but the asynchronous nature of eLearning has brought its own challenges. Unless management and learners prioritize study time, eLearning efforts are continue to suffer.

Management shall have policy that ‘Everyone has responsibility for eLearning’. The findings support the social cognitive theory that indicates a triadic interchange between an individual, the management and environment. In addition to continued investment in eLearning, these stakeholders need to turn their attention to fixing the challenges that accompany eLearning. Although changes can be made to the organization, eLearning policy, design, and technologies, individual staffs must take responsibility for their own learning.
Learners can facilitate the implementation of eLearning through a combination of implementation plan, do, check, and, act. Instructor requires access to the appropriate infrastructure. From an instructor’s perspective it is imperative that management allows staff time to learn. Most organizations are based upon an organizational structure that allows the management to delegate responsibility to support change to the department managers. IT manager has expertise and technological skills to develop plans to support instructors and learners to implement eLearning. The opportunity for teachers to set personal development goals with the help of an in-house expert builds relationships, leads to improved program delivery and models for students that computers and the Internet are learning tools.

There are several driving forces behind the growth of eLearning in aviation industry:

- Technological advances
- Demand for life-long learning
- To improve employees’ competency
- Potential to reduce cost of training
- Potential to deliver just-in-time training

Considering these driving forces, it is necessary for an organization to review the existing training system. The TIME model on eLearning can be applied. The supplementation of the model focusing four dimensions of eLearning should be determined.
5.7 Implication

To implement eLearning within the organization successfully, policy for eLearning implementation shall be stated to improve the deployment of eLearning. Since technology, individuals, management, and, environments differ in each organization, so do the approaches to improve eLearning strategy within the organization. Many of measures are essential encompassing, individual, technological, organizational, instructional, and content strategies. Above all elements for eLearning must accompany any programmatic changes. Technological strategies such as computer software training, modeling, accessing and demonstrations are essential. However, even with highly educated and experienced staffs, computer and Internet skills fall short. A lack of skills must be addressed through training before deploying eLearning within the organization. Statement of ‘Everyone has responsibility for eLearning’ still applicable for taking staff at all levels involve in eLearning within the organization.
CHAPTER VI
CONCLUSIONS, DISCUSSION AND
RECOMMENDATIONS

This chapter is the final chapter of this study. The chapter presents the overall conclusion of this study and summarizes of research findings in conclusion. Recommendation is made with regard to future research opportunities.

6.1 Conclusion

6.1.1 Synopsis of the Dissertation

This section reviews the main issues from Chapter I to Chapter V by intend to reflect on action that has been done and achieved in this study.

1) Chapter I-Introduction

The researcher described the importance and necessity of conducting this research by providing the background, explaining the role of quality management system in aviation industry, and describing the purpose of this study. This research aimed to investigate the feasibility, suitability, and use of a designed eLearning model on quality management systems to support online and apply for the aviation industry by addressing many issues related to the selection, implementation, and use of eLearning management systems.

When worked in aviation field, the researcher found that there is a gap to implement training in quality management. Therefore, this study attempts to answers three research questions. First, what represents a useful quality management based model to support eLearning for aviation industry in Thailand?
Second, in what applications of the research can feedback and suggestions from external experts and stakeholders at the research sites be applied to improve development of the designed model about quality management within the context of eLearning? And third, what is the level of satisfaction of stakeholders and eLearning users’ opinions toward the developed eLearning model, before and after implementation?

In major purposes of the study, there are three objectives. The first objective is to create an eLearning model as a quality management learning tool for aviation industry in Thailand. The second objective is to refine the developed eLearning model based upon quantitative data, and qualitative feedback and suggestions provided by stakeholders at the research sites and external experts. The last objective is to measure opinion of stakeholders and eLearning users in Thailand toward the developed eLearning model.

2) Chapter II-Literature Review

The research reviews theoretical foundation, practice, and literature related to eLearning, learning, quality management and aviation industry.

For empirical investigation, a theoretical foundation for teaching and learning is reflected fundamental values and beliefs about an educational experience. It is by making explicit the theoretical elements of an educational experience that reveal the ideals, which imperfectly strive to realize. When adopting new communication technologies with the potential to fundamentally alter the teaching and learning transaction, being clear as to one’s ideals is particularly important. eLearning has become the protagonist for change in education.
The conceptual framework was developed to guide the researcher doing this study step by step. The framework was divided to three stages which are preparation, implementation and evaluation stage.

The hypotheses are that a developed eLearning model on quality management system for an aviation industry may result in other learning organizations, and, the satisfaction level results on a designed eLearning model on quality management system for an aviation industry may in level of good satisfaction level. The hypotheses are formulated regarding to context of this study.

3) Chapter III-Research Methodology

The research design and methodology were described in this Chapter. The researcher presents research philosophies and techniques and selected the most applicable method to adapt for this study. The study is designed within exploratory and descriptive research. The researcher begins with literature review about eLearning, learning, quality management and aviation industry to make understanding on the actual phenomena. Then, focus to narrow the research methodology and strategy. The assessment survey was employed as a research strategy and measuring tools. The data was collected using Internet-based tools together with get together meeting. The questionnaire pretest was conducted to determine the accuracy and consistency of the respondents. In addition, the reliability and validity of questions were examined. Target group was scoped on engineers or officers who work in aviation industry located in Thailand which could be manufacturing sites or aviation services firms. Statistical technique as SPSS for collecting and analyzing data was applied.

4) Chapter IV-Data Analysis Results and Findings
The process of analyzing data was described in this chapter. The descriptive statistic was applied in presenting demographic information of the respondents. Reliability was applied to demonstrate the reliability of the measurement structure. Cronbach’s alpha was designed as a measure of internal consistency. Research results were relied on a number of statistical techniques as descriptive statistics, reliability analysis, t-test analysis and one way ANOVA. From analysis results, the satisfaction level on a designed eLearning model on quality management system for an aviation industry represent in level of good satisfaction level.

5) Chapter V-Development of an eLearning model

The process applied for development of an eLearning model was described in this chapter. An eLearning fundamental reflects values and beliefs in education. When adopting new communication technologies with the potential to fundamentally alter the teaching and learning transaction, being explicit as to one’s ideals is particularly important. ELearning has become the protagonist for change in education, but the scheme needs a purpose. An eLearning model called “TIME model” was developed. “T” is from ‘technology’, it concerned four elements which are innovation, functionality, accessibility, and compatibility. “I” represents ‘Individual’ part represents usability, attitude, competency, and, comprehensiveness. “M” means management which contains inspiration, encouragement, leading change, and, resource management. And, “E” means environment, it contains infrastructure, pedagogy, and, communication.
6.1.2 Instructor and Learners Perspective

An instructor participant in the study was able to access resources. She had previously not considered and therefore, successfully implemented eLearning at the in-company training by using an Internet site as one component in the QMS course. The instructor expressed proper levels of satisfaction with the quality of materials for the study. The feedback enabled the researcher to demonstrate that when learners are provided with course material with simply to be used and easy to access. The researcher’s objective to measure instructor’s opinions about the effectiveness of the eLearning was achieved through responses to specific data gathering items on the assessment questionnaires.

Referred to the purposes of the study, learners’ demographic did not play significant roles in influencing learners’ responses to the research instrument items. From data analysis of the satisfaction level on the model, it shown that mean was 4.49 on sufficient accessibility, 4.32 on satisfaction level in general and 4.20 on simply usage. 44.6% had moderate level of skills in using the high technology and 55.4% was in good skills level. Most percentage of knowledge level in high technology was in good level (84.6%). Motivation on high technology within the organization was 46.2% in moderate level and 41.5% was very good level. Most staffs had very good skill in Internet (52.3%).
6.2 Discussion

The study shows that aerospace industry still need eLearning to develop staff’s competency and there is possibility to apply technology application such as web technology to be the way to adapt eLearning to aerospace industry. Therefore, the eLearning is able to address the development of workforce’s knowledge and skilled. Moreover, eLearning is highly potential in empowering to the learners. The relevance eLearning approach, principle and concept which are useful for eLearning on Quality Management Systems for Aerospace Industry are reviewed and examined. The subjects related to quality management which significant for aerospace industry is International standards on Quality Management Systems as AS9100 approach. From adaptation of innovation enabled by recent information technology and quality management fundamental for aerospace industry to become TIME model, there are four components under continual improvement cycle which are Technology, Individual, Management and Environment. The online instruction was developed to instruct learners when they use the Internet to go through the sequence of instruction, to complete the learning activities, and to achieve learning outcomes and learning objectives. In addition, strategies were used to allow learners to perceive and attend to the information so that it can be transferred to working memory. The future of aerospace training is eLearning to serve business practice and personal interests.
6.2 Recommendation

In the interaction of the eLearning model and the need for continuous learning, organizations must be prepared to focus greater attention on the strategic integration of eLearning and need to rediscover their roots and ideals. This may well require constructing and communicating the vision and strategic plan in the face of considerable resistance. To be successful, management must understand the dynamics of change and be prepared to implement successfully. In an educational structure, it is the instructor who takes the lead in defining goals, setting the limiting conditions of the inquiry, and providing the presence to regulate the interaction and development. However, there is also a great deal of unscripted interplay in an eLearning experience that provides for creativity and serendipity. Functional communities have a common purpose, but must also allow new meanings and understandings that recognize the uncertainty of knowledge to emerge. Each learner has the potential, through the power of their ideas, or through delegation, to provide teaching presence. Paradoxically, in an aerospace community of inquiry, the focus is the individual and the individual taking responsibility to construct meaning through the stimulation and dynamic of the aerospace industry.

In aerospace industry, leadership is a crucial commodity. There is a core set of leadership values and characteristics required to fully integrate eLearning into the industrial mainstream. The foundational values and personal virtues essential to leading the transformational process are integrity and openness. These values and virtues may be manifested in numerous ways. First, such a leader must have a vision, and must press for it-a dream that recognizes and addresses the realities of
larger societal changes and is consistent with the larger goals of the institution. This vision must then be translated into understandable and achievable strategic goals.

The quality management is an interesting management concept available for aviation industry. Because aviation industry is basically quality and service oriented organization, the quality management concept that focuses on customer needs, continual improvement, empowerment, and so on is the vital fundamental to apply.

The researcher finds that this study served as a foundation for further studies and makes the following recommendation:

1) In order to assist in research, the organization’s management should have policy to support staff on eLearning.

2) Quality management should not be ignored because it supports customer needs and roots in customer perception at the end.

3) The eLearning model for other business type as automotive, food industry, oil and gas, academic institute, and, service organizations shall be considered.

4) The population in aviation industry should be classified officially by the government organization who responsible for managing the industrial organizations in Thailand.

5) Adapt the eLearning on Safety Management for aviation industry should be studied in the future.
BIBLIOGRAPHY


APPENDICES
APPENDIX I

Overview of the study

DEVELOPMENT OF AN ELEARNING MODEL ON QUALITY MANAGEMENT
FOR AVIATION INDUSTRY

While the aviation industry is developing in Thailand, they also developed skilled man powers in the country. It’s important for learning to develop competent man power to supply for the aviation industry. The aviation industry provides both manufacturing and services to customers as well as transportation and travel-related services for travelers. The aviation industry provides aviation parts and spare parts, air services, and aviation-related services to customers to ensure reaching of safety and quality standards.

Research Objectives:

1) To develop an eLearning model as a quality management learning tool for aviation industry in Thailand.
2) To refine the model based upon quantitative data, and qualitative feedback and suggestions provided by stakeholder at the research sites and external experts.
3) To measure opinion of stakeholders and eLearning users in Thailand toward the model.

I am hoping to conduct the field work between May and October 2011. The research study can be conducted within a timeframe at your convenient.

Thank you and regards,
Darawan Sumranwong
APPENDIX II

Project introduction leaflet

An eLearning model on Quality Management for Aviation Industry

Information technology is transforming education around the world. As globalization encompasses local economies like never before, the development of a skilled workforce becomes a genuinely international concern. Important capital as human workforce is becoming the key source of economic value. Education and training are becoming lifelong endeavors for workforce. This is because business success depends more and more on high-quality employee performance, which in turn requires high-quality training. Company executives are beginning to understand that enhancing employee skills is key to creating a sustainable competitive advantage. In the quest to remain competitive in today’s labor market, companies are exploiting advances in technology to train employees more quickly, more effectively, and at a minimum expense.

e-learning (or distance learning) is a solution to assist the company to reduce cost of training.
## APPENDIX III

### List of experts

<table>
<thead>
<tr>
<th>No</th>
<th>Name-Surname</th>
<th>Organization</th>
<th>Field of expert</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dr. Poonsri Vate-U-Lan</td>
<td>Assumption university</td>
<td>eLearning expertise</td>
</tr>
<tr>
<td>2</td>
<td>Mr. Marquis Monfette</td>
<td>Transport Canada</td>
<td>Aviation</td>
</tr>
<tr>
<td>3</td>
<td>Mr. Lyle Alexander</td>
<td>Federal Aviation Administration (FAA), USA.</td>
<td>Aviation</td>
</tr>
<tr>
<td>4</td>
<td>Mr. Andreas Siedel</td>
<td>Industry org., China</td>
<td>Industrial management</td>
</tr>
<tr>
<td>5</td>
<td>Mr. Mark Crownford</td>
<td>Sequa group</td>
<td>Statistical and Aviation</td>
</tr>
<tr>
<td>6</td>
<td>Mr. Santoso Adi K.</td>
<td>Garuda Indonesia</td>
<td>Aviation</td>
</tr>
<tr>
<td>7</td>
<td>Mr. Robert Taylor</td>
<td>Chromalloy company</td>
<td>Quality management</td>
</tr>
<tr>
<td>8</td>
<td>Mr. John Daly</td>
<td>Chromalloy company</td>
<td>Aviation</td>
</tr>
<tr>
<td>9</td>
<td>Dr. Amarawan Intasiri</td>
<td>Chulalongkorn university</td>
<td>Statistical technique</td>
</tr>
<tr>
<td>10</td>
<td>Mr. Eric Sivel</td>
<td>EASA, Hoofddorp</td>
<td>Aviation</td>
</tr>
</tbody>
</table>
APPENDIX IV

Invitation letter

May 6, 2011

Dr. Amarawan Intasiri
Department of Chemistry
Faculty of Science
Chulalongkorn University
Pathumwan, Bangkok

Dear Dr. Amarawan,

This letter is written on behalf of my student in the PhD eLearning Methodology Program, Ms. Darawan Sumranwong. She is a PhD candidate of the College of Internet Distance Education, Assumption University of Thailand. She has passed the research proposal defense and ready to conduct her research. You are considered an expert in the field of her research with the topic “Development of an eLearning Model on Quality Management for Aviation Industry.” Therefore, we would like to ask for your cooperation to review the questionnaires and the eLearning model when completed.

Your cooperation will be highly appreciated. Please kindly find more information concerning her research in the enclosed attachment.

Sincerely,

Prof. Dr. Srisakdi Charmonnan
Chief Executive Officer
College of Internet Distance Education
Vice President for Information Technology
Assumption University of Thailand
APPENDIX V

The eLearning Survey Questionnaire format
APPENDIX VI

The eLearning satisfaction survey
APPENDIX VII

Web page architect
APPENDIX VIII

Paper publication website

a) 2001 International Conference on Information Management, Innovation Management and Industrial Engineering
b) 2011 International Conference on e-education, Entertainment and e-Management.
APPENDIX IX

Peer Review Results

1) ICIII 2011

Dear Author(s):

On behalf of the 2011 International Conference on Information Management, Innovation Management and Industrial Engineering (ICIII 2011), we're pleased to inform you that your paper:

"An Analyzing Model Application for AS/RS standards"

has been accepted.

The 2011 International Conference on Information Management, Innovation Management and Industrial Engineering (ICIII 2011) provides two days focus on the science and technology that are the basis for the management. The theme of the plenary session is "Information Management, Innovation Management and Industrial Engineering" featuring invited speakers who will further explore the topic that is so significant for management. Concurrent sessions and a poster session will cover a wide range of topics and issues, including both contributed papers and special sessions developed on specific themes, all with a central focus of management. Topics will range from the management theories such as experimental management, the management practice methods and technology, such as logistics and supply chain management, knowledge management, information management, innovation management, future technology in Service of Regional Industry, etc.

As all submitted papers in these proceedings have been peer-reviewed by at least two (2) reviewers, drawn from the chairs of committees depending on the subject matter of the paper. Reviewing and initial selection were undertaken electronically. A joint committee meeting was held to resolve the final paper selection and draft programme for the conference.

The proceedings of ICIII 2011 will be published by IEEE Computer Society Conference Publishing Service (CPS), and will be included in the IEEE Computer Society online store, available for indexing through IEEE INSPEC, EI (Compendex), Thomson ISI, and other indexing services; archive the proceedings to IEEE Xplore and the IEEE Computer Society (CSDL) digital libraries. Please download the registration form from the conference website:

http://www.iciii-conf.org/reg.htm  and last template http://www.iciii-conf.org/instruct.doc or http://www.iciii-conf.org/Latez.zip to prepare your final camera-ready papers and through ICIII 2011 AuthorKit:

Reviewer Comments:

--------------------------------------------
Reviewer #1: Clear Accept
Reject
Probable Reject
Marginal Tend to Reject
Marginal Tend to Accept
Clear Accept
Must Accept
--------------------------------------------

PLEASE USE THIS SCALE:
False = 1
Rather False = 2
Questionable = 3
Rather True = 4
True = 5
- The author is familiar with the existing state of knowledge. — 4
- This is a new and original contribution. — 3
- The title is appropriate. — 4
- The abstract and keywords are adequate. — 4
- The paper is logically and technically correct. — 3
- The interpretations and conclusions are sound and justified by the results. — 5
- The paper is well presented and organized. — 4
- The writing style/English is clear and understandable. — 5
- The references are adequate. — 4
- The paper length appropriate. — 5
Reviewer #2: Clear Accept

Accept
Probable Reject
Marginal Tend to Reject
Marginal Tend to Accept
Clear Accept
Must Accept

PLEASE USE THIS SCALE:
False = 1
Rather false = 2
Questionable = 3
Rather true = 4
True = 5

- The author is familiar with the existing state of knowledge. = 5
- This is a new and original contribution. = 5
- The title is appropriate. = 4
- The abstract and keywords are adequate. = 3
- The paper is logically and technically correct. = 4
- The interpretations and conclusions are clear and justified by the results. = 5
- The paper is well presented and organized. = 3
- The writing style/English is clear and understandable. = 4
- The references are adequate. = 4
- The paper length appropriate. = 4

Accepted
NOTIFICATION OF ACCEPTANCE

Dear Author(s):

On behalf of 2011 International Conference on e-Education, Entertainment and e-Management (ICEEE 2011), we are pleased to inform you that your paper:

169 Adaptation DMAIC to develop an eLearning Model for Aerospace Repair Station
Derawan Sunsanwang

has been accepted.

We have included the reviewers’ comments at the end. Please fill in the registration form (download from http://www.iceee-conf.org/registration.html) and IEEE copyright form (download from conference website: http://www.iceee-conf.org/IEEECopyright.doc), finish the final camera-ready papers (word format only, please download from http://www.iceee-conf.org/instruct.doc), finish the payment, and send them to:
iceeeconf@gmail.com.

Please finish this work before October 25, 2011.

Congratulations!

Program Committee of ICEEE 2011
Reviewer Comments:

Reviewer #1
Reject
Probable Reject
Marginally Tend to Reject
X Marginally Tend to Accept
Clearly Accept
Must Accept

PLEASE USE THIS SCALE:
False = 1
Rather false = 2
Questionable = 3
Rather true = 4
True = 5

- The author is familiar with the existing state of knowledge:
  1  2  3  X  4  5

- This is a new and original contribution:
  1  2  3  X  4  5

- The title is appropriate:
  1  2  3  4X  5

- The abstract and keywords are adequate:
  1  2  3X  4  5

- The paper is logically and technically correct:
  1  2  3X  4  5

- The interpretations and conclusions are sound and justified by the results:
  1  2  3  4X  5

- The paper is well-presented and organized:
  1  2  3  4X  5

- The writing style is clear and understandable:
  1  2  3X  4  5

- The references are adequate:
  1  2  3X  4  5
Reviewer #3:

- Reject
- Probable Reject
- Marginal Tend to Reject
- Marginal Tend to Accept
- X Clear Accept
- Must Accept

PLEASE USE THIS SCALE:

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Questionable = 3
Rather true = 4
True = 5

- The author is familiar with the existing state of knowledge.
  1 2 3 4X 5

- This is a new and original contribution.
  1 2 3 4X 5

- The title is appropriate.
  1 2 3 4X 5

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  1 2 3 4X 5

- The paper is logically and technically correct.
  1 2 3 4X 5

- The interpretations and conclusions are sound and justified by the results.
  1 2 3 4X 5

- The paper is well presented and organized.
  1 2 3 4X 5

- The writing style/English is clear and understandable.
  1 2 3 4X 5

- The references are adequate.
  1 2 3 4X 5
**APPENDIX X**

Results generated by SPSS

Pre-test

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Post-test

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Organization needs assessment survey

### Frequency Table

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Reliability analysis

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BIO-DATA

Name of Researcher: Ms. Darawan Sumranwong

Educational Background:

1) Primary School: The Demonstration School of Khon Kaen University.
2) Secondary School: Kaennakorn Wittayalai School
3) Bachelor’s Degree and Major:
   B.Sc. (Physics), Khon Kaen University (KKU.).
4) Others (Certificate, Master’s Degree)
   a. Master’s Degree of Business Administration (MBA.) in Management, Ramkhamheang University
   b. Certification of Science and Technology, Sydney University
   c. Scholar of the Development of Science and Technology Talent Project (DPST.)

Employment:

Present Position: Managing Director, Quality Associates Ltd.

Past Experiences

a) Triumph Aviation Services Asia Co.,Ltd.- Quality manager
b) Chromalloy (Thailand) Co.,Ltd. – Quality manager
c) Philips Electronics (Thailand) Co.,Ltd. – Quality engineer
d) Philips Semiconductors (Thailand) Co.,Ltd.- Quality supervisor
e) Thai Airways International (Public) Co.,Ltd. - Programmer

Special Talents and Interests

Computer Programming, Internet, Web development, Aviation system, Quality, Environmental and Safety management, Training development, and Innovation technology.