

A Service-Oriented Elearning Architecture: LETSI's Vision of the Future of CMI

CMI stands for Computer Managed Instruction. The name itself implies an education market composed of only two product categories: learning management systems (an enterprise software category) and instructional content (created, presumably, by authoring tools). LETSI foresees an explosion of new products and services: enterprise software, websites, and mobile apps. CMI makes other implicit assumptions that are no longer valid in large parts of the learning technology world:

Current Assumptions	LETSI's Vision
A learning activity involves one learner, and nobody else.	Immersive team training, collaborative learning. Teachers, parents, and private tutors monitor and coach online learners.
Every learner has an institution, and each institution has an LMS.	Self-directed learners with multiple institutional ties. Integrated web apps instead of enterprise apps in schools.
The LMS controls access and entitlement to learning activities.	Launch learning anywhere and synch with LMS. Entitlement via learner's institutions or personal purchase.
Content is delivered to the LMS as a package containing files and descriptive metadata.	Advanced learning activities on websites or mobile apps. Publishers & aggregators help teachers and learners find, preview, buy, customize, and organize.
Each LMS has a player for each package format (SCORM, AICC, CC), so that courses appear the same on all products, theoretically.	Complex offerings, like immersive, mobile, adaptive, and team activities, are created and hosted on the web, not packaged for the different LMSs.
The LMS launches all learning activities locally, and all data communication is local.	Data is communicated among the LMS, online learning activities, and other management applications across the web.
The LMS stores all the data about the learner's history, preferences, and proclivities.	Adaptive systems, publishers, and aggregators store and share much more learner data than just scores – give useful feedback to learners and teachers.
The LMS is the only application that will record progress and performance data from the activity, or store data between sessions.	Teachers and tutors use web apps to manage rosters, lesson plans, grade books, and administrative reports. Learner controls access to his data.

LETSI's mission is to shorten the adoption cycle for innovations in elearning: new products, teaching methods, and business models. Several generations of innovation, each building on top of the others, will be required to bring elearning as far into modern life as, say, online shopping or dating. To generate a comparable

level of innovation, investors will need to see successful adoption of new elearning products and services, not just pilots and proofs of concept. Being able to conveniently exchange data with installed systems is a critical requirement for moving successful innovations out of the lab and into the marketplace.

What follows are some thoughts from our perspective about the changing nature of runtime data communications among elearning systems and our ideas about our joint process going forward.

A Modular CMI as Part of a Service-Oriented Architecture

It is time to re-think elearning data communications in terms of web services and the corresponding data payloads that will need to be shared among future online learning activities and related applications.

1. Unless there is market demand for an updated version of the current CMI standards AND a unification of the data model across SCORM and AICC, it should be retired as is. Further improvements, including those recommended by LETSI's Runtime Web Services project, will be included in a major revamp.
2. Going forward, the CMI data structure should be replaced by a set of small, logically coherent data payloads to allow greater efficiency and flexibility – different kinds of apps sharing specific kinds of data.
3. Many additional data models need to be developed. LETSI will be exploring some examples in our working groups:
 - *Content as a Service* will produce an entitlement-related data model to address the needs of commercial content publishers who are hosting their advanced learning activities on the web.
 - *Namesets and Shared Data* will, jointly with the AICC, create a universal scheme for sharing arbitrary datasets on arbitrary Internet servers.
 - *LET Activity Description* will produce a new conceptual model of a learning activity, including its behavioral metadata, to support applications for finding, previewing, buying, organizing, assigning, observing, reviewing, participating in, tracking, reviewing, and recommending both web-based and LMS-hosted learning activities.
 - LETSI is also committed to facilitate the adoption of the ISO standard “Access for all” personal needs and preferences for digital delivery (ISO-IEC 24751-2). Our intention is to create a web service definition corresponding to the Part 2 data describing a learner's accessibility needs.
4. Finding common ground across geographical regions and market sectors (corporate, military, K12, higher ed, professional certification) will increase the potential market size for new products and promote the migration of innovation across markets. We believe that market diversity can be accommodated in the next CMI, and other specs by using abstraction, extension, and a “scriptable” conformance regimen. This approach will minimize the impact of market variations on developers serving multiple markets. The extension mechanism could also serve as a breeding ground for technical innovations (plugins).

5. Where possible, broadly adopted technologies should be used over learning-specific solutions. Our approach to identity management, for example, does not need to be specific to the learning industry.

There are several important parts of this architecture that remain to be defined. LETSI looks forward to working with the AICC, ADL, and others to complete the picture and build a new software infrastructure for elearning.

Process

LETSI's process, pioneered by the Runtime Web Services project, involves open participation in small working groups that produce narrowly scoped deliverables in a fixed time frame. The groups conduct a review of relevant work followed by an agile software development process that involves at least one implementation/test cycle and produces documentation and code samples useful to future developers.

If properly managed, this software-based process will result in better standards faster. More importantly, to achieve LETSI's goal of accelerating the early adoption of innovative products, teaching methods, and business models, we see the open software activity itself serving as an interim interoperability solution for innovators and early adopters in the years before accredited standards are feasible.

To promote innovation and experimentation in different communities of practice, all of LETSI's work is openly available and unrestricted as regards to derivative works. While we have made an exception for RTWS and worked with the IEEE to make recommendations for improvement of the CMI standard, future LETSI work products will be unencumbered by restricted intellectual property.

Some recommendations regarding the proposed joint CMI work process:

1. As a first step, a six-month joint study group could produce an initial design for a service-oriented re-architecting of CMI – as well as a governance structure, timeline, and transition plan. While LETSI is all about disruptive change, we understand the need to protect the investments that have been made and will continue to be made in today's technology. Moving to web-based learning and service-oriented software will minimize the cost of retrofitting existing products.
2. A serious attempt should be made to recognize and accommodate variations across LET markets in the design of the new CMI specs.
3. A meeting like the ADL's Web Services Harmonization Summit should be held regularly to help participating organizations keep up with each other's technical decisions and our experiences with infrastructure technologies like SOAP, REST, security, identity, RDF, and OWL.
4. The role of accredited standards in our plans may need to change, recognizing the need for a period of rapid evolution of elearning technology.
5. The future elearning data communications framework should begin life as an open solution, unencumbered by any restrictive IP.