IEEE IC Industry Consortium on Learning Engineering (ICICLE)
Initiation Document (ICAID)
12 November 2017
IC17-016-01 Approved by the IEEE-SASB 6 December 2017

1. Contact

Provide the name and contact information of the primary contact person for this IC activity. Affiliation is any entity that provides the person financial or other substantive support, for which the person may feel an obligation. If necessary, a second/alternate contact person's information may also be provided.

Name: Shelly Blake-Plock
Email Address: shelly@yetanalytics.com
Phone: +1(667) 701-5805
Employer: Yet Analytics
Affiliation: Yet Analytics

Name: Avron Barr
Email Address: avron@aldo.com
Phone: +1.831.419.5829
Employer: Self
Affiliation: Chair, IEEE LTSC

2. Participation and Voting Model

Specify whether this activity will be entity-based (participants are entities, which may have multiple representatives, one-entity-one-vote), or individual-based (participants represent themselves, one-person-one-vote).

Entity-Based

3. Purpose

3.1.   Motivation and Goal

Briefly explain the context and motivation for starting this IC activity, and the overall purpose or goal to be accomplished.

The past 20 years have seen the emergence of many new tools, products, media formats, and technologies meant to support learning, education, and training. In recent years, the use of technology to support the way people learn in school, on the job, and on their own has accelerated dramatically. These technologies include learning management systems, MOOCS, authoring tools, mobile learning environments, serious games, simulations, applications of virtual and augmented

reality, learning record stores, open badges, pedagogical agents (AI), online laboratories, and much more.

There is a significant engineering aspect to the development and deployment of these learning technologies that is supported by a portfolio of existing and planned standards, but that has yet to coalesce as an identified field of endeavor. While Learning Science research has generated many of these new technologies, neither the scientific community nor the instructional designers who create new learning activities offer much guidance concerning the capabilities and limitations of the underlying technologies; how to use them to accomplish instructional goals; and how to evaluate the effectiveness of both the technologies and the various pedagogical innovations they allow. Motivated by the need to provide this guidance we propose an activity on Learning Engineering whose goals are to:

1. Develop a white paper that surveys the collection of IEEE and related learning technology standards and provides guidance concerning their intent, capabilities, and how to apply them.

2. Identify (or if needed create) examples in the form of open source reference code that learning engineers can use to understand and implement relevant standards.

3. Organize and hold a conference on Learning Engineering.

3.2.   <u>**Related Work**</u>

Provide a brief comparison of this activity to existing, related efforts or standards of which you are aware (industry associations, consortia, standardization activities, etc.).

There are numerous activities in the IEEE LTSC, in other IEEE groups, and in other SDO's and industry associations that develop technical standards for learning systems and that touch on applications of technology to learning, education, and training. However, none is addressing the engineering problems of designing and developing learning systems that incorporate diverse forms of learning, that must interoperate with an increasingly large stack of other technologies, and that should conform to multiple standards, potentially produced by multiple standards committees or SDOs. The proposed IC will address this engineering problem which has become critical as learning systems and their architectures have diversified, and as such is synergistic with and will add value to the many related activities listed next (and to others not on the list):

- <u>IEEE Computer Society Learning Technology Standards Committee (LTSC)</u>: multiple completed and in-progress standards activities including Learning Object Metadata (1484.12.1 – 2002); Augmented Reality (P1589, in ballot); and the current xAPI TAG.
- <u>IEEE Child and Student Data Governance WG</u> (P7004, sponsored by LTSC)

- IEEE Personal Data AI Agent WG (P7006)
- IEEE Industry Connections Actionable Data Book activity (IC12-006-05, sponsored by LTSC): An IC activity focused on the educational publishing community and a new model for tablet-based instructional content.
- IEEE Standard on Networked Smart Learning Objects for Online Laboratories WG (P1876).
- IEEE Simulation Interoperability Standards Organization.
- The US Advanced Distributed Learning (ADL) Initiative's Shareable Content Object Reference Model (SCORM); Experience API (xAPI); and their current Total Learning Architecture research project.
- ISO/IEC JTC 1/SC 36, Information Technology for Learning Education and Training. LTSC has a Category C liaison with SC36, which has a large portfolio of related standards including: Metadata for Learning Resources, ...
- IMS Global Learning Consortium: Industry association with multiple related standards including content packaging, common cartridge, learning technology interoperability, Caliper, EPUB for Education, Competencies and Academic Standards Exchange, Open Badges.
- US Army Research Laboratory's work on the GIFT model for Intelligent Tutoring Systems.
- Society for Learning Analytics Research (SoLAR)
- W3C: Publishing Working Group: EPUB 3.1, Verifiable Claims, the Course community, and the newly started Educational and Occupational Credentials community
- The former Aviation Industry CBT Committee (AICC) produced a series of standards for Computer Managed Instruction including the recent CMI5 specification.
- Access for Learning Community: Student Information Framework (2015)
- LRMI Learning Resource Metadata Initiative (2011) and related schema.org efforts.
- Multiple organizations working on digital competency records, certification, credentials and badges (PESC, IMS CASE, Credential Engine, HR Open, IMS Open Badges, Medibiquitous, ...)
- The US National Science Foundation's Cyberlearning Program
- The new Masters of Educational Technology and Applied Learning Science (METALS) Program at Carnegie-Mellon University and other academic pioneers who are defining the field and training the first generation of Learning Engineers.

In addition, both the IEEE Learning Technology Technical Committee and the IEEE Education Society have contributed in several related areas and will be invited to participate in this activity.

This list is not complete. There are efforts by multiple NATO countries to re-architect military training to incorporate advanced technologies, include the US Army's "Synthetic Training Environment" program and the US Navy's Sailor 2025 training re-design. Many trade associations provide guidance to designers and

consumers of learning technology, including the Western Cooperative for Educational Technology, the eLearning Guild, the Online Learning Consortium, MERLOT, the Masie Consortium, the New Media Consortium, Educause, the ed-fi Alliance, and the Association for the Advancement of Computing in Education (AACE). Finally, there are several European Union projects that related direction to learning engineering (see for example, http://www.laceproject.eu/lace/, http://www.eunis.org/, https://www.geant.org/, http://www.ecis.eu/).

3.3.   **Previously Published Material**

Provide a list of any known previously published material intended for inclusion in the proposed deliverables of this activity.

Masie Consortium, 2002. Making Sense of Learning Specifications & Standards: A Decision Maker's Guide to their Adoption (ftp://ftp.lotus.com/lotusweb/lspace/S3Guide.pdf).(ftp://ftp.lotus.com/lotusweb/lspace/S3Guide.pdf).

Learning, Training, and Assessments in Regulatory Compliance
Thomas Jenewein, SAP Education Simone Buchwald, SAP SE
John Kleeman, Questionmark Mark Tarallo, SAP Education . 2014?

Bill Jerome.Bill Jerome. The Need For Learning Engineers (and Learning Engineering). Post to E-Literate blog, April 14, 2013.

Bror Saxberg. Why We Need Learning Engineers. The Chronicle of Higher Education.   2015. (http://www.chronicle.com/article/Why-We-Need-Learning-Engineers/229391)

Tawfik, Mohamed; Salzmann, Christophe; Gillet, Denis; Lowe, David; Saliah-Hassane, Hamadou; Sancristobal, Elio, & Castro, Manuel (2014). Laboratory as a Service (LaaS): a Model for Developing and Implementing Remote Laboratories as Modular Components. *International Journal of Online Engineering (iJOE), 10* (4). http://r-libre.teluq.ca/906/1/REV2014-LaaS_Tawfik_et_al_R-Libre.pdf

B. Fattouh, H. Saliah-Hassane, "Pedagogical Engineering Fundamentals to Build Robust Software Components", "The International Conference on Engineering Education and Research "; iCEER 2004, 27-30 July 2004, Olomuc, Czech Republic. (https://www.researchgate.net/publication/229049784_Pedagogical_Engineering_Fundamentals_to_Build_Robust_Software_Components_for_Online_Laboratories)

Many organizations have made is a considerable amount of documentation and open source code available at github and elsewhere.

3.4.   **Potential Markets Served**

Indicate the main beneficiaries of this work, and what the potential impact might be.

The increasing number of products designed to help teachers, students, administrators, and publishers can best be viewed as serving to general markets:

The Education Market:
- Schools, school districts, colleges, universities, and adult education programs (inasmuch as they develop or purchase learning systems)
- Professional education (e.g. medical, legal, ...)
- Educational technology vendors (and the suppliers of the devices and services needed to support these products)
- Educational publishers and service providers who develop, maintain, or aggregate learning technologies and systems.

The Corporate and Military Training Market:
- Training and talent management organizations (inasmuch as they develop or purchase learning systems)
- Training technology vendors
- Training content and service providers who develop, maintain, or aggregate learning technologies and systems.

There is also a growing consumer market – students, parents, and teachers who buy learning products or subscribe to online services for their own use.

4. <u>Estimated Timeframe</u>

Indicate approximately how long you expect this activity to operate to achieve its proposed results (e.g., time to completion of all deliverables).

The project is expected to finish the work in two years.

Expected Completion Date: 12/2019

IC activities are chartered for two years at a time. Activities are eligible for extension upon request and review by ICCom and the IEEE-SA Standards Board. Should an extension be required, please notify the ICCom Administrator prior to the two-year mark.

5. <u>Proposed Deliverables</u>

Outline the anticipated deliverables and output from this IC activity, such as documents (e.g., white papers, reports), proposals for standards, conferences and workshops, databases, computer code, etc., and indicate the expected timeframe for each.

- Reference code: ongoing with an open source library repository to be established Q1 2018
- White paper: to be published Q4 2018
- Conference: Q2 2019

6. __Funding Requirements__

Outline any contracted services or other expenses that are currently anticipated, beyond the basic support services provided to all IC activities. Indicate how those funds are expected to be obtained (e.g., through participant fees, sponsorships, government or other grants, etc.). Activities needing substantial funding may require additional reviews and approvals beyond ICCom.

Normal staff support and some help organizing a conference are the only needs we see for the time being. While we are not planning any activities requiring additional revenue at the time, that may change as the activity gets underway. For example, some open-source code or temporary infrastructure may need to be created. External funding for these activities will be obtained if required.

7. __Management and Procedures__

7.1. __IEEE Sponsoring Committee__

Indicate whether an IEEE sponsoring committee of some form (e.g., an IEEE Standards Sponsor) has agreed to oversee this activity and its procedures.

Has an IEEE sponsoring committee agreed to oversee this activity?: Yes

If yes, indicate the sponsoring committee's name and its chair's contact information.

Sponsoring Committee Name: Learning Technology Standards Committee
Chair's Name: Avron Barr
Chair's Email Address: avron@ieee.org
Chair's Phone: +1.831.419.5829

7.2. __Activity Management__

If no IEEE sponsoring committee has been identified in 7.1 above, indicate how this activity will manage itself on a day-to-day basis (e.g., executive committee, officers, etc).

7.3. __Procedures__

Indicate what documented procedures will be used to guide the operations of this activity; either (a) modified baseline *Industry Connections Activity Policies and Procedures,* (b) Sponsor policies and procedures accepted by the IEEE-SA Standards Board, or (c) Working Group policies and procedures accepted by the Working Group's Sponsor. If option (a) is chosen, then ICCom review and approval of the P&P is required. If option (b) or (c) is chosen, then ICCom approval of the use of the P&P is required.

Modified baseline *Industry Connections Activity Policies and Procedure*

8. <u>Participants</u>

8.1. <u>Stakeholder Communities</u>

Indicate the stakeholder communities (the types of companies or other entities, or the different groups of individuals) that are expected to be interested in this IC activity, and will be invited to participate.

Education and training technology vendors; textbook and eLearning media publishers; corporate HR/training departments; digital platform vendors (PC, tablet, phone, VR, AR); related industry associations; educational institutions; and government agencies.

8.2. <u>Expected Number of Participants</u>

Indicate the approximate number of entities (if entity-based) or individuals (if individual-based) expected to be actively involved in this activity.

50-100 (estimate)

8.3. <u>Initial Participants</u>

Provide a list of the entities or individuals that will be participating from the outset. It is recommended there be at least three initial participants for an entity-based activity, or five initial participants (each with a different affiliation) for an individual-based activity.

Use the following table for an entity-based activity:

Entity	Primary Contact
Yet Analytics, Inc.	Shelly Blake-Plock, shelly@yetanalytics.com, 667.701.5805
RePubIT Inc.	John Costa, jbcosta@repubit.com, 321.262-3626
Eduworks Corporation	Robby Robson, rrobson@eduworks.com, 541.908.9888
Omnes Solutions, LLC	Anthony Altieri, altierian@gmail.com, 202.303.4715
Elsevier	Aaron Silvers, a.silvers@elsevier.com, (773) 256-9829
Torrence Learning	Megan Torrance, mtorrance@torrancelearning.com, 734.433.0513
Veracity Technology Consultants	Rob Chadwick, rob@veracity.it
DigitalChalk	Troy Tolle, ttolle@digitalchalk.com, 877.321.2451
Kineo	Haitham Gasim, haitham.gasim@kineo.com, 312.846.6656
College of Education &	Prof. Brenda Bannan, bbannan@gmu.edu

Human Development, George Mason Univ.	

Additional prospective participants have yet to be contacted. Please note that we initiated a new TAG activity at the LTSC this fall about the Experience API specification, which is key to many innovations in learning tech today. We already have over 50 organizations participating in this temporary planning effort.