Development of an instructional design checklist for e-Learning contents: A Japanese challenge in IT skill training

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Abstract: This paper describes a case study to try to develop a checklist for e-Learning content development based on instructional design features in order to assure quality of IT related skill training in Japan. Current situation of Japan's e-Learning is first reviewed to describe a strong need to develop such a checklist. An analysis was conducted by checking instructional design features of 28 courses prepared for a government-related project of promoting e-Learning in IT skill training. Items for the ID checklist were then derived from the analysis, and formatively evaluated and revised to improve the checklist's stability and comprehensiveness. The ID checklist was proposed that consists of 102 items of four levels of instructional quality, with either explanation of the level or examples from examined courses to facilitate evaluation process. Ideas for improving ID qualities can be stimulated by evaluation process using the checklist. An on-line version of the checklist will be available by the time of the conference with data showing effectiveness of the checklist.

Quality assurance of e-Learning: Japan's situation and our challenge

Information dissemination and acquisition through information network has become essential for our professional life. Learning via information network has been gradually accepted in training fields, especially that of Information Technology (IT) related areas. e-Learning has been one of major triggers for professionals to bring about a breath of fresh air to existing training systems. New technology and existing technology that were not widely used in educational places at the time have been accepted by many researchers, practitioners and learners. Hebel & Wiszycz (2004) described that "e-Learning is characterized by a blended mixture of delivery via technology and some change in the learning state. The take-up of e-learning is enormously diverse and dependent on context whilst not always cognisant of the consequences." The word of e-learning is widely used especially in higher education and cooperate training. Sometimes people are bewildering by the terms and definitions around e-learning. Oblinger & Hawkins (2005) explained that "Distance learning, distributed learning, and e-learning are often used interchangeably to describe the delivery of postsecondary education degrees, programs, and course independent of fixed time and place. The students can presidential, commuting, or at a distance. There are a lot of professional magazines and journals of e-Learning now. The same thing is true in Japan. If you search "e-Learning" by amazon.co.jp, you can find and buy 58 books named "e-Learning" as of May 2006.

Academic arena has been active in discussing quality issue of e-Learning. Some academic societies such as Japan Society for Educational Technology (JSET) and Japan Society for Information and Systems in Education (JSiSE) have been published special issues of e-Learning, but there is no society or journal named "e-Learning" yet. National Institute for Multimedia in Education (NIME) is the most influential organization in Japan to discuss quality assurance issue in e-Learning for Higher Education, by having NIME International Symposia with invited researchers from abroad from 2004, and by publishing Journal of Multimedia Aided Education Research from 2004. Some forums and study groups have been held by these societies frequently. WebCT's user group has been one of the most active of Learning Management System (LMS) user groups, which opens frequent seminars to discuss case studies of Higher Education to learn from each other's trials and errors.

On the other hand, after first launch of e-Learning practices, either in Higher Education or corporate training, voices of disappointment have often been heard. There are many cases of negative reactions in Japan such as "e-Learning is not effective", "Expenses are only piling up", "It's out of time" or "It's difficult to use." Some corporate which launched e-Learning section and was hoping great profit have made decisions as to go out business or degradation. Best practices were not sufficient, or easily found, thus big difference between hopes and reality are felt by those who first tried the new solution.

Historic background of the application of media may have induced the above situation. It was merely 1998 when Japan deregulated related laws so that college class can be delivered via information network. "Distance education" had been in place as a separate category of university system that required a few weeks of face-to-face classroom instruction as a part of their curriculum. The 1998 alteration made possible the 100% on-line system for colleges and universities, although the style was permitted only as synchronous TV conference (Yoshida et. al, 2005). It was 2000 when other forms of media utilization, such as asynchronous communication via Bulletin Board System, can be officially counted as a part of "face-to-face equivalent" forms of instruction. It was around the same time of spread of broadband technology with high speed and moderate price, which made possible the traditional lecture style e-Learning. Yoshida et. al. reported that, in 2003, 81.0 percents of e-Learning at college level were delivered using a presentation tool. Streaming videos were used in 45.9 percents of the e-Learning. One way streaming contents become the main stream of e-Learning in Japan.

Because commonly used e-Learning in Japan is following traditional lecture-on-line style, they may not contain necessary learning components and learning activities for target learners. Without good showcases of similar e-Learning content and explanations for design decisions, the designers can't imagine how they can construct e-Learning materials. They may even unaware of what the problems they are facing, or what are the possibilities they may have to create alternative forms of teaching. For those who design e-Learning content in Japan, design guidelines such as E-Learning Courseware Certification Standards by ASTD (2003) are not widely known. Even providing Japanese translation of such guideline may not work well, due to the lack of background knowledge and skills about instructional design among such practitioners. There are representative organizations for pursuing to provide quality assured contents such as The Quality Matters™ project (2005), which uses peer review process with Instructional Designers. On the contrary, this study is focused on providing independent support tools to those who can not receive Instructional Designers' opinions directly at their working environments.

It was the purpose of this study to create a set of design checklist by analyzing more advanced areas of e-Learning practices, namely IT related training courseware. By formatively evaluating the proposed checklist for clarity and stability among raters, and by providing the revised checklist in a Web-based format with links to concrete examples, both good ones and bad ones, with explanations for design decisions, it was also aimed to make the checklist an easy-to-use tool for beginning instructional designers.

Content Analysis

Twenty-eight courses were selected for our content analysis from an IT training good practice by Information-technology Promotion Agency (IPA).   IPA is a government-affiliated agency established in 1970. This agency is mainly offering information about IT related security and international standard, multimedia research, and assistance for contents development (IPA, 2006).   They are implementing demonstration experiment of e-Learning content delivery, aiming at higher-level professional training at local training centers throughout Japan.   Their goal is to built up a certain blending learning style, while resolving the problems in existing face-to-face training they are conducting.   Learning contents have been developed by major IT related training companies.   These 28 e-Learning contents were selected as representative contents distributed to the market for our analysis of instructional design strengths and weaknesses.

Targeted 28 contents were learning materials for IT engineers about system management, information security and SQL fundamentals.   All of these works were provided on a common LMS platform (opensourceLMS by NTT Resonant, Co.).   The amounts of academic workload were different from course to course, ranging from 2 hours to 14 hours of average expected learning time.   The materials used in this experiment were provided by multiple companies, but framework, layout, and mounted functions were adopted commonly.   These were typical types of products that people could buy in Japanese market.

The first author checked a representative set of sample courses to extract general characteristics of the target content.   A framework of 6 categories was then selected from the literature of instructional design (e.g., Clark & Mayer, 2003; Merrill, 2002; Rothwell & Kazanas, 2004):   (1) ID meta information (objectives, target learners, prerequisites, etc.), (2) ID composition (order, table of contents, index, etc.), (3) ID for information presentation (explanations, examples, glossary of terms, etc.), (4) ID for practice (number of items, consistency, feedback, reflection, etc.), (5) Media design (proper uses of visuals and audios, etc.), and (6) Usability design (navigation, easy access, standard layout, etc.).

All of the 28 target contents were analyzed based on these six categories, by the first and third author attentively, resulting in general description of strengths and weaknesses shown in Table 1.   The contents seemed to follow same ID principles, such as stating learning objectives and equipped with pretest and posttest. However, the contents were mainly one-way delivered with limited capability for providing practice and feedback.   There were some rooms for improvement, such as unclearness of objective statements.

ID Checklist Development

ID Checklist was then developed based on content analysis.   Original checklist consisted of 107 items, each of which was classified into 4 levels. Level 1 was at minimum requirement level.   The content which doesn't satisfy all questions at level 1 would be considered inappropriate as e-Learning material.   Level 2 means standard level.   Content should be covered up to this level to be considered adequate.   This level was to describe commonly used functions and features of standard quality.   Level 3 was at advanced level.   If the content is qualified at this level, it would mean that the material has strong design feature at any of the six design categories.   Level 4 is at a further advanced level.   If there are any unique features that can be considered an exemplary, checklist user would describe verbally in the space provided.

The first checklist was reviewed by first and second authors.   One of 28 contents was chosen for evaluating the checklist.   The main purpose was to confirm the orientation and operational quality of the checklist.   101 out of 107 items were found matched after marking separately, but 6 items were not. Reviewers discussed and reviewed each result.   As a result, 4 out of 6 mismatched items were confirmed that

differences were due to unclearness of items' wording.   Two reviewers' judgment after rewording the items became the same.   Other two items were deemed necessity of examples in order to result in the same judgment. Some weak points of question items' explanation were pointed out.   Alternative ideas were discussed, then revised checklist was created.

Second, another evaluation trial was implemented by using a different content.   Content in different area developed by different company was selected for evaluation.   As a result, 88 out of 107 items matched, but 19 items were not.   After discussion and reflection of individual checklist evaluation, the result has changed to 103 out of 107 items corresponded and 4 items mismatched.   It showed some imprecise explanations were still existed.   Comparing to the first content, this content had a more complicated framework, which seemed to be the reason why a greater discrepancy occurred.   Considering the target user of the checklist to be novice designers, it was predicted to be difficult to use the checklist unless some improvements were made.   To complete the development process of the checklist, it was reconfirmed that examples should be added as an essential component of the checklist.   The second author developed bad examples that reviewers had difficulty to answer or derived unmatched first.   Each of 8 out of 19 unmatched items in second review was attached with an example.   Figure 1 shows one Level 2 item from ID Meta Information category (item #11), with a screen-shot example, whereas Figure 2 shows one Level 3 item from ID Composition category (item #33).

Table 1: Strength and Weakness of target contents by ID categories

Strength

	Category	Content
1	ID Meta information	Prepared Pretest and Posttest
2	ID Meta information	Informed objectives and target learners
3	ID Information presentation	Prepared a glossary
4	ID Information presentation	Prepared additional explanation on important matters
5	Media Design	Uniformity of total design
6	Media Design	Utilization of text, sound and images
7	Usability Design	Explanation with moving images as supplemental

Weakness

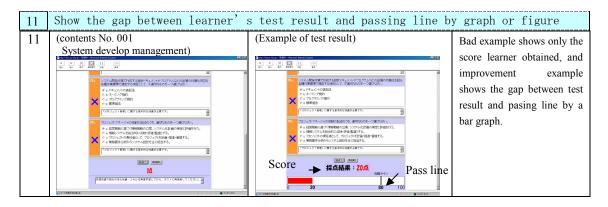|	Category	Content
1	ID Meta information	Unclearness of prerequisites
2	ID Meta information	Unclearness of explanation of learning objectives
3	ID Composition	List of content not shown when learning was started
4	ID Composition	Lack of providing outline of learning before learning
5	ID Composition	No index provided
6	ID Composition	Weak relationship between learning objective and test.
7	ID Composition	No explicit explanation for providing Pretest
8	ID Information presentation	Lack of adequate examples
9	ID Practice	Not enough test items (All contents provide 5 selective question only)
10	ID Practice	Not enough questions or too easy questions
11	ID Practice	No or very few exercise provided
12	ID Practice	Inadequate feedback
13	ID Practice	Lack of reflection, no direct link between test result and review page
14	Media Design	Too small text
15	Media Design	Text message not fit in the screen frame
16	Media Design	Unrelated pictures included
17	Media Design	Not enough interactivity
18	Usability Design	Lack of explanation for Navigation
19	Usability Design	Lack of direction for operation

11	Show the gap between learner's test result and passing line by graph or figure		
11	(contents No. 001 System develop management)	(Example of test result)	Bad example shows only the score learner obtained, and improvement example shows the gap between test result and pasing line by a bar graph.

Figure 1: An example of Level 2 item with a screen-shot example

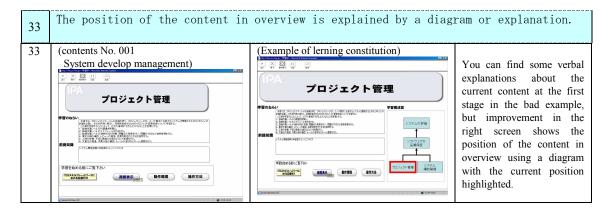| 33	The position of the content in overview is explained by a diagram or explanation.		
33	(contents No. 001 System develop management)	(Example of lerning constitution)	You can find some verbal explanations about the current content at the first stage in the bad example, but improvement in the right screen shows the position of the content in overview using a diagram with the current position highlighted.

Figure 2: An example of Level 3 item with a screen-shot example

A research associate working at a university whose major was not instructional design, but information technology was asked to participate in the final evaluation of the checklist. The checklist contained the examples of bad contents and suggestions for improvement. To reduce unclearness of questions in the checklist, the total number was reduced to 102, including 8 questions with examples. Evaluation was implemented after explaining the contents and checklists to the reviewer. The evaluator left a total of 8 items as blank, because he could not judge from merely observing the contents. In the interview after the evaluation, he mainly pointed out problems of content rather than the checklist. "If the user of the checklist was not SME, it is difficult to answer of checklist's question" he also mentioned.

Conclusions

In this case study a 102 item checklist for ID quality of e-Learning was proposed based on content analysis of 28 IT training courseware. The checklist was formatively evaluated for its clarity and ease of use.

More improvement may be helpful for the target users with a limited past experiences and knowledge of ID, the checklist was able to be manipulated by a novice participated in the last reviewing process of this study.

It is our intention to finish our research effort by the deadline of manuscript writing by (1) creating an on-line version of the checklist, and by (2) obtaining data showing effectiveness of the on-line checklist. A complete list of our 102 item checklist will be ready in English, if space would permit us to include it in our manuscript.

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