Quality Dimensions and Assessment of E-learning Systems

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1. Problem definition.
2. E-learning definition and types.
3. E-learning and Technology.
4. Why e-learning?
5. Quality dimensions of e-learning systems.
8. Quality Assessment of e-learning systems
9. Conclusion
Problem definition

- A long term claim from business and industry that universities do not prepare students well for the world of work.

- Significant increase in spending on education has produced “almost no acceleration” in the performance of students.

- Teaching and learning should be an integrated process, with more awareness of the needs of learners.
Problem definition

- The only person who is educated is the person who:
  - has learned how to learn,
  - how to adapt and change;
  [change has become the only constant factor we can depend upon].
  - realized that no knowledge is secure.
- The process of seeking knowledge gives a basis of security.
- A mind is a terrible thing to waste, but a wonderful thing to invest in.
E-learning definition and types

"E-learning is the use of Web and Internet technologies to create experiences that educate human beings". William Horton (2001)

E-Learning is the acquisition and distribution of multimedia knowledge by electronic means specifically by networks of computers via variety of channels and technologies.
E-learning definition and types

- E-Learning technology is an infrastructure that emphasizes on online delivery of information and hence accelerates learning process.

- Laurillard (2006) defined E-Learning as “Use of any of the new technologies or applications in the service of learning or learner support”.
**E-learning definition and types**

- E-learning also goes beyond the merely delivery of static content. It includes collaboration, both synchronous and asynchronous, as well as some type of shared learning experience with fellow students (Maggie and John, 2007).

  [Learning is a social rather than an individual process].

- E-learning can cover a spectrum of activities from supported learning, to blended learning, to learning that is entirely online.

- E-learning is a major force for change.
Why e-learning?

- Freedom of (place – pace – time).
- Learning that is spread out over time increases knowledge retention. Our brains work best at certain times of the day.
- Enhances communication and collaboration.
- It provides consistent and world wide training.
Why e-learning?

- Reduces delivery cycle time. (the capacity to deliver traditional learning is limited by the number of available classrooms and trainers.)
- Increases learner's convenience/retention (Multimedia tools improve our brain's memory power).
- Reduces information overload.
- Improves tracking
- Lower expenses (Welsh et al., 2003).
E-learning and Technology:

- Technology has radically altered the surface of the educational landscape.

- Educational technology is the driving force in learning.

- Technological capabilities are constantly changing, so, the best solution today may not be the best solution tomorrow.
Synchronous learning

- Learning and teaching takes place in real time (same time) while the trainer and learners are physically separated from each other (place shift).

- Examples include:
  - Listening to a live radio broadcast
  - Watching live a television broadcast
  - Audio/video conferencing
  - Internet telephony
  - Online lectures
  - Two-way live satellite broadcast
Asynchronous learning

- The trainer prepares the courseware material before the course takes place.
- The learner is free to decide when he wants to study the courseware.
- Self-directed and self-paced methods of learning (enables learner to go back and review the material before going forward).
- Examples include:
  - Videotaped classes
  - Stored audio/video Web presentations or seminars
  - Recorded audio tapes
  - Reading e-mail messages
Examples of asynchronous and synchronous learning

<table>
<thead>
<tr>
<th>Asynchronous learning</th>
<th>Synchronous learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fax</td>
<td>Telephone</td>
</tr>
<tr>
<td>E-mail</td>
<td>Screen Sharing</td>
</tr>
<tr>
<td>Knowledge Base</td>
<td>Chat</td>
</tr>
<tr>
<td>Newsgroups</td>
<td>Desktop Conferencing</td>
</tr>
<tr>
<td>Computer Based Training</td>
<td>Online seminar</td>
</tr>
<tr>
<td>Quick Reference Guide</td>
<td></td>
</tr>
</tbody>
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Quality dimensions of e-learning systems:

- Quality is fitness for use (J.M. Juran, 1989).
- Quality is meeting or exceeding customer expectations at a cost that represents a value to them (H. James Harrington, 1991).
- Quality should be defined as surpassing customer needs and expectations throughout the life of the product.
Quality dimensions of e-learning systems:

- Quality means "meeting requirements".
- Requirements must be measurable, and the product's requirements will either be met or not met.
- When you cannot measure what you are speaking about, when you cannot express it in numbers, our knowledge is of a meagre and unsatisfactory kind.
- Quality is binary state; that is, a product is either a quality product or not.
Quality dimensions of e-learning systems:

- Quality cannot be achieved by assessing an already completed product.
- The aim, is to prevent quality defects or deficiencies in the first place.
- Errors are typically 10 times more expensive to correct at coding stage than at requirements stage.
- They are 100 times more expensive at maintenance stage (Barry Boehm).
- The sooner a defect is located and corrected, the less costly it will be in the long run.
Quality dimensions of e-learning systems:

(Majdi Adellatif, 2010) proposed four quality characteristics for e-learning systems:

- Service content.
- System functionality.
- Information technology
- System reliability.

Each one of these characteristic has sub-characteristics
Quality dimensions of e-learning systems:

- Service content.

Management technique: well organized, student tracking, e-random tests, user profile, e-books, and e-announcements.

Teaching technique: self study, scheduling, bookmarking technique, notes and highlights, archives, online experts, recommended resources, and user feedback.

Delivered method: print, e-text, audio, communication, and video.
Quality dimensions of e-learning systems:

- System functionality:

  **Browsing issues:** virtual lab, multi-language, upload file, download file, navigation, link relevancy, level of scrolling, coupling among sub-sites, and label of position.

- **Usability:** ease of use, site map, feedback technique, quality of help features, web-site last update, FAQ feature, E-mail directory, phone-fax directory, post mail directory, and address directory.
Quality dimensions of e-learning systems:

- Information technology:
  - **Communication**: application sharing, discussion forum, E-mail services, interactive multimedia, virtual community, and virtual classroom.
  - **Security**: access privileges, privacy, cookies, and accessibility.

- Interface issue: cohesiveness to groups, main control objects, course information, attractiveness, style uniformity, and stability.
Mugridge presented an overview of a distance learning program in England and the factors associated with quality assurance in their programs. Factors were broken into three major areas:

- Learner-content.
- Learner-instructor.
- Learner-learner.
Quality dimensions of e-learning systems:

- System reliability:
  Mean Time Between Failure (MTBF), link errors, invalid links, broken links, number of destination nodes under construction, and number of dead-end.
Quality dimensions of e-learning systems:

- Quality in e-learning is not associated with a well defined measure.
- But, it is variable with respect to scope, perspective (qualitative or quantitative), and dimension (Pawlowski, 2003).
Quality dimensions of e-learning systems:

- There are a number of classifications and dimensions that determine the nature of the approach to quality such:

- The focus that is whether the quality is related to the final output e-learning product or the different processes of developing it;

- The subjective, who is speaking about the quality? project manager, analyst, instructional designer, designer, web designer, developer, tester, integrator, auditor, subject matter expert, or learner, etc.;
Quality dimensions of e-learning systems:

The objective

- Educational process, subject domain, and content.
- Suitability of learning content for each learner now and in the future, course design, and authoring tool.
- E-learning elements (text, picture/image, animation, audio, and video).
Quality dimensions of e-learning systems:

Learning Management System (LMS):
(Registering, locating, scheduling, tracking, managing, reporting on learning activities, support of different possibilities of learning, integration of solution in the context of IS firm, wide administration range, compatibility with standards, the support of the applications of the other suppliers, possibility of using mobile communication);
Quality dimensions of e-learning systems:

LMS applications:
Applications for learning (documents, examples),
Testing applications (tests, checking of tests),
Support applications (notepad, discussion forum, chat) etc.;
Quality dimensions of e-learning systems:

- The perspective: qualitative or quantitative.
- Qualitative data deals with descriptions.
- Data can be observed but not measured (colors, appearance, usability, etc.).
- Qualitative data is not using numbers, but is based on personal opinions and judgment.
- Qualitative data is related to quality.
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Quality dimensions of e-learning systems:

The perspective: qualitative or quantitative.

- Quantitative data deals with numbers that can be measured such as (response time, number of errors or defects, Defect Removal Efficiency (DRE) = \( E/(E+D) \), cost, progress rate, etc.).
- Errors: Faults found by developers during software development.
- Defects: Faults found by the customers after release.
- Quantitative data is related to quantity.
Quality dimensions of e-learning systems:

The perspective: qualitative or quantitative.

- Quantitative methods use a broad range of numerical approaches for solving problems.

- Qualitative assessment techniques are “softer” than quantitative tools, less accurate and less objective.
Quality dimensions of e-learning systems:

- Requirements are the most important document.
- Everyone is committed to quality.
- Quality requires a commitment, particularly from top management.
- Close cooperation between all participants is required to make it happen.
- To ensure e-learning quality, well defined standards and procedures must be followed.
Quality dimensions of e-learning systems:

E-learning quality assessment is a difficult task that involves human intervention and cannot be based only on an easy and reproducible methodology.
Two of the most common e-learning standards:

- Sharable Content Object Reference Model (SCORM)
E-learning Quality Assurance (EQA):

- (EQA) is achieved through the use of established guidelines for quality control to ensure the integrity and long life of e-learning systems.

- (EQA) is a set of support activities needed to provide adequate confidence that processes are established and continuously improved to ensure products that meet specifications and are fit to use.

- (EQA) is a strategy for risk management.
Components of E-learning Quality Assurance:

E-learning Testing

Standards

E-learning Configuration Management

Conventions

E-learning Quality Control

Procedures

Specifications

Figure 1: Components of E-learning Quality Assurance
E-learning Testing:

- It is used to verify that functional and non-functional requirements were met.

- Tests are only as good as the test cases
E-learning Quality Control (EQC):

- (EQC) is the process by which product quality is compared with applicable standards and action taken when nonconformance is detected.
- (EQC) is defined as the process and methods used to monitor work and observe whether requirements are met.
- (EQC) consists of well-defined checks on a product that are specified in the product quality assurance plan.
E-learning Quality Control (EQC):

- (EQC) is designed to detect and correct defects, whereas (EQA) is oriented toward preventing them.

- (EQA) is a managerial function that prevents problems by heading them off, and by advising restraint and redirection.
E-learning Configuration Management:

- E-learning Configuration Management (ECM) is concerned with labeling, tracking, and controlling changes in the e-learning elements.

- It controls the evolution of an e-learning system by managing different versions and their relationships.
Quality Assessment of e-learning systems

- **Definition/description**: definition of the quality characteristic;
- **Scale**: the unit of measurement;
- **Test**: the practical test of the extent to which the attribute quality exists;
- **Minimally acceptable**: the worst value which might be acceptable, and below which the product would have to be rejected out of hand;
- **Target range**: the range of values within which it is planned the quality measurement value should lie;
- **Now**: the value that applies currently.
Proposed procedure for quality assessment of e-learning systems

- **Step 1**: Design a questionnaire for collecting data from all stakeholders reflecting quality classifications and dimensions.

- **Step 2**: Score assignment: each defined quality dimension is assigned a direct score between 0 and 1 (A higher value reflects a better quality dimension).

- **Step 3**: The quality score for each dimension is calculated as the average of different values which we obtained from different stakeholders.
Proposed procedure for quality assessment of e-learning systems:

- **Step 4**: Compute the value of each quality classification.

- **Step 5**: Compute the total quality of e-learning system in a bottom-up manner.
Conclusion

- Quality cannot be achieved by assessing an already completed product, but it is a continuous process improvement from A to Z.
- Everyone is committed to quality (close cooperation between all participants is required for quality assurance (different stakeholders/different views)).
- Quality requires a commitment, particularly from top management.
Conclusion

- Quality of e-learning is not associated with a well defined measure. It is variable with respect to scope, perspective, and dimension.

- To ensure e-learning quality, well defined standards and procedures must be followed.
Invitation to collaboration, comments, and questions

My best wishes
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