An Evaluation of the ELNP e-Learning Quality Assurance Program: Perspectives of Gap Analysis and Innovation Diffusion

Ming-Puu Chen
Graduate Institute of Information and Computer Education, National Taiwan Normal University, Taiwan // mpchen@ntnu.edu.tw

ABSTRACT

The purpose of this study was to examine the appropriateness of a nationwide quality assurance framework for e-learning from participants' perspectives. Two types of quality evaluation programs were examined in this study, including the e-Learning Service Certification program (eLSC) and the e-Learning Courseware Certification program (eLCC). Gap analysis and the innovation attributes were employed to examine participants' perception gaps and attitudes toward the quality framework. The analysis showed that the quality framework obtained adequate validity and reliability. Gap analysis revealed that both the eLSC and eLCC participants perceived the quality of their e-learning overly. The attitude analysis revealed that a) for eLSC, the positive and increased observability was inferred to enhance participants' adoption of eLSC, b) for eLCC, the positive attributes of observability, relative advantage and compatibility were inferred to facilitate and sustain the adoption of eLCC, c) the decreased attributes of trialability/complexity and relative advantage of eLCC indicated the necessity for further improvement. Crystal-clear descriptions and examples of quality criteria are suggested to make the quality assurance framework more amiable and easy of access to e-learning developers and organizations.

Keywords

E-learning, Quality assurance, Courseware, Innovation diffusion

Introduction

Recently, the application of the Internet and multi-media technologies to learning has transformed the traditional face-to-face learning into a new and pervasive variety of "anytime, anywhere, and anyone" e-learning. In responding to the rapid growth of e-learning applications, the "National Science and Technology Program for e-Learning (ELNP)" was launched by the National Science Council of the Executive Yuan of Taiwan with the aims to a) upgrade Taiwan's overall competitiveness in the era of knowledge economy, b) stimulate the development of e-learning related industries, and c) bring about new waves of academic research (ELNP, 2003). From the viewpoint of national development, bridging the digital divide between rural and urban areas has become an important issue. It is, therefore, imperative for the government to take the lead in building an affordable, effective, and easy-to-access e-learning environment, especially for the remote regions of the country. From the human resource viewpoint, the needs to train a great number of internationally competitive talents in order to compensate for the country's limited space and natural resources are essential in maintaining its competitiveness in the knowledge economy era. Whereas quality e-learning can provide efficient and effective digital learning experiences to the learners through web-based interactive methods, it also plays an important role in improving the quality of human resources. ELNP is an integral part of the nation's efforts to lead Taiwan into the knowledge economy century under the Council for Economic Planning and Development's national development plan, "Challenge 2008". The 5-year e-learning development program aimed to build a quality e-learning environment for education and training, with the hope to enhance the quality of human resources, bridge the digital divide between rural and urban regions in the country, and bring about better competitiveness of the nation in the knowledge economy century (ELNP, 2006). Therefore, it is hoped that ELNP will serve as a driving force for e-learning related industries and improve the nation's overall competitiveness.

Although e-learning has become a popular way of learning, the educational effectiveness of the Internet-based e-learning is not automatically ensured through the use of the Internet and multi-media technologies. To enhance e-learning quality, the e-Learning Quality Assurance program (eLQA) was implemented in 2005 to recognize and promote quality e-learning under the ELNP national program. It was hoped that eLQA would serve as an accreditation service for e-learning providers targeting for corporate e-training as well as school e-learning. Therefore, eLQA provided the e-learning providers with opportunities to access to a reliable quality assurance system and to endorse the educational quality of e-learning for the certified e-learning organizations and courseware. It was also hoped that eLQA would provide trustful quality information for prospective e-learners, so they could

identify and select quality e-learning courseware and services confidently and truly benefited from e-learning. Although the introduction of eLQA has aroused general awareness toward quality issues in e-learning related industries in Taiwan, how participants perceive eLQA was not studied in a systematic manner yet. Therefore, the present study aimed to a) examine the validity and reliability of eLQA, b) explore the quality gaps between participants' self-evaluation and the eLQA quality evaluation, and c) evaluate participants' attitudes toward eLQA in terms of innovation attributes. Therefore, based on the results of the present study, eLQA can be further improved and become more amiable and easy of access to e-learning developers and organizations.

Quality Measures for E-learning

To ensure quality learning, many organizations and individuals have developed various quality measures for evaluating Internet-based e-learning (McLoughlin & Visser, 2003). Based on the perspective of needs assessment, Chapnick (2000) proposed an e-learning needs assessment model containing eight components to assess an e-learning organization's "Psychological readiness", "Sociological readiness", "Environmental readiness", "Human resource readiness", "Financial readiness", "Technology readiness", "Equipment readiness", and "Content readiness". Focusing on an organization's e-learning sustainability, Rosenberg (2000) suggested seven components to evaluate how an organization can sustain e-learning, including "Business readiness", "Changing nature of learning and e-learning", "Value of instruction and information", "Role of change management", "Reinvention of training organizations to support e-learning efforts", "E-learning industry", and "Personal commitment". Similarly, Borotis and Poulymenakou (2004) defined seven components for evaluating e-learning readiness, including "Business readiness", "Technology readiness", "Content readiness", "Training process readiness", "Culture readiness", "Human resources readiness", and "Financial readiness". Moreover, targeting on the e-learning readiness of a country, the Economist Intelligent Unit (2003) estimated the ability of 60 countries to produce, use and expand Internet-based learning in government, industry, education, and society by means of nearly 150 qualitative and quantitative criteria organized into four categories, including "Connectivity", "Capability", "Content" and "Culture" called 4Cs. "Connectivity" represents the quality and extent of the Internet infrastructure. "Capability" is the ability to deliver, consume, and develop e-learning in training and education. "Content" is the quality and pervasiveness of e-learning materials. Finally, "Culture" relates to behaviors, beliefs and institutions that support e-learning development.

In higher education e-learning, the Institute for Higher Education Policy (IHEP, 2000) identified 24 benchmarks considered essential to ensure excellence in Internet-based learning. These benchmarks were distilled from the most popular strategies employed by colleges and universities, and they were divided into seven categories of quality measures, including "Institutional support", "Course development", "Teaching and learning", "Course structure", "Student support", "Faculty support", and "Evaluation and assessment". Likewise, the Western Cooperative for Educational Telecommunications (WCET) developed a set of "Principles of good practice for electronically offered higher education degree and certificate programs" that encompassed three categories of quality measures, "Curriculum and instruction", "Institutional context and commitment", and "Evaluation and assessment" (WCET, 2001, 2005). These principles have become a generally accepted basis for evaluating distance learning programs in the United States.

With respect to the quality of e-learning courses, the WebCT Exemplary Course Project annually recognizes e-learning courses that model best practices in "Course design", "Interaction and collaboration", "Assessment and evaluation", "Meaningful technology use", and "Learner support" (WebCT, 2006). Likewise, the annual Brandon Hall Research Excellence in Learning Awards employs seven criteria, including "Navigation", "Content presentation", "Use of media", "Interactivity", "Engagement", "Support of objectives", and "Overall", to recognize the best custom-designed, self-paced, online, interactive courses related to workplace learning (Brandon Hall Research, 2008). Furthermore, the Quality Criteria for E-Learning Courseware designed by the American Society for Training and Development (ASTD) aims to raise the quality of asynchronous web-based and multimedia e-learning courseware in institutions and corporations through the E-learning Courseware Certification program (ECC). The 19 quality criteria of ASTD ECC evaluate the quality of "compatibility", "interface", "production quality", and "instructional design" of an e-learning courseware (ASTD, 2002, 2006).

The growing emphases on quality measures among organizations and researchers revealed the importance of quality assurance for e-learning. In spite of the variety of quality measure for e-learning, there is consensus emerging as to

what constitutes quality e-learning (IHEP, 2000; McLoughlin & Visser, 2003). The readily available quality instruments can provide systematic frameworks for assessing e-learning, the results of the analysis, however, may vary from one instrument to another as well as from one organization to another due to the specific perspective and purpose of a quality instrument (Borotis & Poulymenakou, 2004). Therefore, an e-learning quality instrument should be utilized and interpreted thoughtfully and in accordance with what it aims to do. With the intention to support the continuous improvement of quality e-learning, the eLQA quality framework was developed to promote and encourage the e-learning industries to pursuit high quality e-learning. Although the construct validity of the eLQA quality framework can be sustained by experts' review and referred to the commonly recognized indexes, how the eLQA quality framework works is not assessed in a systematic manner, especially from the participants' perspective.

The Innovation Diffusion Perspective

The quality of e-learning is a perception which needs to be verified. Although the eLQA quality framework aimed to serve as a common platform for ensuring quality e-learning in the country, the precondition of achieving the goal is based on e-learning developers' positive attitudes toward and precise perception of the quality framework. Therefore, how e-learning participants perceive a specific quality measure needs to be studied in order to determine a best way to ensure its sustainable harvest. For improving program evaluation, Hubbard and Sandmann (2007) suggested that the empirically tested innovation diffusion theories, developed in the 1950s, have provided a popular framework to study and explain how new ideas are spread and adopted in a community. Based on Rogers' perspective of innovation diffusion (Rogers, 2003), adopters of an e-learning quality measure will go through a five-stage innovation-decision process from knowledge of the quality measure to forming attitudes toward the quality measure, to a decision to adopt or reject the quality measure, to implementation and use of the new idea, and to confirmation of the adoption decision. Therefore, adopters' attitudes toward the eLQA quality framework play an important role in making and sustaining the adoption decision, and inevitably affect the diffusion of the quality measure to the potential adopters.

Rogers (1995) concluded from studies and suggested that the way adopters perceive the attributes of an innovation is critical and these perceptions account for 49-86% of the variance in adoption or rejection of an innovation. The five most important attributes impacting on the rate of adoption of an innovation include the relative advantage, compatibility, complexity, observability, and trialability of an innovation (Rogers, 1995, 2003). *Relative advantage* is the degree to which an innovation is perceived as better than the one it supersedes, such as increased performance, reduced cost, or other superior factors. *Compatibility* involves the degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters. *Complexity* involves the degree to which an innovation is perceived as difficult to understand and use from the potential adopters' perspective. *Trialability* deals with the degree to which an innovation may be experimented with on a smaller and limited scale. Finally, *Observability* relates to the degree to which the results of the implemented practice are visible to others. Some practices are more observable than others and therefore might be adopted more quickly by potential users.

Moreover, Rogers (2003) noted that each construct of the innovation attributes is somewhat interrelated. Some studies (Goldman, 1994; Sonnenwald, Maglaughlin, & Whitton, 2001) concluded that the five constructs of the innovation attributes were distinct. Pankratz, Hallfors and Cho (2002), however, found three distinct constructs of advantage/compatibility, complexity and observability with the relative advantage and compatibility clustered into one construct. Due to the interrelated characteristics among these five constructs, Scheirer (1990) even suggested that the five perceived attributes can be combined into one index of favorability toward the adoption of an innovation. Therefore, based on the verified validity and appropriate accountability in explaining adopters' perceptions of the adoption of an innovation, the constructs of innovation attributes are suitable for evaluating the diffusion of the quality framework. In the present study, the constructs of innovation attributes were employed to examine participants' attitudes toward the adoption of eLQA.

The eLQA Quality Assurance Programs

In 2004, the eLQA quality framework was developed by means of a series of focus groups and with referring to previous quality measures, such as WCET (2001) and ASTD (2002), to ensure the construct validity of the quality

framework. The first version of eLQA quality assurance programs was implemented in January 2005 by the e-Learning Quality Certification Center (eLQC) which was setup and dedicated to providing quality certification services to e-learning organizations and e-learning courseware developers, especially for those stationed in the e-Learning Network Science Park. eLQA consists of two quality certification programs, the e-Learning Service Certification program (eLSC) and the e-Learning Courseware Certification program (eLCC), targeting on e-learning service providers and e-learning courseware developers, respectively. The eLSC quality evaluation assesses the quality of an e-learning organization from aspects of personnel, course and system. Meanwhile, the eLCC quality evaluation examines the educational quality of an e-learning courseware from aspects of content, navigation, instructional design and instructional media.

The e-Learning Service Certification Program

The development of eLSC quality evaluation was based on the perspective of "quality is how the organization goes about achieving its objectives" and aimed to recognize and promote quality e-learning services through a systematic process to evaluate the quality of e-learning service. As shown in Table 1, the quality framework of eLSC consists of three aspects of quality measures, including personnel, course and system. These three aspects can be further divided into eight quality criteria, including (1) learner support, (2) faculty support, (3) curriculum development, (4) instructional design, (5) instructional process, (6) organizational support, (7) technology and (8) assessment and evaluation. Each eLSC quality criterion comprises three to five sub-criteria with a total of 27 sub-criteria for the quality framework of eLSC.

Considering the various types and scopes of e-learning applications among organizations and companies, three types of e-learning service certification, including the Unit Certification, the Course Certification and the Curriculum Certification, were provided by ELNP to best fit the target audiences' needs. The Unit Certification was targeted on organizations that do not need to apply whole scale instructional design in the development of e-learning courses. In general, this type of organizations is usually limited by time constraint and develops and delivers short and efficient e-learning just enough for internal needs. For instance, companies employed rapid e-learning methods to develop e-training to employees. In contrast, the Course Certification was targeted on organizations that always applied whole scale instructional design in the development of e-learning courses. This type of organizations develops and delivers self-directed e-learning to employees or to the clients. Finally, the Curriculum Certification was targeted on organizations that not only apply whole scale instructional design in the development of e-learning courses, but also provide certificates or degree programs to the clients, such as, training organizations and universities. As shown in Table 1, to apply for the Unit Certification, eLSC quality criteria 1, 2, 7 and 8 are required in the quality evaluation; to apply for the Course Certification, quality criteria 1, 2, 4, 5, 7 and 8 are needed; and to apply for the Curriculum Certification all the eight criteria are required.

Table 1. eLSC consists of three quality aspects, eight quality criteria and twenty-seven sub-criteria

Quality aspects	Criteria	Number of sub-criteria	Unit Certification	Course Certification	Curriculum Certification
Personnel	1. Learner support	3	■ Required	■ Required	■ Required
	2. Faculty support	4	■ Required	■ Required	■ Required
Course	3. Curriculum development	3	□ Optional	□ Optional	■ Required
	4. Instructional design	3	□ Optional	■ Required	■ Required
	5. Instructional process	3	□ Optional	■ Required	■ Required
System	6. Organizational support	3	□ Optional	□ Optional	■ Required
	7. Technology	5	■ Required	■ Required	■ Required
	8. Assessment and evaluation	3	■ Required	■ Required	■ Required

The eLSC quality evaluation employed a checklist-type evaluation form to identify the quality level of an organization's e-learning service. For each sub-criterion, a 4-level checklist with quality levels of "AAA", "AA", "A", and "Fail" was used to identify the quality level of an organization from a specific perspective. Due to the principle of "all criteria are required" of the eLSC quality evaluation, an applicant must pass all of the required sub-criteria of a specific type of certification, such as the Unit Certification, the Course Certification, or the Curriculum Certification, in order to be certified with the quality level of the lowest passing-level of this specific type of

certificate. For instance, if an applicant passes all of the six required sub-criteria of the Course Certification with a lowest quality level of "Level A", then the applicant will be certified with a "Level A" Course Certificate. Furthermore, if a Course Certification applicant failed in any sub-criteria of the required "Course aspect" criteria, it will be downgraded to the Unit Certification evaluation. In other words, the lower type of eLSC certification will be applied automatically to the unqualified cases when it is applicable.

The e-Learning Courseware Certification Program

The eLCC quality evaluation aimed to recognize and promote well-designed, self-paced e-learning courseware through examining the educational quality of e-learning courseware from four quality aspects, including content, navigation, instructional design and instructional media. The quality aspects, quality criteria and objectives of quality aspects are shown in Table 2. The eLCC quality evaluation is composed of 15 quality criteria, which can be further identified as 8 required criteria and 7 optional criteria. eLCC scores each quality criterion with different weights to differentiate the importance of required and optional quality criteria. Each eLCC quality criterion comprises three checklist items to differentiate e-learning courseware into four levels of quality from a specific perspective. Accordingly, 0, 3, 5, or 7 points will be given for each required quality criterion and 0, 2, 4, or 6 points will be given for each optional criterion. Exceptionally, due to the importance of learning strategies, the optional quality criterion of "learning strategies" is scored as a required criterion. Therefore, as shown in Table 2, the eLCC quality evaluation measures the quality of e-learning courseware on a 100-point scale.

The eLCC quality evaluation employed individual reviews and a joint meeting of reviewers to determine the quality level of an e-learning courseware. The eLCC reviewers consisted of content experts, e-learning experts, academicians, instructional design practitioners and e-learning leaders in the industry. Individual reviews were conducted first by two randomly selected reviewers and one domain expert, and then a joint meeting of reviewers was held to make decisions of passing or failing for each eLCC quality criterion based on the results of individual evaluation. The qualified e-learning courseware was certified with "Level A", "Level AA", or "Level AAA" for passing all of the eight required criteria and with a total score equal to or higher than 60, 75 and 90 points, respectively.

Table 2. The quality aspects, criteria, objectives and scoring method of eLCC

Quality aspects and criteria	Objectives of quality aspects	Points given by quality level	Sub-total
1. Content	E-learning courseware should provide the learners with accurate, appropriately organized and clearly expressed content in order to facilitate the expected learning.		21
1-1 Accuracy (r)		0, 3, 5, 7	
1-2 Organization (r)		0, 3, 5, 7	
1-3 Clarity (r)		0, 3, 5, 7	
2. Navigation	E-learning courseware should provide the learners with navigational tools to facilitate smooth progress and effective management of learning.		19
2-1 Learning navigation (r)		0, 3, 5, 7	
2-2 Operational helper (o)		0, 2, 4, 6	
2-3 Learner tracking (o)		0, 2, 4, 6	
3. Instructional design	E-learning courseware should provide the learners with well-designed learning activities, such as clearly expressed objectives and content, appropriate learning methods and strategies, and adequately designed practice, feedback and assessment, to facilitate learning interaction, comprehension and elaboration.		41
3-1 Goal and objectives (r)		0, 3, 5, 7	
3-2 Instructional presentation (r)		0, 3, 5, 7	
3-3 Practice and feedback (r)		0, 3, 5, 7	
3-4 Assessment (o)		0, 2, 4, 6	
3-5 Learning strategies (o)		0, 3, 5, 7	
3-6 Congruence (r)		0, 3, 5, 7	
4. Instructional media	E-learning courseware should employ well-designed instructional media to facilitate learning comprehension and sustain motivation for learning.		19
4-1 Media design (r)		0, 3, 5, 7	
4-2 Interface (o)		0, 2, 4, 6	
4-3 Media elements (o)		0, 2, 4, 6	

Note. (r): required criterion, (o): optional criterion, Total points = 100

Gap Analysis of eLSC and eLCC

The implementation of eLQA aimed to enhance the quality of e-learning service and courseware in the country. How precise the participants perceive the educational meanings of the quality criteria would affect the educational quality implemented in their e-learning products. Therefore, it was important to investigate whether any perception gap exists in the participants. Accordingly subsequent plans could be adopted to enhance learning quality and bridge the gap. Hence, the purpose of gap analysis was to examine whether gaps existed between the eLQA quality evaluation and applicants' self-evaluation. For considering the congruence of quality evaluation standards, applicants evaluated by the 1.04 version of eLQA between July 2005 and June 2006 were selected and analyzed in the gap analysis. Totally, 28 eLSC cases and 37 eLCC cases were examined in the present study. Self-evaluation was a requirement for submitting an application for eLSC or eLCC certification. The eLQA quality evaluation was the final results of applicants' eLSC or eLCC quality evaluation. Paired *t*-tests were employed to examine the difference between applicants' self-evaluation and the eLQA evaluation, therefore possible gaps of participants' perception of e-learning quality can be verified against the eLQA quality standards. The level of significance was set to .05 for all paired *t*-tests.

Gap Analysis of eLSC Cases

Twenty-eight eLSC cases were examined to identify gaps between the eLSC quality evaluation and applicants' self-evaluation at the criterion level. For conducting quantitative analysis, the quality levels of "AAA", "AA", "A" and "Fail" of the eLSC cases were transformed to the values of 3, 2, 1 and 0, respectively, at the criterion level. Most of these applicants participated in the "Project of Promoting and Developing E-Learning Industries" conducted by the Industry Bureau of the Ministry of Economic Affairs, and being certified by eLQA was a requirement for winning awards. As shown in Table 3, there were 13 cases (46.4%) applied for the eLSC Course Certification and only 4 cases (14.2%) certified with the eLSC Course Certificate. Only 15 cases (53.6%) applied for the eLSC Unit Certification, but there were 24 case (85.7%) receiving the eLSC Unit Certificate. In other words, 9 cases applying for the Course Certification were downgraded and only certified with the Unit Certificate.

Table 3. Summary of eLSC application and certification results

	Type of certificate	Number of cases	Percentage
Application	Unit Certification	15	53.6%
	Course Certification	13	46.4%
	Total	28	100.0%
Certificate	Unit Certificate, Level A	6	21.4%
	Unit Certificate, Level AA	18	64.3%
	Course Certificate, Level A	2	7.1%
	Course Certificate, Level AA	2	7.1%
	Total	28	100.0%

The construct validity of the eLSC quality evaluation was ensured by means of a series of focus groups during the development of the eLSC quality framework. The content validity coefficient of eLSC was .85 as measured by Kendall's coefficient of concordance. The internal consistency reliability of the eLSC quality evaluation was .88 as measured by Cronbach's α. The validity and reliability coefficients indicated that the eLSC quality evaluation obtained appropriate reliability and content validity.

Paired *t*-tests were conducted to examine whether gaps existed at the criterion level between the eLSC evaluation and applicants' self-evaluation. The group means and summary of paired *t*-tests (self-evaluation – eLSC evaluation) by quality criterion are shown in Table 4. All of the means of the quality levels evaluated by the applicants were significantly higher than the eLSC evaluation. The results revealed that the eLSC applicants overestimated the quality levels of their e-learning in all quality criteria. The concordance of the lowest self-evaluation score (mean=1.87) and the lowest eLSC evaluation score (mean=1.00) assessed in the "Instructional design" criterion indicated that the eLSC participants were aware of the shortage in providing appropriate instructional design for supporting successful e-learning. The reasons why suitable efforts were not implemented in the instruction design for

the eLSC cases could not be answered in the present study. Moreover, whether the perception gaps were caused by participants' misconceptions toward the quality measure, approaches of e-learning design, or other factors needs to be further studied.

Table 4. Summary of paired *t*-tests of eLSC cases by quality criterion

Quality Criterion	Evaluation	Mean	SD	*t*	df	Sig. (2-tailed)
1. Learner support	Self-evaluation	2.45	.58	4.07*	27	.000
	eLSC evaluation	2.04	.39			
2. Faculty support	Self-evaluation	2.27	.60	3.90*	25	.001
	eLSC evaluation	1.92	.45			
4. Instructional design	Self-evaluation	**1.87**	.45	4.81*	9	.001
	eLSC evaluation	**1.00**	.74			
5. Instructional process	Self-evaluation	2.27	.49	3.58*	9	.006
	eLSC evaluation	1.60	.54			
7. Technology	Self-evaluation	2.38	.52	2.88*	27	.008
	eLSC evaluation	2.10	.22			
8. Assessment and evaluation	Self-evaluation	2.20	.54	3.46*	27	.002
	eLSC evaluation	1.81	.45			

Note. * $p<.05$, N=28

Gap Analysis of eLCC Cases

Thirty-seven e-learning courseware cases were examined to identify perception gaps between the eLCC quality evaluation and applicants' self-evaluation at the quality aspect level. The distribution of the 37 eLCC cases was summarized in Table 5. For the field of use, 16 eLCC cases (43.2%) were developed for corporate training, 13 eLCC cases (35%) were developed for use in schools, and the other 8 cases (21.6%) were not limited to a specific field of use. As for the target audience, 25 cases (67.6%) were aimed at adult learning, 8 cases (21.6%) were targeted on school students, and the other 4 cases (10.8%) claimed to be suitable for audience of all ages. For the length of learning, about half of the eLSC cases (45.9%) were less than 2 hours of learning. Finally, as for the final results of the eLCC quality evaluation, only 2 cases (5.4%) were certified as eLCC Level AAA, 9 cases (24.3%) were certified as eLCC Level AA, 4 cases (10.8%) were certified as eLCC Level A, and the other 22 cases (59.5%) failed in the eLCC quality evaluation for not passing all of the 8 required criteria or with a total score less than 60 points.

Table 5. The distribution of eLCC cases by field of use, target audience, length of learning and quality level

Category	Sub-category	Number of cases	Percentage	Cum. percentage
Field of use	Corporate training	16	43.2	43.2
	Education	13	35.1	78.4
	Not limited	8	21.6	100.0
Target audience	Adult	25	67.6	67.6
	Student	8	21.6	89.2
	Not limited	4	10.8	100.0
Length of learning	16hr ~	6	16.3	16.3
	6~16hr	7	18.9	35.2
	2~6hr	7	18.9	54.1
	0~2hr	17	45.9	100.0
Certified quality	Level AAA	2	5.4	5.4
	Level AA	9	24.3	29.7
	Level A	4	10.8	40.5
	Uncertified	22	59.5	100.0

Note. N=37

The construct validity of the eLCC quality evaluation was ensured by means of a series of experts' reviews, focus groups and pilot-tests during the development of the eLCC quality framework. The content validity coefficient of eLCC was .83 as measured by Kendall's coefficient of concordance. The internal consistent reliability of the eLCC quality evaluation was .81 (Cronbach's α) as measured on the 37 eLCC cases. It was concluded that the eLCC quality evaluation possessed adequate reliability and content validity.

The difference between the eLCC evaluation and applicants' self-evaluation on each eLCC quality aspect was analyzed by means of paired *t*-tests. The mean scores and summary of the paired *t*-tests are shown in Table 6. The mean scores of the eLCC evaluation were significantly lower than the mean scores of applicants' self-evaluation in all of the eLCC quality aspects. The results indicated that the e-learning courseware developers overestimated the educational quality of their e-learning courseware. Due to technical issues, cost, time, or other factors, the lowest scored-ratio among self-evaluation fell in the "Navigation" criterion (mean ratio=79%). Accordingly, the lowest scored-ratio among eLCC evaluation score fell in the "Navigation" criterion (mean ratio=60%) and revealed that the "learner tracking" sub-criterion was not fulfilled in most eLCC cases. Moreover, the largest perception gap (92% vs. 62%) was observed in the quality aspect of "Instructional design" and indicated that most of the eLCC applicants were over-confident with the instructional design features implemented in their e-learning products. The discrepancy could be derived from the developers' lack of appropriate instructional design knowledge or due to the inadequate understanding toward the eLCC quality criteria. Further studies are suggested to explore the factors causing applicants' perception gap in the instructional design aspect.

Table 6. Group means and summary of paired t-tests of eLCC cases

Quality aspect	Evaluation	Mean	Ratio	SD	*t*	df	Sig. (2-tailed)
Content	Self-evaluation	20.68	98%	1.11	6.36*	36	.000
	eLCC evaluation	16.84	80%	3.72			
Navigation	Self-evaluation	15.00	**79%**	4.03	5.12*	36	.000
	eLCC evaluation	11.49	**60%**	4.17			
Instructional design	Self-evaluation	37.81	**92%**	3.53	8.82*	36	.000
	eLCC evaluation	25.59	**62%**	8.48			
Instructional media	Self-evaluation	17.97	86%	2.19	6.92*	36	.000
	eLCC evaluation	15.05	72%	2.85			
Total	Self-evaluation	91.46	91%	10.86			
	eLCC evaluation	68.97	69%	19.22			

Note. * $p<.05$, N=37

Analysis of Participants' Attitudes toward eLQA

The diffusion of the eLQA quality framework to e-learning developers and organizations cannot be accomplished by just a single event of announcing it. Instead, achieving a pervasive adoption of an innovation by the potential adopters relies on appropriate diffusion strategies and competitive attributes of the quality framework itself. The present study examined the diffusion of the eLQA quality framework from the perspective of perceived innovation attributes. Therefore, e-learning project managers in the 67 e-learning organizations stationed in the e-Learning Network Science Park were selected as the potential sample for data collection in the present study. The target population had involved in managing the quality of e-learning projects and was familiar with the quality assurance programs. Therefore, the target population is suitable for representing the adopters and prospective adopters of eLQA.

An on-line questionnaire was developed based on Rogers' perspective of innovation attributes (Rogers, 2003) and conducted in February 2007 to investigate eLQA participants' perception toward the implemented quality frameworks. As shown in Appendix A, the attitude questionnaire employed a 5-point Likert-type scale to collect participants' perception of the trialability, complexity, observability, relative advantage and compatibility toward eLQA with 1 to 5 standing for "strongly disagree", "disagree", "neutral", "agree" and "strongly agree", respectively. There were three items for each component measure of the attitude questionnaire. Totally, the attitude questionnaire consisted of 15 items. For ensuring the validity, the survey instrument was developed with referring to previous

studies (Goldman, 1994; Hubbard & Sandmann, 2007; Pankratz, Hallfors, & Cho, 2002; Scheirer, 1990; Sonnenwald, Maglaughlin, & Whitton, 2001), reviewed and revised by peer experts, tested for validity and implemented in the present study. There were 71 responses received from 185 invitations with a response rate of 38.4%.

To assess the construct validity of the instrument, a principal component factor analysis was employed on participants' perceptions of the innovation attributes toward eLQA. The mediocre KMO (.67) and significant Bartlett's test of sphericity (Chi-square=2429.70, df=105, p<.001) indicated the appropriateness of conducting factor analysis. The summary of factor analysis is shown in Table 7, four factors, including trialability/complexity, observability, relative advantage and compatibility, emerged with eigenvalues grater than one based on Kaiser's rule. Trialability and complexity were clustered as one combined construct, instead of two distinct constructs. The total variance explained by the four factors reached 89.53% of the variance. The overall reliability coefficient of the questionnaire was .91 as measured by Cronbach's α, and the reliability coefficients of the component measures of trialability/complexity, observability, relative advantage and compatibility were .76, .79, .90 and .71, respectively, as measured by Cronbach's α.

Table 7. Summary of factor analysis on innovation attributes of eLQA

Item	Component			
	1. Trialability/ Complexity	**2. Observability**	**3. Relative Advantage**	**4. Compatibility**
Trialability 2	0.92	-0.05	0.15	0.23
Trialability 3	0.85	0.26	-0.09	0.10
Complexity 3	0.85	0.16	0.01	-0.04
Trialability 1	0.84	0.08	0.15	0.42
Complexity 2	0.81	0.47	0.09	0.18
Complexity 1	0.71	0.47	0.22	0.03
Observability 3	0.08	0.98	-0.04	0.01
Observability 2	0.19	0.94	0.13	0.02
Observability 1	0.46	0.84	0.11	-0.06
Relative Advantage 2	-0.05	-0.11	0.97	0.07
Relative Advantage 1	0.14	0.10	0.94	0.24
Relative Advantage 3	0.23	0.33	0.86	0.21
Compatibility 3	0.26	0.11	0.17	0.93
Compatibility 2	0.36	0.05	0.04	0.84
Compatibility 1	-0.13	-0.17	0.34	0.81
Cronbach's α	**.76**	**.79**	**.90**	**.71**

Note. 1. Extraction Method: Principal Component Analysis
2. Rotation Method: Varimax with Kaiser Normalization
3. Total variance explained: 89.53%

Multivariate Analysis of Variance (MANOVA) was employed to examine whether the experienced eLQA participants perceived the quality framework the same as the prospective participants did in the innovation attributes of trialability/complexity, observability, relative advantage and compatibility. The mean scores of participants' overall attitudes toward eLQA are shown in Table 8. Participants revealed positive attitudes toward the observability (mean=3.28), relative advantage (mean=3.31) and compatibility (mean=3.19) of eLQA, and stood neutral toward the trialability/complexity (mean=2.97) of eLQA. In other words, the positive observability indicated that the eLQA participants felt that the effects of adopting eLQA could be visible easily, the positive relative advantage also indicated that the adoption of eLQA would bring about better quality in e-learning, and the positive compatibility revealed that the adoption of eLQA was compatible with the development of quality e-learning within participants' organizations. Finally, the neutral attitude toward the trialability/complexity of eLQA indicated that it was not too difficult or complex for participants to try out the quality evaluation by themselves before submitting an eLQA application. Whether the experience of eLSC and eLCC quality evaluation affects participants' perception of the quality framework is further examined as follows.

Table 8. Mean scores of participants' overall perceptions of eLQA

Innovation attributes	Mean	SD	N
Trialability/complexity	2.97	0.72	71
Observability	3.28	0.89	71
Relative advantage	3.31	0.80	71
Compatibility	3.19	0.69	71

Analysis of eLSC Participants' Perception

One-way MANOVA was conducted to examine the effects of eLSC experience on participants' perceptions of the trialability/complexity, observability, relative advantage and compatibility of the quality framework with the significance level of .05. Participants were identified as the experienced eLSC participants group and the prospective eLSC participants group, according to previous experience of eLSC evaluation and experience in managing the quality e-learning service. That is to say, the experienced group not just had the experience in managing e-learning service quality but also the experience of the eLSC quality evaluation. In contrast, the prospective participants were familiar with the eLSC quality framework and had the experience in managing the quality of e-learning service but without the eLSC quality evaluation experience. For achieving the goal of successful diffusion of eLSC to the potential adopters, the experienced participants' attitudes toward eLSC were hypothesized to be enhanced and reach a higher level of perception than the prospective participants did as measured in the attributes of trialability/complexity, observability, relative advantage and compatibility. In other words, if eLSC was successfully diffused to the adopters, it should bring about positive attitudes in the experienced participants and ensure the continuing use of the quality framework.

The mean scores of the experienced-participants group and the prospective-participants group are shown in Table 9. Both the experienced participants and prospective participants stood a neutral attitude toward the trialability/complexity of eLSC with mean scores of 2.96 and 2.97, respectively. The experienced participants revealed positive attitudes (observability: mean=3.55; compatibility: mean=3.31) toward the attributes of observability and compatibility, and the prospective participants showed neutral-toward-positive attitudes (observability: mean=3.07; compatibility: mean=3.09). Moreover, the prospective participants showed a positive attitude (mean=3.55) toward the relative advantage of eLSC but the experienced participants stood a neutral perception (mean=3.02).

Box's Test of equality of covariance matrices was insignificant (Box's M = 6.02, F = 1.688, p = .167). The homogeneity assumption was sustained. The significant Wilks' Lambda (Wilks' Lambda = .584, $p < .001$, $\eta^2 = .416$) indicated that participants' eLSC experience affected their perceptions of the quality framework. The main effects were further examined as follows.

Table 9. Group means of eLSC participants' perceptions

Innovation attributes	Group	Mean	SD	N
Trialability/complexity	Prospective participants	2.97	.63	39
	Experienced participants	2.96	.82	32
Observability	Prospective participants	3.07	.97	39
	Experienced participants	**3.55**	.68	32
Relative advantage	Prospective participants	**3.55**	.55	39
	Experienced participants	3.02	.96	32
Compatibility	Prospective participants	3.09	.65	39
	Experienced participants	3.31	.74	32

Note. N=71

The MANOVA summary of eLSC experience on participants' perception of the innovation attributes of eLSC is shown in Table 10. The main effects of the observability and relative advantage were significant (observability: $F_{(1, 69)} = 4.932$, $p = .030$, $\eta^2 = .068$; relative advantage: $F_{(1, 69)} = 10.301$, $p = .002$, $\eta^2 = .132$). The results indicated that the experienced eLSC participants possessed a higher level perception (mean=3.55) of the observability of eLSC than

the prospective participants did (mean=3.07). In other words, the experienced participants felt that the positive effects of the adoption of eLSC could be observed apparently. In contrast, without the eLSC experience, the prospective participants only stood a neutral attitude toward the observability of eLSC. Therefore, the successful diffusion hypothesis was retained and participants' positive perception was enhanced through the observability attribute of eLSC.

Furthermore, the prospective participants revealed a higher level perception (mean=3.55) of the relative advantage of adopting eLSC than the experienced participants did (mean=3.02). That is to say, participants without eLSC experience tended to perceive the relative advantage of eLSC positively, but after experiencing the eLSC evaluation, the experienced participants stood a neutral perception. With comparison to the positive attitude possessed by the prospective participants, the experienced participants' perception of the relative advantage of eLSC could be treated as decreased after experiencing eLSC. Therefore, the successful diffusion hypothesis was rejected and participants' perception of the relative advantage decreased but sustained at a neutral level after experiencing eLSC.

Finally, the non-significant difference and the mean scores of the trialability/complexity and compatibility indicated that both un-experienced and experienced eLSC participants possessed neutral attitudes toward the trialability/complexity and compatibility of eLSC. In other words, the eLSC experience did not enhance or decrease participants' perceptions of the trialability/complexity and compatibility. Although the successful diffusion hypotheses were rejected, participants still sustained a neutral attitude toward the attributes of trialability/complexity and compatibility.

In conclusion, although the preparation of supporting evidences for the eLSC quality evaluation usually takes tremendous time and efforts, the enhanced perception of the observability of eLSC indicated that participants were able to see the positive effects of adopting eLSC on the enhancement of e-learning service quality. Therefore, the adoption of eLSC can be facilitated through the observability attribute of eLSC. Moreover, the neutral attitudes toward the trialability/complexity and compatibility suggested that the eLSC quality framework possessed moderate trialability/complexity and compatibility for sustaining eLSC adopters. However, the neutral but decreased relative advantage was suggested to be further enhanced in order to facilitate a successful and pervasive adoption of the eLSC quality framework among e-learning service providers.

Table 10. MANOVA summary of eLSC experience on participants' perception

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
eLSC experience	Trialability/complexity	.016	1	.016	.034	.854	.000
	Observability	3.641	1	3.641	4.932*	.030	.068
	Relative advantage	5.668	1	5.668	10.301*	.002	.132
	Compatibility	.937	1	.937	1.965	.166	.028

Note. * $p<.05$, N=71

Analysis of eLCC Participants' Perception

One-way MANOVA was conducted to examine the effects of eLCC experience on participants' perceptions of the trialability/complexity, observability, relative advantage and compatibility of the quality framework with the significance level of .05. Participants were identified as the experienced eLCC participants and the prospective eLCC participants according to previous experience of eLCC evaluation. The experienced participants were familiar with the eLCC quality evaluation and possessed the experience of eLCC evaluation. Furthermore, the prospective participants were also familiar with the quality framework but without the eLCC quality evaluation experience. For achieving the goal of successful diffusion of eLCC, the experienced participants' attitudes were hypothesized to reach a higher level of perception as measured in the attributes of trialability/complexity, observability, relative advantage and compatibility than the prospective participants did. Therefore, if eLCC was successfully diffused to the adopters, it should bring forth positive attitudes in the experienced participants and enhance the continuing use of the quality framework.

As shown in Table 11, the mean scores revealed that the prospective participants possessed positive attitudes toward the trialability/complexity (mean=3.20), observability (mean=3.42), relative advantage (mean=3.50) and

compatibility (mean=3.13) of adopting eLCC. Furthermore, the experienced participants also showed positive attitudes toward the observability (mean=3.18), relative advantage (mean=3.17) and compatibility (mean=3.23) of eLCC, and stood a neutral perception (2.79) of the trialability/complexity of eLCC. The experienced participants' positive attitudes implied that the observability, relative advantage and compatibility of eLCC are adequate for facilitating the adoption of the quality framework. However, the neutral perception of the trialability/complexity suggested that the eLCC quality framework could be further reinforced to increase trialability and reduce the complexity in order to facilitate the adoption of eLCC.

Box's Test of equality of covariance matrices was not significant (Box's M = 4.64, F = 1.30, p = .272). The homogeneity assumption was sustained. The significant Wilks' Lambda (Wilks' Lambda = .785, p = .007 and η^2 = .215) indicated that eLCC experience affected participants' perception of the quality framework. The main effects were further examined as follows.

Table 11. Group means of eLCC participants' perception

Innovation attributes	Group	Mean	SD	N
Trialability/complexity	Prospective participants	**3.20**	.47	31
	Experienced participants	**2.79**	.80	40
Observability	Prospective participants	3.42	.90	31
	Experienced participants	3.18	.87	40
Relative advantage	Prospective participants	**3.50**	.98	31
	Experienced participants	**3.17**	.61	40
Compatibility	Prospective participants	3.13	.84	31
	Experienced participants	3.23	.56	40

Note. N=71

The MANOVA summary of eLCC experience on participants' perception of the innovation attributes of eLQA is shown in Table 12. The main effects of trialability/complexity and relative advantage were significant (trialability/complexity: $F_{(1, 69)}$ = 10.809, p = .002, η^2 = .137; relative advantage: $F_{(1, 69)}$ = 4.870, p = .031, η^2 = .067). The significant trialability/complexity main effect suggested that the eLCC participants' perception of the trialability/complexity attribute of eLCC decreased (from 3.20 to 2.79) and sustained at a neutral level after experiencing the quality evaluation. The decreased perception of the trialability/complexity attribute indicated that the eLCC quality evaluation was not as easy as it expected to try out by the prospective participants. Therefore, the experienced participants only sustained at a neutral level of perception toward the trialability/complexity attribute. Accordingly, participants' perception of the relative advantage of eLCC also decreased (from 3.50 to 3.17) but sustained at a moderately positive level after experiencing the eLCC quality evaluation. Hence, the successful diffusion hypotheses were rejected for the trialability/complexity and relative advantage attributes, and participants sustained a neutral perception after experiencing the eLCC quality evaluation.

Moreover, the non-significant main effects of observability and compatibility main effects and the mean scores, as shown in Table 11, indicated that the observability attribute of eLCC was moderate and the positive effects of adopting eLCC were easily visible to the e-learning courseware developers, and the eLCC quality framework was compatible with the development process employed and values possessed by the courseware developers. Although the successful diffusion hypotheses were rejected, participants still sustained neutral attitudes toward the observability and compatibility of eLCC after experiencing the quality evaluation.

To sum up, although eLCC participants' perceptions of the trialability/complexity and relative advantage of eLCC decreased after experiencing the quality evaluation, participants maintained positive perceptions of the observability, relative advantage and compatibility of eLCC and sustained a neutral attitude toward the trialability/complexity eLCC. In other words, participants valued the observability, relative advantage and compatibility attributes of eLCC. Therefore, the positive attributes of observability, relative advantage and compatibility of eLCC would enhance the adoption of the eLCC quality framework. Finally, the neutral perception of the trialability/complexity suggested that the eLCC quality framework could be further reinforced to reduce the complexity and increase trialability in order to facilitate the adoption of eLCC.

Table 12. MANOVA summary of eLCC experience on participants' perception

Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
eLCC experience	Trialability/complexity	4.954	1	4.954	10.809*	.002	.137
	Observability	.639	1	.639	.866	.355	.013
	Relative advantage	2.680	1	2.680	4.870*	.031	.067
	Compatibility	.283	1	.283	.593	.444	.009

Note. * $p<.05$, N=71

Discussions

Quality assurance is a systematic and comprehensive effort for improving quality. A quality framework can serve as a common platform for organizations, individuals, practitioners and educators. Through the adoption or development of a suitable quality assurance framework, an organization can deal with the quality challenge in a systematic and effective manner. Although there are various quality guidelines, standards, benchmarks and checklists developed by organizations and researchers to respond to the needs caused by the rapid growth of Internet-based learning, the results of the analysis may vary from one instrument to another as well as from one organization to another. Therefore, e-learning quality instruments should be utilized and interpreted with caution (Borotis & Poulymenakou, 2004). Furthermore, the adoption of a quality framework is a long-term process and requires a great deal of organizational change in perception, workflow and culture (Daft, 2006). Changing the mindset of potential adopters or organizations is the first important task in facilitating a smooth process of innovation diffusion. Therefore, it is imperative to examine how the potential adopters as well as the adopters perceive the innovation.

In the present study, the appropriateness of the eLQA quality framework for e-learning was confirmed in terms of validity, reliability and participants' perceptions. The eLSC quality framework was developed based on the perspective that "quality is how the organization goes about achieving its objectives" and incorporated an in-depth hierarchy constituted with quality aspects, quality criteria and sub-criteria to assess the quality level of e-learning service of an organization from multiple perspectives. The successful implementation of the eLSC quality evaluation not only verified the applicability of the quality framework itself to the e-learning industries, but also aroused general awareness toward quality issues among e-learning providers in the country. As expected, the results of gap analysis indicated that participants perceived their e-learning quality overly for all eLSC quality criteria. This indicated that consultation services such as by-phone or face-to-face were imperative for resolving the perception gaps. Correspondingly, the lowest self-evaluation score and the lowest eLSC evaluation score both fell into the instructional design criterion and indicated that the eLSC participants were aware of their shortage in providing appropriate instructional design to supporting quality e-learning in their products. This shortage may caused by the participants' inability or unwillingness. For those participants who were incapable of doing so could be facilitated by providing appropriate training on instructional design skills and knowledge. However, the reasons for the unwilling participants might be caused by short development period of e-learning projects, cost-effective consideration, or other factors, and were suggested to be further investigated.

Moreover, the positive observability and compatibility and the moderate trialability/complexity and relative advantage of eLSC confirmed that the eLSC quality framework was appropriately implemented. However, after experiencing the eLSC quality evaluation, the relative advantage of eLSC decreased but sustain at a moderate level. The diminished dominant relative advantage of eLSC could be explained by the overestimate revealed in gap analysis. The frustration could cause an adopter to cease the adoption of eLSC. Therefore, how to sustain the relative advantage of eLSC becomes a top priority issue in improving the eLQA quality framework. Furthermore, the lowest quality level of the sub-criteria determined the overall quality of e-learning in the eLSC quality evaluation. The lack of flexibility in comprising the quality performance of sub-criteria onto a superordinate criterion-level quality level not just caused the criterion-level to become useless in representing the quality level of e-learning but also restrained the applicability of the quality framework. Therefore, it was suggested that the determination of eLSC quality level could be refocused and move back onto the criterion-level in order to represent the quality level of e-learning in fidelity.

Similarly, the successful implementation of the eLCC quality evaluation has aroused general awareness toward quality issues among e-learning courseware developers. There are two major problems evolved, including learner tracking and instructional design, from the analysis. For achieving the adaptive characteristic of e-learning, courseware needs to be design to monitor the learner through out the learning, provide adaptive interaction with the learner accordingly, and update learners' learning records through the Internet. However, this adaptive feature can only work on an appropriate e-learning platform. Whether the learner tracking gap is caused by technical issue, poor instructional design, cost-effective consideration needs to be further examined. Moreover, the insufficient instructional design quality problem may also be caused by the participants who were incapable or unwilling to do. Focusing on the quality framework issues, the insufficient instructional design may be just caused by participants' misinterpretation of the quality criteria. However, the development of e-learning courseware relies on collaborative works of subject matter experts, teaching experts, instructional designers, educational psychologists, multi-media specialists and web-technology specialists. Meanwhile, all the ingredients need to take effect to suit the educational underpinning in order to bring forth effective learning in the learners. However, the causes of insufficient instructional design quality could be more complicate. Furthermore, the analysis on participants' attitudes toward eLCC suggested that the eLCC quality evaluation was adequately implemented and possessed positive observability, relative advantage and compatibility, and moderate trialability/complexity. The decreased trialability/complexity and relative advantage of eLCC also indicated the necessity for further improvement. Crystal-clear descriptions, examples and best practices of quality criteria are suggested to make the eLCC quality framework more amiable and easy of access to e-learning developers and organizations.

In addition, this study adopted the construct of innovation attributes to assess participant's perceptions of the introduced new quality framework for e-learning. Four principal components of innovation attributes were emerged, including trialability/complexity, observability, relative advantage and compatibility, and explained 89.53% of the variance in the study. The results of factor analysis were in accordance with Rogers' assertion of the interrelated characteristics of innovation attributes (Rogers, 2003) and similar to previous studies (Goldman, 1994; Pankratz, Hallfors & Cho, 2002; Sonnenwald, Maglaughlin, & Whitton, 2001). For those e-learning practitioners, the combined trialability/complexity construct may also support the suggestion of providing sufficient crystal-clear descriptions, examples and best practices of quality criteria to narrow quality gaps and facilitate the adoption of the quality framework. Besides, due to the factors of timing and widespread target population, the present study could only examine the difference between the prospective participants and the experienced participants. It is suggested that further studies could employ a repeated measure design to examine the same participant's perceptions before and after the quality evaluation in order to get a better fidelity of the change in participants' perceptions.

There are related issues emerged. First, a quality framework might not suitable for all types of e-learning courseware as well as e-learning organizations. The eLQA quality assurance program needs to be considerate and open any necessary revision in order to meet e-learning participants' needs. Second, a fair and objective quality evaluation relies on evaluators' consensus, as well as other participants' consensus, toward the meanings represented by the quality criteria. Therefore, evaluator trainings and interactions among e-learning participants are essential for emerging and sustaining such consensus. Third, an implemented quality framework might restrict the subsequent development of e-learning. The impact needs to be carefully monitored and studied systematically in order to prevent negative effects that hamper the positive development of e-learning. Fourth, the compatibility of the fixed set of quality standards with the newly developed technological applications, such as the collective intelligence of web 2.0 and the semantic networks of web 3.0, remains an issue. Fifth, a positive perspective of quality assurance indicates pursuing better quality in learning. In contrast, a negative perspective might imply just reaching the minimum requirement. Unfortunately, the final decision-making judgment usually falls on a cost-effective consideration which jeopardizes the development of pedagogically effective courseware in most cases. Finally, the educational effectiveness of the Internet-based learning was not spontaneously ensured through the utilization of the Internet and multimedia technologies. The eLQA quality framework demonstrated adequate reliability and validity, and was capable of assessing learning services and courseware reliably. However, the key measure of quality is "whether a learner can demonstrate the skills, knowledge and competencies set out for them by the organization" (Meyer, 2002). The process-oriented evaluation of eLQA does not measure whether learners' learning outcomes meet the pre-set objectives of an organization directly. Further studies are suggested to validate the relationships between the process-oriented measures and the outcomes of e-learners.

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Appendix

Sample Items of the Attitude Questionnaire

Please indicate your level of agreement for each of the following statements according to your perception of the quality framework with 1, 2, 3, 4, and 5 standing for "Strongly Disagree", "Disagree", "Neutral", "Agree", and "Strongly Agree", respectively.

Note. The word "eLQA" in the questionnaire items is substitutable by "eLSC" and "eLCC".

A. Relative advantage

1. With comparison to the previous/current quality assurance method implemented in my organization, eLQA consists of a complete spectrum of quality aspects for ensuring quality e-learning.
   □1 □2 □3 □4 □5
2. With comparison to the previous/current quality assurance method implemented in my organization, eLQA provides opportunities to examine the educational meaningfulness for e-learning in depth.
   □1 □2 □3 □4 □5
3. With comparison to the previous/current quality assurance method implemented in my organization, eLQA provides effective mechanisms for ensuring the educational meaningfulness of e-learning.
   □1 □2 □3 □4 □5

B. Compatibility

1. The quality aspects and criteria of eLQA are consistent with the major factors emphasized by the previous/current quality assurance method implemented in my organization.
   □1 □2 □3 □4 □5
2. The quality aspects and criteria of eLQA can be infused in the previous/current quality assurance process implemented in my organization.
   □1 □2 □3 □4 □5
3. The process of conducting eLQA is similar to the previous/current quality assurance process implemented in my organization.
   □1 □2 □3 □4 □5

C. Complexity

1. The meanings of the quality aspects and criteria of eLQA are stated concisely.
   □1 □2 □3 □4 □5
2. The rating method and criteria of eLQA are clearly stated.
   □1 □2 □3 □4 □5
3. Following the self-evaluation instruction of eLQA, I can conduct a precise assessment on an e-learning product.
   □1 □2 □3 □4 □5

D. Observability

1. The quality improvement derived from the adoption of eLQA is apparent and can be recognized by most project members.
   □1 □2 □3 □4 □5
2. The quality levels of eLQA certification are recognized by the public.
   □1 □2 □3 □4 □5
3. The eLQA evaluation report provides clarified information for improving e-learning.
   □1 □2 □3 □4 □5

E. Trialability

1. eLQA provides sufficient information concerning ways to examine the quality of e-learning.
   □1 □2 □3 □4 □5
2. Following the provided information and resources, such as procedure manuals, examples, checklists, and self-evaluation forms, it is easy to try out some parts of or the complete eLQA quality evaluation.
   □1 □2 □3 □4 □5
3. Through the try-out of the eLQA quality evaluation, the educational meanings of quality criteria become clear in my mind.
   □1 □2 □3 □4 □5