Standardization for e-Learning

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Abstract

e-Learning is an online education through computer networks, providing educational services by taking advantage of information technology. e-Learning has many advantages such as reduction of education costs, the benefits from repeated learning, customized education, and so on. However, it could be impossible to gain these benefits, unless components of the e-Learning system have the requisite properties; reusability, accessibility, interoperability, and durability. For these requirements, standardization of the e-Learning system is essential. This paper describes the purpose of e-Learning standardization and standardization activities ranged over international, Asian to Korean ones. Furthermore, it suggests the establishment of an e-Learning Promotion Division in AAOU for information sharing and mutual cooperation in this field.

1. INTRODUCTION

1.1 e-Learning

1.1.1 What Is e-Learning?

The Information Society has a strong impact on education and training systems in the world such as lifelong learning, just-in-time training, re-training required to overcome unemployment, and conventional education that could be more efficient by using information technology as well. They are placing considerable demands on education and training authorities, service providers, producers of content, hardware manufacturers, and telecommunications operators. With the advent of information technology, e-Learning is about to take place in all sectors of education and training systems to give access to learning and knowledge to all citizens, regardless of where they study, work or live.

e-Learning is an online education through the computer networks (the Internet or local intranet), providing educational services by taking advantage of information technology. For more specific definition of e-Learning, you may use eLearners.com's; that is, e-Learning is defined as any learning that utilizes a network (LAN, WAN or the Internet) for delivery, interaction, or facilitation. This includes distributed learning,
distance learning (other than pure correspondence), Computer Based Training (CBT) delivered over a network, and Web Based Training (WBT) and it could be synchronous, asynchronous, instructor-led or computer-based or a combination [1].

In other word, e-Learning is a new paradigm of education system using information technology. It provides a cyber space where teachers and students can interact educationally whenever or wherever they want.

An e-Learning system is operating on an infrastructure (or called as platform) which is called as one of Learning Management System (LMS), Knowledge Management System (KMS), or Learning Content Management System (LCMS). Whatever called, the e-Learning infrastructure has several educational facilities such as authoring tools, virtual collaboration tools, curriculum roadmaps, performance support tools, personalized learning applications, skill gap analysis tools, and so on [2].

e-Learning can make use of a wide range of technologies and media. These technologies can be categorized by delivery media and interaction tools. Delivery media has types of print, audio, video, digital data. Depending on the delivery mode, the interaction tools category includes differently; email, web-based forum, newsgroups, bulletin board system (BBS) for asynchronous mode, and chatting facilities, application sharing tools, teleconferencing, videoconferencing, multi-user dimension (MUD) tools for synchronous mode. The media and technologies frequently used in e-Learning are summarized in Table 1 [1].

<table>
<thead>
<tr>
<th>Category</th>
<th>Type / Mode</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivery media</td>
<td>Print</td>
<td>Textbooks, Study Guides, Workbooks</td>
</tr>
<tr>
<td></td>
<td>Audio</td>
<td>Streaming audio, Audio tapes</td>
</tr>
<tr>
<td></td>
<td>Video</td>
<td>Streaming video, Video tapes</td>
</tr>
<tr>
<td></td>
<td>Data</td>
<td>Web Pages, CBT Content, Computer files, Online Tests</td>
</tr>
<tr>
<td>Interaction tools</td>
<td>Asynchronous</td>
<td>email, web-based forum, newsgroups, BBS</td>
</tr>
<tr>
<td></td>
<td>Synchronous</td>
<td>chatting facilities, application sharing tools, teleconferencing, videoconferencing, MUD</td>
</tr>
</tbody>
</table>

1.1.2 What Is e-Learning For?

The advantages of e-Learning are described in many documents, but they could be summarized as follows [1]:
- There is no time spent commuting to class
- There is no travel costs
- You can have a job while you take classes
- You can learn when you need it (Just-In-Time)
- Your learning options are not constrained by your geographic location
- You can learn at your own pace
- Learning can be fit into your busy schedule
- It can be more effective for certain types of learners (shy, reflective, language challenged, those that need more time)
- There are often more student-to-student interactions
- There can be more focused on the learner and less on the instructor
- Instruction can be more customized and flexible
- It can take lower costs for both learning providers and organizations that need training
- It can take fewer costs for students than traditional programs
- There are side benefits of learning new technologies and technical skills

One of the reasons why e-Learning has got spotlights in these days and it is spreading its territory so fast is reduction of educational costs; once an educational content has been made, the same content can be used repeatedly wherever it is needed. e-Learning has the benefit from repeated learning by students as many times as they want. Furthermore, e-Learning can provide students with one-to-one bi-directional education, which means that a student feels the teacher take care of him or her only (for example, the student can ask a question to the teacher at any time).

For emphasizing the necessity of e-Learning in these days, it could be better to present a quotation from the keynote speech of John Chambers, CEO of Cisco Systems, to the Fall 1999 Comdex Trade Show [3]; "The biggest growth in the Internet, and the area that will prove to be one of the biggest agents of change, will be e-Learning."

1.2 Standardization

Whenever you go abroad, you should be very careful about what voltage the country provides; if you bring a hair dryer for 110 volt, be careful in Korea where they use 220 volt normally. What if there is only one voltage system? Of course, you don't have worry about your hair dryer burning.

As similar as the electrical voltage situation, in the IT-related e-Learning system, you should know whether your educational content is suitable for unknown platforms or not. If not, your content is valuable for its compatible platform only. This situation will lead the content developer to make educational contents more suitable for any platforms. On the other hand, if a platform cannot operate your content, it will not be selected to provide the content no matter how excellent it is. That consequently leads the platform vendor to make less money or to make the platform more compatible to any content.

In particular, due to the high cost of producing high quality multimedia education material, there is a great need for widely accessible and re-usable digital content that would either be delivered over telecommunications networks, or stored locally. For such content to be useful, it would need to conform to certain standards.

The main areas of concern in the e-Learning standardization process include architectures and reference model, educational metadata, course structures, student
assessment, content packaging and encapsulation, student management, runtime environments, and other specifications [4].

Until now, there is no e-Learning standard acceptable to everyone, but ADL (Advanced Distributed Learning) has the standard, called SCORM, which could be acceptable to "considerably many" people. ADL considers the following as the requirements of e-Learning standards [5]:

- **Accessibility.** The learning content needs to be available anywhere in the world, not just on a local network or CD-ROM.
- **Interoperability.** The learning content should work on all conformant platforms, browsers, and LMSs -- not for just a handful of products.
- **Durability.** Components developed in current versions of the reference model should work in later versions without people having to redesign or recode content (a.k.a. upward compatibility).
- **Reusability.** Content can be used not just in a single course or lesson, but wherever it's needed. No special codes or links are allowed that would lock content into a specific course or lesson.
- **Adaptability.** Perhaps a longer-term goal, this is the ability of learning content to configure itself based on learning progress or preferences. If that sounds utopian, witness the sophisticated capability of many commercial Websites to adapt to customer behavior. Adaptability means, simply, ways to label content to match learner preferences or skill levels.
- **Affordability.** Meeting the previous goals will eventually reduce production costs for e-learning content and make quality learning widely available at significantly lower costs.

2. INTERNATIONAL TRENDS

This chapter summarizes international activities of e-Learning standardization, including most international standardization organizations such as ISO/IEC JTC1/SC36, IEEE/LTSC, CEN/ISSS, DCMI, AICC, IMS, AICC, PROMETEUS, and ARIADNE, illustrated in Figure 1.
2.1 ISO/IEC JTC1/SC36

SC36 is a subcommittee of JTC1, which is a joint technical committee of ISO (International Organization for Standardization) and IEC (International Electrotechnical Commission) for making international standards. SC36 was formed according to the resolution of the fourteenth JTC1 plenary meeting in Seoul, Korea in November 1999. The first plenary meeting of SC36 was held in London, UK in March 2000 and as of present, it has held six plenary meetings.

2.1.1 What is SC36 [6], [7]

The formal title of SC36 is "Information Technology for Learning, Education, and Training." The main task is standardization in the field of information technologies for learning, education, and training to support individuals, groups, or organizations, and to enable interoperability and reusability of resources and tools. However SC36 does not intend to create standards or technical reports that define educational standards, cultural conventions, learning objectives, or specific learning content.

The National Bodies comprise the membership of SC36. They are either Participating (required to be involved in technical activity; required to vote), or Observing (may be involved in technical activity; no vote). SC36 has twenty National Body members (18 P-members, 2 O-members).

SC36 liaises with other organizations and is aware of related activities so that technical work is harmonized and participants' resources are used effectively. SC36's technical work is performed in Working Groups (WGs), Rapporteur Groups (RGs), and Ad Hoc (AHCs) committees. Figure 2 shows the organization structure of SC36.
2.1.2 Working Groups

There are five working groups (WGs) in SC36; WG1 for vocabulary, WG2 collaborative technology, WG3 learner information, WG4 management and delivery of learning, education, and training (MDLET), and WG5, recently formed, for quality assurance and other frameworks. Each working group has its own terms of reference summarized in Table 2.

<table>
<thead>
<tr>
<th>WGs</th>
<th>Title</th>
<th>Scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>WG1</td>
<td>Vocabulary</td>
<td>Terminology-related standardization for ISO/IEC JTC1/SC36, and its supporting technologies</td>
</tr>
<tr>
<td>WG2</td>
<td>Collaborative Technology</td>
<td>IT-related standardization for collaboration, and its supporting technologies</td>
</tr>
<tr>
<td>WG3</td>
<td>Learner Information</td>
<td>IT-related standardization for information associated with or about learners, and its supporting technologies</td>
</tr>
<tr>
<td>WG4</td>
<td>Management and Delivery of Learning, Education, and Training</td>
<td>IT-related standardization for the management and delivery of learning, education, and training, and its supporting technologies</td>
</tr>
<tr>
<td>WG5</td>
<td>Quality assurance and Descriptive frameworks</td>
<td>not yet announced (former Quality Assurance Ad Hoc Committee)</td>
</tr>
</tbody>
</table>
2.1.3 Other Committees

SC36 has the Marketing Rapporteur Group (RG) for developing and promoting public awareness of SC36. Based upon Adelaide Resolution of the fifth plenary meeting in March 2002, it had established three ad hoc committees: International Standardized Profiles (ISP), W3C Technology Applicability, and Quality Assurance. ISP ad hoc was formed for referencing individual standards or bundles of standards on platform and media profiles. W3C Technology Applicability ad hoc was established for harmonizing standardization development efforts of SC36 with the World Wide Web Consortium. Quality Assurance ad hoc had concerned learner and learning content quality assurance.

According to the resolution of the last plenary meeting held in Lawrence, USA, however, ISP ad hoc committee has become another RG, and Quality Assurance ad hoc committee is succeeded by WG5. Work programs of WG5 address describing and characterizing processes, components, and attributes related to the quality and architecture of IT-supported environments in the field of learning, education, and training [8].

2.2 Major Organizations' Activities

It is very clear that SC36 has the role of developing International Standards (ISs) in information technology in the areas of learning, education, and training. Nevertheless, there have been many other organizations doing similar works. If we may say that SC36 concerns ISs world-wide agreed, other organizations concern recommendations and/or specifications applicable relatively local areas or narrow fields of learning, education, and training. Even though they have not the authority to make ISs, they make a lot of R&D products influencing SC36 and e-Learning industry. This section describes e-Learning standardization activities of major organizations, such as IEEE/LTSC, CEN/ISSS/WS-LT, and DCMI.

2.2.1 IEEE/LTSC [9]

The Learning Technology Standards Committee (LTSC) is chartered by the Institute of Electrical and Electronics Engineers Computer Society Standards Activity Board to develop accredited technical standards, recommended practices and guides for learning technology. The LTSC coordinates formally and informally with other organizations that produce specifications and standards for similar purposes. The LTSC holds quarterly meetings.

LTSC has sixteen working groups and five study groups, among them eight working groups and one study group are relatively active recently. Standards development is done in working groups via a combination of face-to-face meetings, teleconferences, and exchanges on discussion groups. As occasion demands, a study group is approved to become a working group for more intensive works. In Table 3, working and study groups in LTSC are summarized. Major functions of each of the active groups are described below.
P1484.1, the WG for architecture and reference model, has made efforts to develop a framework for understanding exiting and future systems, and identify critical system interfaces for promoting interoperability and portability since May 1997. The glossary WG, P1484.3, has studied for defining the terms used in the other standards for software tools, technologies and design methods that facilitate the development, deployment, maintenance and interoperation of computer implementations of education and training systems since June 1998.

P1484.11, the WG for Computer Managed Instruction (CMI), has made efforts to make standards for the description, listing of contents, and sequencing of the lessons in a course since June 1998. The standards are to allow different lessons to work with different CMI systems, allow courses to move from one CMI system to another with minimal effort (‘course interchange/interoperability’), and allow modification and expansion of a course by any instructor with his/her preferred CMI tools.

Table 3. Working and Study Groups in IEEE/LTSC

<table>
<thead>
<tr>
<th>Group</th>
<th>Name</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1484.1</td>
<td>Architecture and Reference Model WG</td>
<td>G</td>
</tr>
<tr>
<td>P1484.2</td>
<td>Learner Model WG</td>
<td>L</td>
</tr>
<tr>
<td>P1484.3</td>
<td>Glossary WG</td>
<td>G</td>
</tr>
<tr>
<td>P1484.4</td>
<td>Task Model WG</td>
<td>L</td>
</tr>
<tr>
<td>P1484.5</td>
<td>User Interfaces SG</td>
<td>L</td>
</tr>
<tr>
<td>P1484.6</td>
<td>Course Sequencing WG</td>
<td>C</td>
</tr>
<tr>
<td>P1484.7</td>
<td>Tool/Agent Communications WG</td>
<td>M</td>
</tr>
<tr>
<td>P1484.8</td>
<td>Enterprise Interfaces SG</td>
<td>M</td>
</tr>
<tr>
<td>P1484.9</td>
<td>Localization SG</td>
<td>D</td>
</tr>
<tr>
<td>P1484.10</td>
<td>CBT Interchange Language WG</td>
<td>K</td>
</tr>
<tr>
<td>P1484.11</td>
<td>Computer Managed Instruction WG</td>
<td>M</td>
</tr>
<tr>
<td>P1484.12</td>
<td>Learning Object Metadata WG</td>
<td>D</td>
</tr>
<tr>
<td>P1484.13</td>
<td>Student Identifier WG</td>
<td>L</td>
</tr>
<tr>
<td>P1484.14</td>
<td>Semantics and Exchange Bindings WG</td>
<td>D</td>
</tr>
<tr>
<td>P1484.15</td>
<td>Data Interchange Protocols WG</td>
<td>D</td>
</tr>
<tr>
<td>P1484.16</td>
<td>HTTP Bindings WG</td>
<td>D</td>
</tr>
<tr>
<td>P1484.17</td>
<td>Content Packaging WG</td>
<td>K</td>
</tr>
<tr>
<td>P1484.18</td>
<td>Platform and Media Profiles WG</td>
<td>M</td>
</tr>
<tr>
<td>P1484.19</td>
<td>Guide for Application of ISO-9001 to Self-Managed Learning and Knowledge Management SG</td>
<td>L</td>
</tr>
<tr>
<td>P1484.20</td>
<td>Competency Definitions WG</td>
<td>L</td>
</tr>
<tr>
<td>not yet numbered</td>
<td>Digital Rights Expression Language SG</td>
<td>-</td>
</tr>
</tbody>
</table>

G: General group,  L: Learner-related group, D: Data and metadata group  M: Management systems & applications
P1484.12, the WG for Learning Object Metadata (LOM), held its kickoff meeting in December 1996 to develop the standards for specify the syntax and semantics of Learning Object Metadata, defined as the attributes required to fully/adequately describe a Learning Object. Learning Objects are defined here as any entity, digital or non-digital, which can be used, re-used or referenced during technology supported learning. As the result of the WG's efforts, the 1484.12.1 LOM has been approved as an IEEE-SA standard in June 2002.

P1484.14, the WG for Semantics and Exchange Bindings, held its first meeting in March 1999. The predecessor of the WG was the study group approved for integration of CMI and LOM. The WG has made three working drafts of guidelines for binding techniques and data extension techniques. The WG for Data Interchange Protocols, P1484.15, has studied for defining a protocol and semantics that can easily be implemented in networking applications and can easily be bound to APIs since March 1999.

P1484.18, the WG for Platform and Media Profiles, has made efforts to make standards for the description. The predecessor of the WG was the study group approved for integration of CMI and LOM. The WG has made three working drafts of guidelines for binding techniques and data extension techniques. The WG for Competency Definitions, P1484.20, was formed in March 2000 in order to specify the mandatory and optional data elements that constitute a competency definition as used in a learning management system. The Digital Rights Expression Language (DREL) study group is one of active study groups in LTSC. It has just formed to study the best approach to a DREL for learning technology.

2.2.2 CEN/ISSS/LTWS [10]

CEN is the European Committee for Standardization whose mission is to promote voluntary technical harmonization in Europe in conjunction with worldwide bodies and its partners in Europe. CEN/ISSS (Information Society Standardization System) was created in mid-1997 by CEN for providing market players with a comprehensive and integrated range of standardization-oriented services and products, in order to contribute to the success of the information society in Europe. CEN/ISSS has operated several workshops for the information and communication fields such as electronic commerce, e-Business, electronic signatures, knowledge management, and learning technologies as well. In March 1999, CEN/ISSS/LTWS (Learning Technologies Workshop) held the kick-off meeting.

The workshop's objective is to encourage the effective development and use of relevant and appropriate standards for learning technologies for Europe by encouraging participation in global initiatives, creating specifications, agreements, guidelines or recommendations, providing a forum for the development and implementation of requirements-driven learning technologies, and so on. The workshop proposes and elaborates work items. Recent work items includes the followings:
(1) Internationalization of the IEEE Learning Object Metadata (LOM)
This work item is standardization work that will lead to the internationalization of
IEEE LOM, taking into account European specificities and requirements. Localization refers to the process of mapping the international version into local cultures.

(2) Availability of alternative language versions of a learning resource in LOM
The workshop identifies this topic as one of the high priority requirements for standard-related activity in relation to learning technologies. As a response to this requirement, the workshop has initiated a work item, in the context of which a report on standardization actions that permit the identification of alternative versions of resources, in different languages, as well as the origin of the translation in metadata based on the IEEE/LTSC LOM specification, is expected.

(3) Translation and localization of LOM into other EC languages
This work item is for translations of the current version of LOM into German, French, Spanish and Catalan already exist, and are available from the CEN/ISSS website.

(4) Description of language capabilities
This is a standardization action to define a European specification describing language capability, e.g. for incorporation into interpersonal communication tools and learning resource metadata.

(5) Educational copyright license conditions
This work item is for establishing educational copyright license conditions. It will be done by collecting a collection of European and American best practice regarding educational copyright licenses, determining what scope there is for standardization of current educational copyright licenses and how best practice and associated business processes may change to take account of relevant technical developments, and extending current copyright license schemes and best practice to handle new media and new uses.

(6) Quality assurance and guidelines
The workshop has concluded that a prescriptive regimentation, especially when dealing with stylistic or pedagogical issues, may never be appropriate and would definitely be premature at least. The definition of descriptive elements of the production or learning process can however be investigated. The objective is therefore to define a work item for standards, guidelines and codes of practice for quality description and assurance during the lifecycle of a learning resource.

(7) A central repository of taxonomies and vocabularies
This work item is for collecting and organizing a register of taxonomies and vocabularies relevant to a European learning society, via an on-line repository. This will benefit interoperability between European learning technology systems and services of metadata implementations using standardized taxonomies and vocabularies.

(8) Extended work items
Subjects like collaborative learning, learner information, and educational modeling languages have been identified as new areas for further work. Initial work on each of these subjects will take place. In addition, it is likely that other subjects will emerge
during the workshop's lifetime, which may also be added to its work items.

2.2.3 Dublin Core Metadata Initiative [11]

The Dublin Core Metadata Initiative (DCMI) is an organization dedicated to promoting the widespread adoption of interoperable metadata standards and developing specialized metadata vocabularies for describing resources that enable more intelligent information discovery systems. The original workshop for the Initiative was held in Dublin, Ohio in 1995. Hence, the term "Dublin Core" has been in the name of the Initiative. Since that time, there have been nine workshops held in England, Australia, Finland, Germany, Canada, Japan and the United States.

The Dublin Core has become an important part of the emerging infrastructure of the Internet. Many communities are eager to adopt a common core of semantics for resource description, and the Dublin Core has attracted broad ranging international and interdisciplinary support for this purpose.

DCMI Working groups are organized around specific problem domains. Working groups are formed and dissolved as dictated by the work at hand and the availability of expertise to accomplish such work. Special Interest groups are similar to working groups. They are organized around specific problem domains and have chairs and co-chairs. Special interest groups provide a forum for discussions that might lead to metadata conventions that support the common goals of their specific community. Currently active working groups and special interest groups are summarized in Table 4.

<table>
<thead>
<tr>
<th>Group Title</th>
<th>Goal</th>
<th>Formed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administrative Metadata WG</td>
<td>To propose an element set for the management of metadata</td>
<td>2000-10-06</td>
</tr>
<tr>
<td>Agents WG</td>
<td>To develop a commentary and a recommendation for an agent record and an agent element set</td>
<td>1998-11-04</td>
</tr>
<tr>
<td>Architecture WG</td>
<td>To develop a model, strategy and roadmap for the practical deployment of Dublin Core metadata using mainstream Web technologies</td>
<td>2000-10-06</td>
</tr>
<tr>
<td>Citation WG</td>
<td>To agree on mechanisms for providing a DC-compliant set of metadata elements for recording bibliographic citation information</td>
<td>1998-11-04</td>
</tr>
<tr>
<td>Collection Description WG</td>
<td>To develop a Dublin Core-based application profile for collection description</td>
<td>2000-10-06</td>
</tr>
<tr>
<td>Education WG</td>
<td>To continue discussion and development of proposals for the use of Dublin Core metadata in the description of educational resources.</td>
<td>1999-08-09</td>
</tr>
<tr>
<td>Government WG</td>
<td>To promote use of DC within government agencies considering developing metadata-based information services.</td>
<td>1999-10-25</td>
</tr>
<tr>
<td>Libraries WG</td>
<td>To foster increased operability between DC and library metadata by identifying issues and solutions</td>
<td>1999-10-25</td>
</tr>
</tbody>
</table>
### Registry WG

To develop a metadata registry providing authoritative information regarding the DCMI vocabulary  
1999-12-15

### Standards WG

To involve in various standardization efforts and to monitor the progress of the Dublin Core as it makes its way through the different standards processes  
1998-11-04

### Tools WG

To support planning and discussion for workshops devoted to developing tools and applications based on Dublin Core Metadata  
2001-03-06

### Type WG

To review DCMI Type Vocabulary and propose any needed additions, and to produce best practice guidelines to develop users' own type vocabularies for use within Dublin Core  
1998-11-04

### User Guide WG

To maintain using Dublin Core including user guide publication  
1997-10-08

### Accessibility SIG

To consider the accessibility of DCMI products - website, tools and recommendations  
2001-10-25

### Business SIG

To promote the use of Dublin Core in internal and cross-company business environments; and discuss the possible expansion of Dublin Core for the future commercial requirements and uses.  
2000-10-06

### Environment SIG

To provide a forum for individuals and organizations involved in implementing Dublin Core in the environmental domain  
2001-10-27

### Localization and Internationalization SIG

To share information and knowledge gained from experiences in local or domain-specific applications of Dublin Core with global community  
1997-10-08

#### 2.3 Other International Activities

##### 2.3.1 ADL [12]

The US government ADL (Advanced Distributed Learning) initiative started originally in 1997 within the US Department of Defense (DoD) to develop a DoD-wide strategy for using learning and information technologies to modernize education and training and to promote cooperation between government, industry and academia to develop e-learning standardization. The ADL Initiative has defined high-level requirements for learning content, such as content reusability, accessibility, durability and interoperability to leverage existing practices, promote the use of technology-based learning and provide a sound economic basis for investment.

Through the coordination of private-sector and public-sector working groups, the ADL community is preparing tools, specifications, guidelines, policies and prototypes of learning content that are "RAID:"

- Reusable: easily modified and used by different development tools,
- Accessible: can be searched and made available as needed by both learners and content developers,
- Interoperable: operates across a wide variety of hardware, operating systems and web browsers, and
- Durable: does not require significant modifications with new versions of system software.

The well-known product of the ADL is the Sharable Content Object Reference Model (SCORM), which defines a web-based learning "Content Aggregation Model" and "Run-Time Environment" for learning objects. The SCORM, first released in January 2000, is a collection of specifications adapted from multiple sources to provide a comprehensive suite of e-learning capabilities that enable interoperability, accessibility and reusability of web-based learning content. It applies current technology developments to a specific content model by producing recommendations for consistent implementations by the vendor community. The reference model is built upon the work of the AICC, IMS, IEEE, ARIADNE and others to create one unified "reference model" of interrelated technical specifications and guidelines. The SCORM includes aspects that affect learning management systems and content authoring tool vendors, instructional designers and content developers, training providers and others.

Approximately twice a year, the ADL Co-Laboratory sponsors Plugfests to bring together early adopters of the SCORM. Plugfests are a series of events validating and documenting progress in meeting the collective requirements of reuse, adaptability, interoperability, cost-effectiveness and global access of learning content. The goal of the Plugfest is to provide participants with a forum for sharing their experiences in converting instructional products to conform with SCORM specifications and help make them more robust. The ADL Plugfest 7, scheduled in December 2002, will focus on the further development of the SCORM Version 1.3 Sequencing and Application Profile and content or systems that have been updated to implement the SCORM Version 1.3.

2.3.2 IMS Global Learning Consortium [13]

The original name of this initiative was the Instructional Management Systems (IMS) project. Over time, it became clear that the term "instructional management systems" raised more questions than it answered. So, they usually just call the organization IMS. IMS originated in 1997 in the US with its membership drawn from academic and commercial organizations. It has quickly grown to include international participation and its investment membership has broadened to include content developers and government agencies. IMS has over 200 "developers network" members that review and use IMS-developed specifications. IMS specifications are aimed at delivering interoperability for systems that support online learning, education and training.

IMS has two key goals: 1) defining the technical specifications for interoperability of applications and services in distributed learning, and 2) supporting the incorporation of the IMS specifications into products and services worldwide. IMS endeavors to promote the widespread adoption of specifications that will allow distributed learning environments and content from multiple authors to work together (in technical parlance, "interoperate").
The scope for IMS specifications, broadly defined as "distributed learning," includes both online and off-line settings, taking place synchronously (real-time) or asynchronously. This means that the learning contexts benefitting from IMS specifications include Internet-specific environments such as web-based course management systems, as well as learning situations that involve off-line electronic resources such as a learner accessing learning resources on a CD-ROM. The learners may be in a traditional educational environment (school classroom, university), in a corporate or government training setting, or at home.

IMS has intended to establish the critical aspects of interoperability in the learning markets. Based on these requirements, it develops draft specifications outlining the way software must be built in order to meet the requirements. In all cases, the specifications are being developed to support international needs. Once the specifications are finalized internally and have been proven tested through interoperability trials, the draft specification is formally approved by the IMS technical board and then released to the public. IMS specifications are made available free of charge to the general public, regardless of whether or not they are members of IMS, once the technical board approves their release.

IMS operates nine working groups currently: Meta-data Team, Content and Management Systems Team, Re-usable Competency Definition Team, Profiles/Enterprise Team, Learning Design Team, Question and Test Interoperability Team, Accessibility Team, Simple Sequencing Team, and Digital Repositories Team. Among their works, ‘the IMS Enterprise v1.1’ is a final specification, which is about Enterprise Information Model, Enterprise XML Binding Specification, and Enterprise Best Practices and Implementation Guide. ‘The IMS Content Packaging Specification' provides the functionality to describe and package learning materials, such as an individual course or a collection of courses, into interoperable, distributable packages. ‘The IMS Learner Information Package Specification' addresses the interoperability of internet-based Learner Information systems with other systems that support the Internet learning environment. And ‘the IMS Digital Repositories v1.0' is a public draft specification, which is to provide recommendations for the interoperation of the most common repository functions.

2.3.3 AICC [14]

The Aviation Industry CBT (Computer-Based Training) Committee (AICC) is an international association of technology-based training professionals. This consortium has existed since 1988 and focuses on a particular user community: the aviation industry. The objectives of the AICC include not only assisting airplane operators in development of guidelines, which promote the economic and effective implementation of computer-based training (CBT), but also providing an open forum for the discussion of CBT (and other) training technologies, and as well as developing guidelines to enable interoperability.

The AICC has developed technical specifications, known as AGRs (AICC Guidelines & Recommendations), such as AGR-002 (Platform guidelines for CBT
delivery), AGR-003 (A DOS-based digital audio guideline), AGR-006 (A guideline for
CMI interoperability), AGR-010 (A guideline for CMI interoperability in web-based
CBT), and so on. This organization has also developed formal certification testing
procedures for the CMI related AGR's (AGR-006/AGR-010) and currently offers
certification testing for both CMI systems and CBT courseware. But the other seven
AGR's have no formal tests so far.

2.3.4 PROMETEUS [15]

PROMETEUS (PROmoting Multimedia Access to Education and Training EUropean Society), was launched in March 1999 under the sponsorship of the European Commission with the aim of promoting multimedia access to education and training throughout European society, and has evolved since then to encompass the whole range of technology-assisted learning.

The Memorandum of Understanding (MoU), which governs the overall activities of
PROMETEUS, defines the main goal of PROMETEUS as being to support effective
use, take-up, research and development in the field of technology-enabled learning. It
goes on to state that this will be achieved by creating a European forum and a global
knowledge resource dedicated to identifying, sharing and disseminating knowledge and
best practices relating to all significant activities in this field, and to identifying any
gaps in knowledge, experience, capability and tools across Europe.

The major issues the Special Interest Groups (SIGs) within PROMETEUS try to
address are reusability and interoperability, metadata for learning contents, quality
compatible with ISO9000, legal issues, multilingualism, multiculturalism, and
accessibility issues. The outputs from the SIGs could be in the form of Guidelines, Best
Practice Handbooks, Recommendations to Standards Bodies, or Recommendations to
National and International Policy Makers.

2.3.5 ARIADNE [16]

The ARIADNE (Alliance of Remote Instructional Authoring & Distribution
Network for Europe) Foundation was created to exploit and further develop the results
of the ARIADNE and ARIADNE II European Projects, which created tools and
methodologies for producing, managing and reusing computer-based pedagogical
elements and telematics supported training curricula. Validation of the tools and
concepts took place in various academic and corporate sites across Europe.

An important contribution was made to the developing body of educational
standards by ARIADNE, in the form of the ARIADNE Educational Metadata
specification, which was one of the main ingredients in the creation of the emerging
IEEE/LTSC LOM Standard. Since December 1997, ARIADNE has been involved in
standardization activities performed under the auspices of the IEEE/LTSC. In this
context, ARIADNE has agreed to collaborate with the US funded IMS Project, in view
of reaching as quickly as possible an educational metadata set that would be widely
ARIADNE is also active in the standardization activities initiated by the European Commission, taking place under the auspices of the ISSS/CEN/LTWS. ARIADNE has recently established cooperation with the ADL Initiative US Project, whose SCORM specification relies on the LOM metadata.

ARIADNE's concept of computer-based and telematics-supported education relies primarily on an international system of interconnected knowledge pools (the KPS). Prototypes of the tools and basic methodologies for maintaining and exploiting the KPS, in all forms of classical, continuing, open and distance education or training have been developed and tested in ARIADNE, stressing the value of share and reuse. Continued maintenance and training in the use of ARIADNE's best tools, as well as their further development will consolidate and augment the Users Community.

3. ACTIVITIES IN ASIA

3.1 ALIC

ALIC (Advanced Learning Infrastructure Consortium) is a Japanese initiative focusing on research, development, application and promotion of Advanced Learning Infrastructure including learning technology specifications, tools, systems, and methodologies. ALIC was established in April 2000 and has more than 500 members from more than 300 industries and academic organizations. ALIC, which is intimately cooperating with the Japanese NB, has many overlapping participants serving as SC36 domestic committee members [7], [17].

ALIC's activities cover prototype system implementation based on the standards, trial application of the standards, development of new standards, and promotion of the existing standards. Library modules and test tools are designed and implemented based on WBT content standard, called SCORM, developed by ADL. It conducted interoperability experiment exploiting these software modules and tools. Application of LOM specification to school education and enterprise human resource development has been investigated. It is also trying to develop new specifications for collaborative learning. Other activities include publishing guidelines for end users to apply standards, and seminars to promote standards. Activities and future plans of ALIC will be described in the presentation [18].

ALIC is managed as part of IPA (The Information-technology Promotion Agency), the special approval corporation of Ministry of Economy, Trade and Industry Business. Having studied the advanced learning infrastructure, the consortium is about to develop specifications for content reuse and the interoperability of learning systems, especially for collaborative learning.

ALIC has three technical committees; Interoperability Committee, Advanced Technology Committee, and Content Committee. To improve interoperability of
learning system and content reuse, Interoperability Committee has studying for development of guidelines, specifications for test beds and prototypes, especially for the operability of Japanese learning systems so far. The committee is administrated in accordance with the e-Learning Consortium Japan, which has made actual progress related to interoperability. To study on the infrastructure of the next generation, Advanced Technology Committee has contributed to global standardization by submitting proposals and drafting standards, and developed prototypes based on global standards and specifications, especially in related with collaborative learning. Content Committee has examined how to educate by e-learning in company and school, made clear users needs about e-learning, and developed quality evaluation standard about e-learning [17].

In addition to the ALIC, Japanese activities for e-Learning standardization include the e-Learning Consortium Japan and several websites such as the e-Learning Portal Site "Learning Technology Network (LTN)" [19].

4.2 AEN

AEN (Asia e-Learning Network) Conference 2002 was held on July 24-25th, 2002 in Tokyo, Japan. The representatives from 12 countries adopted the AEN Tokyo Statement, announcing they had agreed to establish the Asia e-Learning Network, a knowledge network for promoting e-Learning in the region. The 12 countries are Brunei Darussalam, Cambodia, Indonesia, Japan, Lao PDR, Malaysia, Myanmar, Philippines, Republic of Korea, Singapore, Thailand, and Vietnam (Table 5) [20], [21].

<table>
<thead>
<tr>
<th>Country</th>
<th>Participating Organization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brunei</td>
<td>Ministry of Education&lt;br&gt;Universiti Brunei Darussalam</td>
</tr>
<tr>
<td>Cambodia</td>
<td>Offices of the Council of Ministers Prime Minister's Office&lt;br&gt;Ministry of Posts and Telecommunication</td>
</tr>
<tr>
<td>Indonesia</td>
<td>Directorate of Information Technology and Electronics Industry&lt;br&gt;Technical Education Development Center (TEDC) Bandung</td>
</tr>
<tr>
<td>Japan</td>
<td>Ministry of Economy, Trade and Industry (METI)&lt;br&gt;Advanced Learning Infrastructure Consortium (ALIC)</td>
</tr>
<tr>
<td>Lao PDR</td>
<td>Science Technology and Environment Agency&lt;br&gt;Sengsavanh College</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Multimedia University&lt;br&gt;Unitem Coren University of Malaysia (UNITEM)</td>
</tr>
<tr>
<td>Myanmar</td>
<td>Ministry of Science &amp; Technology&lt;br&gt;Myanmar Computer Industries Association</td>
</tr>
<tr>
<td>Philippines</td>
<td>Commission on Higher Education&lt;br&gt;De La Salle University</td>
</tr>
<tr>
<td>Korea</td>
<td>Ministry of Commerce, Industry &amp; Energy&lt;br&gt;Ewha Womans University</td>
</tr>
<tr>
<td>Singapore</td>
<td>Nanyang Technological University (NTU)&lt;br&gt;E-Learning Competency Centre (ECC)</td>
</tr>
</tbody>
</table>
The main purposes of the AEN are to share information on the latest e-learning trends and technologies, promote interoperability and resource sharing of e-learning systems and contents, and promote the spread of knowledge on the effective use of e-learning. In pursuing the above-mentioned purposes, member countries are expected to build closer cooperation among government, academic and business sectors in each country, promote the exchange of information, know-how, experiences, and best practices in real or virtual form, and carry out joint projects and share the results with member countries.

In that context, six countries presented summary reports of situation revolving around e-Learning in each country, and there were interim reports about several joint experimental projects summarized in Table 6 [21].

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Participating Countries</th>
</tr>
</thead>
</table>
| MJeN (Malaysia - Japan e-Learning Network Project)                           | Japan (Kyoto University / Waseda University)  
Malaysia (Multimedia University)  
(Vendor: NTT-X)                                                                   |
| International Experiment Project of Asynchronous Collaborative-learning Method | Japan (Aoyama Gakuin University)  
Philippines (De La Salle University)  
(Vendor: Nihon Unisys, Ltd.)                                                      |
| Issues around E-government and E-commerce in Singapore and Japan              | Japan (The University of Tokyo / National Institute of Multimedia Education)  
Singapore (Nanyang Technological University)  
(Vendor: IBM Japan, Ltd.)                                                           |
| Synchronous and Asynchronous Distance Education of Graduate Programs between AIT and Tokyo Tech. | Japan (Tokyo Institute of Technology)  
Thailand (Asian Institute of Technology)  
(Vendor: Hitachi Electronics Services Co., Ltd.)                                 |
| Network Campus Initiative for Asia e-Learning                                | Japan (Keio University)  
Vietnam (Vietnam National University / Hanoi University of Technology)  
(Vendor: Hitachi, Ltd.)                                                          |

4. KOREAN ACTIVITIES

4.1 The Recent Situation of e-Learning in Korea

Statistically speaking, 25 million people (53% of population) use the Internet as of
December 2001; about 8 million (54% of total households) has subscribed in high-speed broadband Internet service as of January 2002; 5.3 million students and teachers has been enrolled in EDUNET, the biggest educational information network service system mainly for K-12 education in Korea; over 20,000 college students are studying in 15 legal Cyber Universities; over 35,000 workers every year attend information technology courses with fund supported by Employment Insurance Refund Policy of Ministry of Labor, and so on.

As same as in the world trend, e-Learning business in Korea is considered as the promising knowledge-intensive industry, which has a huge growth potential as the next-generation Internet business. The size of e-Learning market in Korea is illustrated in Table 7 [22]. It is reported that the size would reach US$ 1,417 millions, two times as large as that of the game industry (US$ 690M), and five times of the movie industry (US$ 275M). Given the spread of the Internet and a high zeal for education, the e-Learning industry would continue an annual average growth of 32.5% (48% for contents business, 37% for solutions, and 11% for learning services) [23].

Table 7. Market Size of e-Learning in Korea

<table>
<thead>
<tr>
<th>Year</th>
<th>1999</th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Size</td>
<td>683</td>
<td>833</td>
<td>1,167</td>
<td>1,417</td>
<td>2,083</td>
</tr>
</tbody>
</table>

Since late 1990s, large enterprises have taken e-Learning programs, now 37% of 1,000 companies are operating e-Learning programs, which are deliver such contents as foreign languages, business administration, information technology, and so on.

In these e-Learning fields, however, dozens of learning management systems and authoring tools are individually used. Furthermore, a new product with less interoperability is released almost every month. In order to reduce the huge efforts to a minimum and avoid duplicate investments for developing such "not-interoperable" e-Learning products, it becomes most important issues for the government and NGOs as well to develop and provide standards to venders and content developers.

4.2 Governmental Activities

e-Learning business using information technology is expected leap into prominence along with some governmental supports such as Policy on Boosting e-Learning Industry and Encouraging e-Learning of Ministry of Commerce, Industry and Energy (MOCIE), Internet Practical Use Policy of Ministry of Information and Communication (MOIC), the Internet Communication Training Program of Ministry of Labor (MOL), and Cyber University Foundation Law of Ministry of Education and Human Resource Development (MOEHRD) [24], [25], [26], [27].

Having provided nation-wide communication infrastructure for high-speed Internet, MOIC keeps on trying to supply more comfortable Internet services. It has been
promoting Internet technologies and contents development, including e-Learning fields, for Korea Information Infrastructure (KII). The ministry has pushed forward e-Korea project since 1996, and e-Campus (Information and Communication University) project as well [25].

Employment Insurance Refund Policy of MOL keeps workers trained to easily adjust themselves to information technologies such as XML, Java programming, and webmaster courses. For this purpose, it operates Korea Research Institute for Vocational Education & Training (KRIVET) and Human Resource Development network (HRDnet) [28], [29]. MOEHDR has carried out The Master Plan of Adapting Education to the Information Age since 1997. In this section, some activities of MOCIE related to e-Learning standards development are described [27].

4.2.1 Korea SC36 Mirror Committee

In April 2001, Korea Agency for Technology and Standards (KATS) of Ministry of Commerce, Industry and Energy (MOCIE) decided to establish the mirror committee to ISO/IEC JTC1/SC36 [30]. This committee is composed of twenty persons from industry and academic, and holds the regular meeting bimonthly. Among the other mirror committees in KATS, SC36 is one of the most active committees, even though its history has just begun.

Providing guidelines of standards development, and having authority to vote some local standards as draft KSs (Korea Standards), the committee leads and impacts on Korea e-Learning standards development. The committee operates four WGs; Collaborative Technology WG, Learner Information WG, Management and Delivery of Learning, Education, and Training WG, and Quality Assurance and Descriptive Frameworks WG.

4.2.2 Policy on Boosting e-Learning Industry and Encouraging e-Learning

In June 2002, MOCIE laid down a detail plan for e-Learning industry promotion. Some of practical projects are listed up in this plan, such as
- Establishment of e-Learning Infrastructure
- Expansion of e-Learning in public sector
- Improvement of legal framework to facilitate e-Learning, and
- Construction of an e-Learning network composed of representatives from industry, academic, and government [22], [24].

Among these practical projects, MOCIE gives higher priority in action to the establishment of e-Learning Infrastructure, and this project includes supporting e-Learning technical standards development, and bringing up e-Learning experts.

To support standards development, MOCIE provides some fund to experts from industry, academic, research centers, and government to establish a kind of e-Learning standardization forum. The forum is expected to make a long-term roadmap for
standards developments taking account of domestic circumstance. In the same context, MOCIE changed Korea status in ISO/IEC JTC1/SC36 from O-Member to P-Member as of July 2002. Furthermore, the Ministry will support technology development for data exchange and e-Learning solutions with some portion of MOCIE budget (about 10 million US$) for technology development projects in the year of 2003. "Learning Contents Management System (LCMS) based on XML Metadata" is one of projects being carried on in 2002, and two or three e-Learning technology development projects will be carried out in 2003 [23].

To bring up e-Learning experts, the Ministry will select six or more universities equipped with professional skill and provide them with some fund in order to develop e-Learning contents and media of high quality and human resources as well.

Furthermore, to help e-Learning take root in the overall society, the Ministry tries to improve the institutional environment, revising the laws concerned like copyright law, set up civilian organizations, which will take in charge of the market survey, and organize a consultative body among industrial, educational, and research groups.

4.3 Nongovernmental Activities

Speaking about e-Learning standardization in Korea, some of typical nongovernmental activities are described in this section, but the following activities could be paid attention:
- Korean companies such as Hanvit Net, Mediopia Technology, Samsung SDS has got the standard certification from AICC,
- KERIS (Korea Education & Research Information Service) is developing a metadata specification of educational information, and
- Knowledge Information Technology Co. is developing a domestic technical standard of "Interactive Content Model" for e-Learning.

4.3.1 e-Learning Contents Standardization Forum

In order to provide an information sharing space for participants and promote e-Learning standards development, e-Learning Contents Standardization Forum (e-LCSF) held the kick-off meeting in October 2002. Major objectives of the e-LCSF include the following:
- To support domestic activities of e-Learning technology standards development,
- To provide an network for sharing information of standards development,
- To harmonize domestic standards development with international activities, and
- To certify domestic standards and consult about e-Learning technology standards development.

The forum has set up three subcommittees (SCs) such as Contents Sharing SC, Metadata SC, and Learning Objects SC. These SCs are mainly composed of participants
having practical business ability in order to obtain cooperation from each other [31].

4.3.2 Korea e-Learning Industry Association

In order to promote e-Learning industry and provide an information sharing space for participants, Korea e-Learning Industry Association (Ke-LIA) held its kick-off meeting in September 2002. Ke-LIA consists of over 40 organizations from e-Learning-related companies, universities, and research centers, including Korea Education & Research Information Service (KERIS), Korean Educational Development Institute (KEDI), Korean University Alliance for Cyber Education (KUACE), and Korea National Open University (KNOU) as special members [32].

The Association has four subcommittees (SCs): International Cooperation SC, Technology SC, Contents Promotion SC, and Policy Development SC. Fully cooperating with the government, Ke-LIA intends to promoting e-Learning business projects, harmonizing with standardization activities and joint e-Learning technology development, and expanding the oversea market. One of good example of Ke-LIA's efforts is Korea e-Learning 2002, an industry promoting conference scheduled in November 2002, for boosting nation-wide interest in e-Learning.

Furthermore, the Association will concentrate its energy on e-Learning standardization by operating an e-Learning Technical Standards Forum and establish e-Learning Standard Research Center in the near future.

4.3.3 Korea Education & Research Information Service

Korea Education & Research Information Service (KERIS) has provided educational information to teachers, students, and parents since April 1999. The main purpose of KERIS is to provide an open & flexible venue to learn, promote lifelong learning, and to develop educational resources through up-to-date information and communications technologies [33].

Succeeded to Korea Education Development Center, KERIS has developed and managed the EDUNET (EDUcational NETwork) since September 1996. As of June 2002, 5.3 million have enrolled as member of the EDUNET, the biggest educational information network service system in Korea [34]. Furthermore, it has provided universities and research centers with research information services, and K-12 schools with School Information Management System services. The other important projects include quality certification of education software, provision of educational multimedia data, and operation of APEC Cyber Education Network (ACEN), which is a transnational educational network that helps reduce educational gaps in terms of learning resources, expertise, and pedagogy [35].

For efficient management of content development, KERIS has been working on e-Learning standardization. It has analyzed international standardization policies and studied on the requirements of domestic e-Learning standards, followed by currently submitting a proposal, "Educational Information - Metadata Specification," to Korea
SC36 for considering as a Korea Standard (KS).

4.3.4 KNOU and Its Activities

Korea National Open University (KNOU), one of the ten mega-universities in the world [36], has 800 faculty and staff members and more than 200,000 students from throughout the country, covered by 14 regional campuses and 35 study centers. The university has operated a videoconferencing system connecting 14 campuses and 2 major study centers, and a satellite broadcasting TV station (OUN: Open University Network) covering the whole country and parts of China and Japan [37].

To go with this kind of hardware facilities, the university has needed a flexible, collaborative, and interactive software solutions enabling e-Learning both within and outside the classroom. The university has been trying to provide a variety of educational media such as textbook, audio, video (broadcasted and/or digitalized), multimedia data, web-based instructional data, with the Internet tools such as email, BBS, discussion room (a web-based forum), chatting room, and so on. Digital Library is one of most successful achievements of KNOU in the last decade. Furthermore, the graduate school of KNOU is being operated by e-Learning contents only, except a few of workshops. e-Learning contents have been developed and managed by Cyber Education Support Center (CESC) [38].

As the first university using Internet technology and digital library for new educational media in the country, KNOU has played an important role in Korea e-Learning and its standards development.

Fist of all, KNOU is very famous as a leader in the future of distance education in Korea. The university has been participating in two Cyber Universities: Korea Virtual Campus (KVC) [39] and Information and Telecommunication University (ITU, or called e-Campus) [40], which are composed of 10 and 16 universities across the nation, respectively. KNOU has proved excellence in educational contents in KVC, with its 'Korean Costumes' course selected as "Best Teacher" for the first semester of 2001. Furthermore, KNOU has been operating the Cyber Educational System for ITU as the head university of the Association of ITU since it has established.

Speaking of Korea e-Learning standards development, several members of KNOU have done many efforts in that field. Dr. Duk-Hoon Kwak is working as the acting chair of Korea SC36 Mirror Committee and as the chair of the Steering Committee of the e-LCSF. The other faculty members are also working as conveners or acting chairs of some working groups for e-Learning standards development.

Having developed several excellent contents, CESC has considered e-Learning standard very important to create, manage, adopt, and reuse its contents efficiently. The center is developing a guideline for faculty members to produce educational contents interoperable to as many platforms as they could be operated on. CESC is also trying to improve the platform it has used so far by applying such e-Learning standards as ADL's SCORM ver.1.2, IEEE LOM, and so on.
5. SUMMARY AND THE SUGGESTION

5.1 SUMMARY

e-Learning is an online education through the computer networks (the Internet or local intranet), providing educational services by taking advantage of information technology. Recently, e-Learning industry has become in the spotlight as the next generation Internet business, and many governments and companies have intended to focus their energy on promoting and developing e-Learning.

e-Learning standardization activities of as many organizations as possible were described in this paper from international to Korean ones. The most important reason why such many organizations have paid attention to e-Learning standardization is the need of "RAID-ness" of e-Learning systems is strongly rising. This need is essential and minimum requirements for content developers, software and hardware venders, and users of the system to have mutual benefits without redundant development costs.

There is no e-Learning standard acceptable to everyone, however, SCORM and IEEE LOM have become acceptable to "considerably many" people. For example, IEEE Standards Association announced on June 13, 2002 that it approved the Standard for Learning Object Metadata (LOM), which is currently in the IEEE ballot process to become an IEEE Standard [9]. IEEE/LTSC presented the first accredited standard for gathering support from the National Bodies in the last Plenary Meeting of ISO/IEC JTC1/SC36 in September 2002 [8].

In the mean time, a knowledge network for promoting e-learning in Asia, called AEN, put up its sail in July 2002. Even though it is frail now, its establishment should be considered as an important step to the Asian e-Learning industry. We, members of AAOU, need to establish and participate this kind of knowledge networks so that e-Learning may much enhance our education systems especially for Open Universities in Asia.

5.2 THE SUGGESTION

This paper concludes by making a suggestion that an e-Learning Promotion Division be established in AAOU so that every Asian Open University (AOU) can exchange and share information and make mutual cooperation in e-Learning. The Division will be expected to become an e-Learning Hub providing AOU's with educational and technical supports so as to march altogether to the much enhanced Distance and Lifelong Learning Society.

While the goals and objectives of the Division could be discussed in this conference or in a steering committee, it would be better to include the following:
- Building AAOU e-Learning community
- Sharing IT knowledge, know-how, and experience by using the Internet or through actual meetings.
- Developing e-Learning contents so reusable, accessible, interoperable, and durable that Open Universities in Asia can use them (For example, "Asian Culture" is one of good contents to be developed, available to students of universities in not only the Asian region but also in other regions as well.)
- Carrying out practical joint projects and making examples of best practices

REFERENCES

Dr. Jin Gon Shon received the B.S. degree in mathematics and the M.S. and Ph.D. degrees in computer science from Korea University, Seoul, Korea, in 1984, 1988, and 1991, respectively. Since 1991, he has been with the Department of Computer Science, Korea National Open University (KNOU), Seoul, Korea. He had been a Visiting Professor at State University of New York (SUNY) at Stony Brook, USA. His research interests are in protocol engineering, distributed and mobile computing, fault-tolerant systems and ITLET (Information Technology for Learning, Education, and Training) as a committee member of ISO/IEC JTC1/SC36.

Dr. Shon has published over 30 scholarly articles in the noted journals and written several books on computer science. After serving a Dean of Gangwon Campus, he is now working as the Director of the Information & Computer Center and the Head of Cyber Education Support Center (CESC) in KNOU.