

Current Directions in Learning Technology Standards

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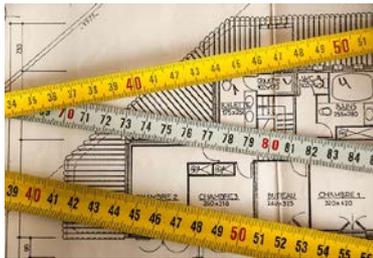
Institute for Defense Analyses

IEEE Learning Technology Standards Committee

Today's Topics

- ▶ Why standards?
- ▶ The IEEE standards process
- ▶ Current IEEE LTSC projects





Why Standards?

▪ *Standards Solve Market Problems*

- Interoperability – common interpretation of data
 - Lowers costs of product development & integration
 - Enables supply chains to develop
 - Facilitates competition and grows markets
 - Reduces vendor lock-in (third-party & after-market components)
 - Lowers barriers to entry – plug-and-play
- Quality & Product Category Standards
 - Define best practices
 - Improve reliability, consistency, quality (saving money!)
 - Engender trust (hence willingness to buy)

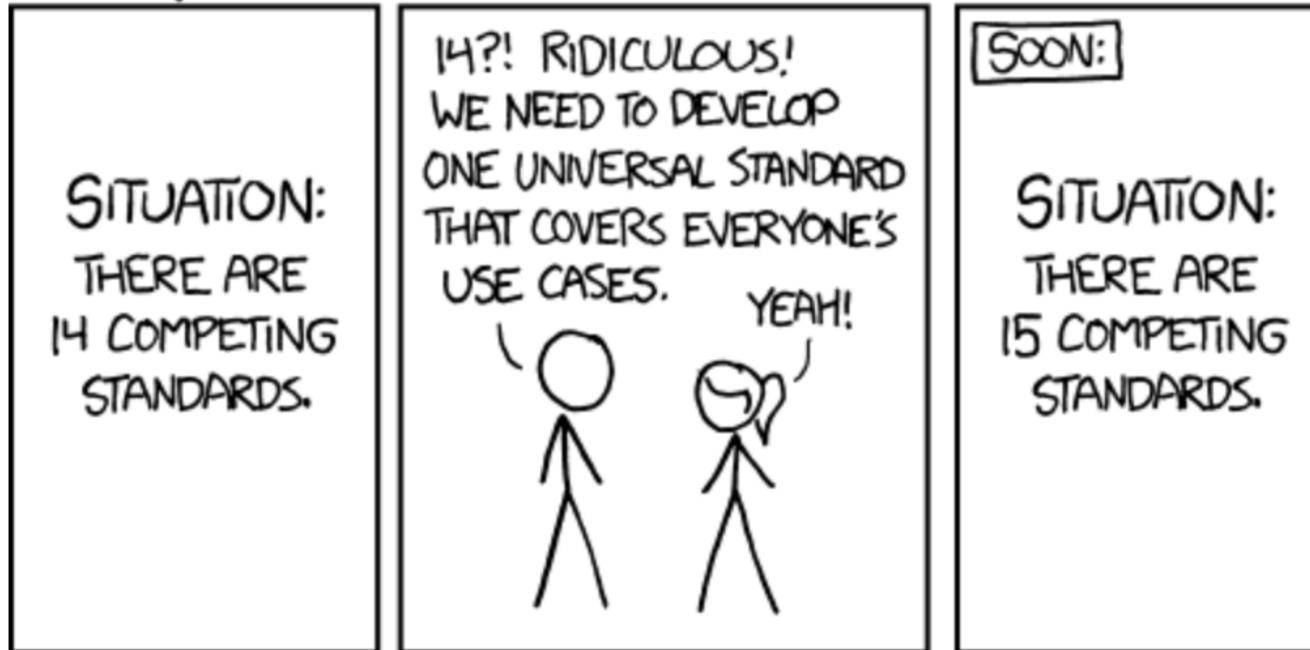
▪ *Adoption is the only metric of success*

After Robby Robson, 2017

After Robby Robson, 2018

The Mandatory Slide ...

HOW STANDARDS PROLIFERATE:
(SEE: A/C CHARGERS, CHARACTER ENCODINGS, INSTANT MESSAGING, ETC.)



<https://xkcd.com/927/>

You thought the cartoon was a joke?



IEEE Standard for Learning Technology—Data Model for Reusable Competency Definitions

IEEE Computer Society

Sponsored by the Learning Technology Standards Committee



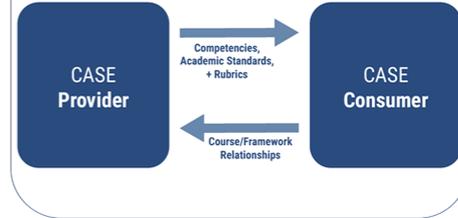
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Moving Credentialing Forward



COMPETENCIES AND ACADEMIC STANDARDS EXCHANGE (CASE) 1.0



IMS Reusable Definition of Competency or Educational Objective - Information Model



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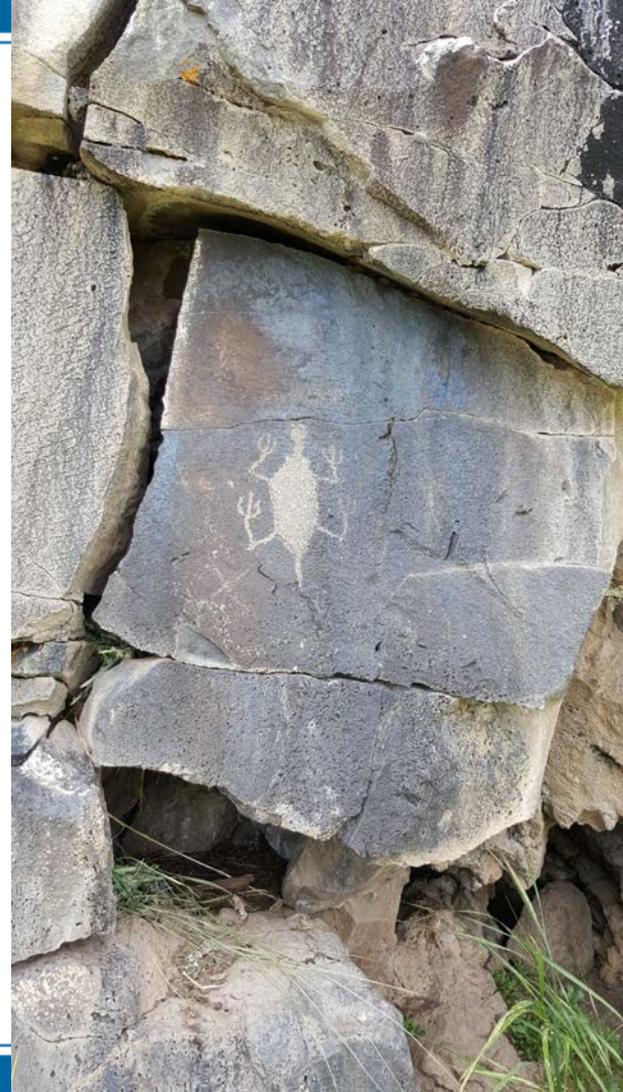


After Robby Robson, 2018

Learning Technology Standards Have a Long History

- ▶ Aviation Industry CBT Committee (AICC) (1988)
- ▶ Simulation Interoperability Workshop (SIW) (1989) develops DIS and becomes Simulation Interoperability Standards Organization (1997) and IEEE organization (2003)
- ▶ EDUCAUSE National Learning Infrastructure Initiative (1995) [becomes] Instructional Management System project (1997) [spins out] (1999) [becomes] IMS Global
- ▶ ARIADNE (EU Project) (1996)
- ▶ US Postsecondary Educational Standards Committee (PESC) (1997)
- ▶ IEEE Learning Technology Standards Committee (IEEE LTSC) (1997)
- ▶ HR-XML Consortium (1999) [becomes] HR Open Standards (2014)
- ▶ W3C MathML Group (released 1998) and OpenMath (released 2000)

After Robby Robson, 2017

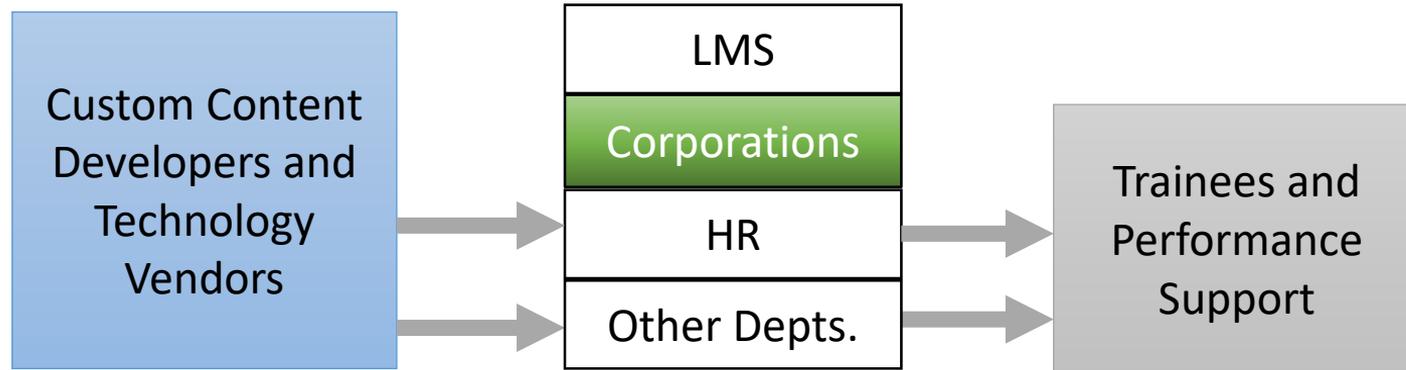


Some Current Learning Technology Standards

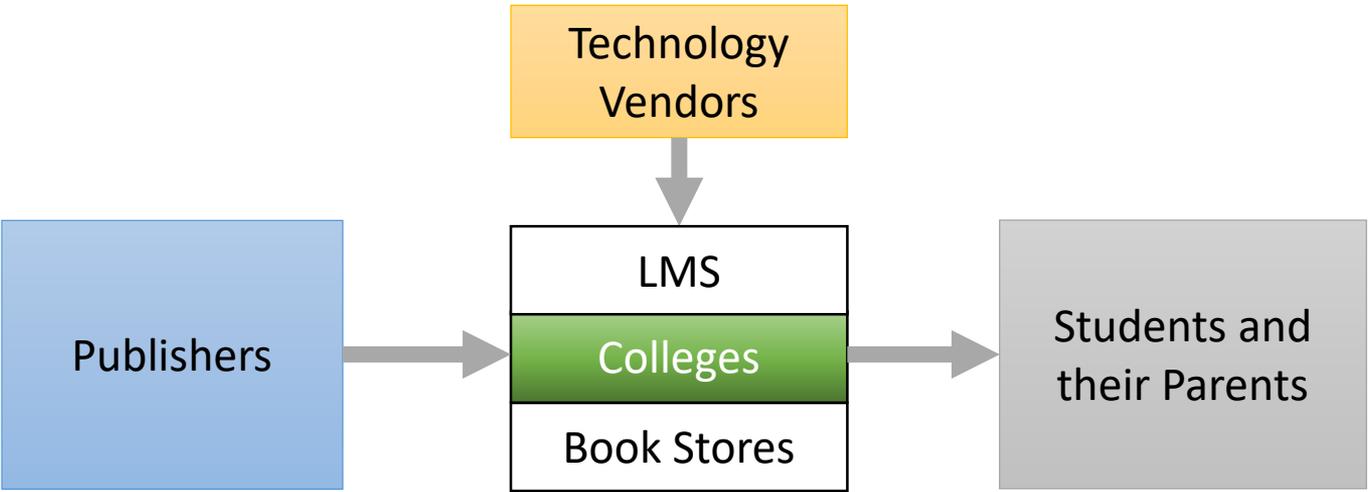
- ▶ SCORM (a reference model)
 - Includes IMS Content Packaging, LOM, AICC CMI, and IEEE protocol standards
- ▶ Competency and credential standards
 - RDCEO, inLOC, LIP, HR-XML, MedBiquitous. Each serves a different market.
- ▶ Expanding LMS capabilities
 - IMS Learning Tools Interoperability
- ▶ Content metadat
 - LOM, LRMI, schema.org
- ▶ Learning analytics & data exchange in a distributed architecture
 - xAPI, IMS Caliper



Standards Assume a Model of the Marketplace: SCORM and the Enterprise Training Supply Chain



Standards Assume a Model of the Marketplace: IMS Global and the Higher Education Supply Chain



Learning Portability: Fundamental Changes are Afoot

Yesterday

- ▶ Until recently, content was stored, managed, and delivered via an LMS silo
- ▶ Schools, teachers and trainers could assume that they were the learner's sole source
- ▶ Data was gathered for human interpretation, e.g. in daily reports and transcripts
- ▶ The principal type of learning activity involved flipping through browser pages
- ▶ Online assessment limited to quizzes
- ▶ Publishers depend on teacher feedback about their products

Today

- ▶ An increasing amount of content is cloud- or app-based. Data is distributed.
- ▶ Students today work simultaneously with multiple institutions and on-line providers
- ▶ AI-enhanced products will benefit from a wide range of historical and real-time data
- ▶ The range of technologies and activities is broad and getting much broader
- ▶ Continuous collection and analysis of lots of learner activity data by multiple stakeholders
- ▶ Publishers are also monitoring learner activity

While SCORM and other standards from that era stressed content portability across LMSs, today's market issue is "learning portability"



The IEEE Standards Development Process

Community, Consensus, Clarity



Institute of Electrical and Electronic Engineers

- ▶ The world's largest technical professional organization for the advancement of technology
- ▶ 420,000+ Members (majority not in US)
- ▶ Professional Association
 - Publications, Conferences, Member Services
 - Standards
- ▶ Organized into societies, councils, and the IEEE Standards Association (IEEE-SA)
- ▶ IEEE-SA
 - Over 7000 individual and 200 Corporate Members
 - Offices in US, Asia (China / India), Europe
 - 2,000+ standards + other consensus products



IEEE-SA Principles*

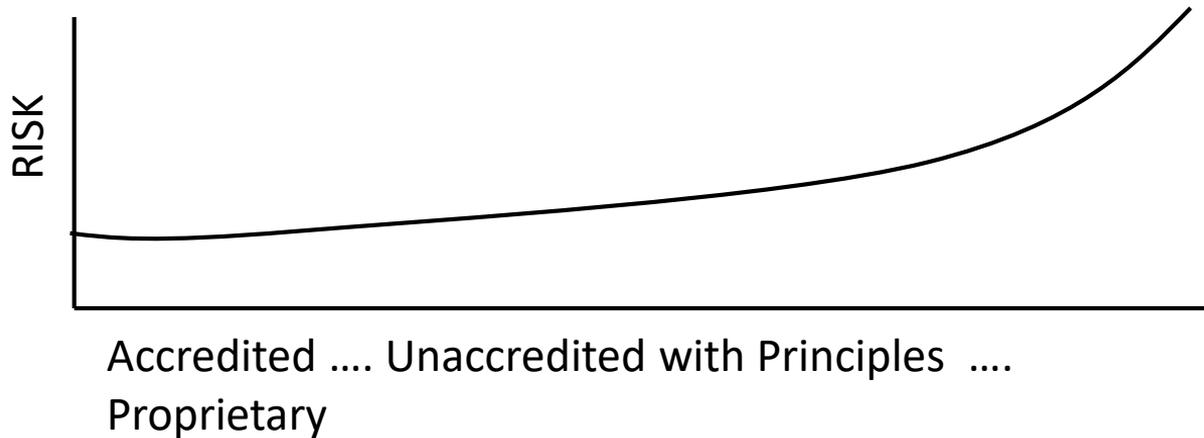


- ▶ Due process
 - Follow highly visible procedures
 - Set at the IEEE-SA, Sponsor, and Working Group level
 - Process is transparent
- ▶ Openness
 - All interested parties can actively participate
- ▶ Consensus
 - A clearly defined percentage required for approval
- ▶ Balance
 - All interested parties are represented
 - No single party has an overwhelming influence
- ▶ Right of appeal
 - Anyone can appeal any decision at any point

* <https://standards.ieee.org/develop/govern.html>

How Standards are Made

- ▶ Other SDOs produce standards using procedures that may or may not follow the same principles.
- ▶ *De facto* standards may arise from proprietary Intellectual Property (IP) and be controlled by a single entity



Most Relevant International Standards Development Organizations for Learning, Education & Training

SDO	Type	Focus
Dublin Core Metadata Initiative	Metadata (Education part)	Metadata, includes educational elements
IEEE Standards association	Formal SDO	General interoperability standards. Industry, academia, and government. Includes the Learning Technology Standards Committee, but there are other relevant standards activities.
IMS Global Learning Consortium	Industry Consortium	General interoperability standards. Participants tend to be connected with formal education.
ISO/IEC JTC1 SC36	Formal SDO	General interoperability standards. Participation from national bodies.
W3C	Open Consortium	Web / Semantic Web – also used for its communities structure
Schema.org	Not an SDO but relevant	Microdata for describing resources
HR Open	Industry Consortium	Applicant Tracking Systems, Background checks, HR systems, etc.

Types of IEEE Standards Projects

- ▶ A **standard**, containing mandatory requirements,
- ▶ A **recommended practice**, outlining preferred procedures, or
- ▶ A **guide**, offering suggestions for working with a technology.
- ▶ Examples:
 - Lists of terms, definitions, or symbols
 - Measurement/tests of the performance of any device, apparatus, system
 - Characteristics, performance, and safety requirements
 - Recommendations reflecting state-of-the-art in the application of principles
- ▶ Key question
 - Is the standard necessary for market growth, stability, and/or innovation?

What Can be Standardized?

PHYSICAL STANDARDS

- Weights and measures
- Sizes and shapes
- Stresses and tolerances
- Allocation of spectrum
- What wires do what

DATA STANDARDS

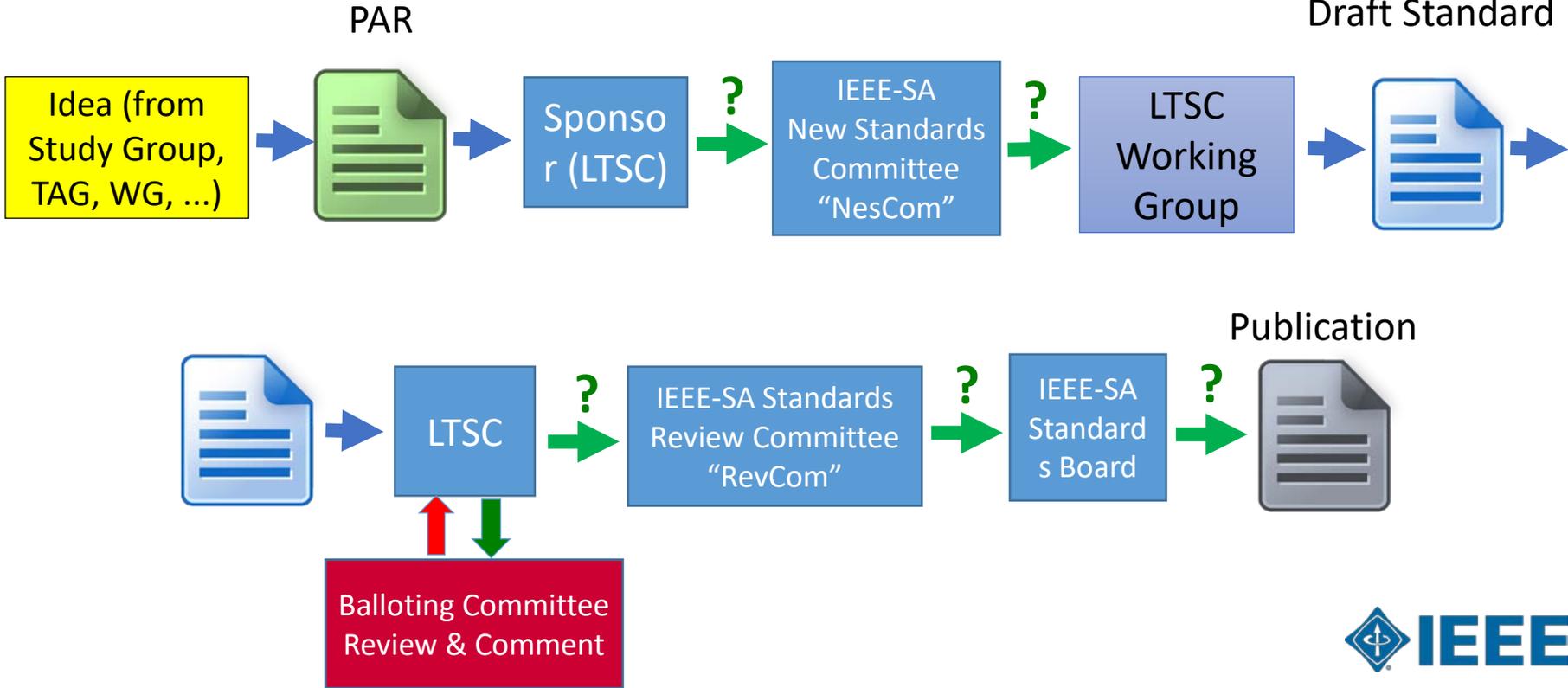
- Formats & representations
- Semantics & interpretation
- Persistence and availability
- Metadata and curation
- Privacy and security

PROCESS STANDARDS

- Governance and reporting
- Process management
- Quality control & assurance
- Safety & legal conformance
- Ethics and behaviors

A given standard can involve aspects of two or even all three categories

The IEEE Standards Association's Process



Publishing a Standard is Just the Beginning

Only the market can establish a standard

Pre-standards Activities

- Principles
- Requirements
- Early Specs
- Prototypes

Standard Writing

- Compromises
- Consensus
- Champions
- Prototypes

Initial Implementations

- Publication
- PR
- First Products

Rude Awakening

- User feedback
- Revisions

Adoption-

Stabilization

- Test Suites
- Products
- Conformance
- Buyer require compliance



Barriers – How Consensus Standards Fail

- ▶ Too complex to implement affordably
- ▶ Too ambiguous to implement consistently
- ▶ Does not result in the needed level of interoperability
- ▶ Lack of promotion to help the marketplace understand its value
- ▶ Inelegant or outdated choices in technical implementation
- ▶ Lack of support for implementers (docs, help desk, conformance test, ...)
- ▶ Competition with alternative standards, e.g., proprietary solutions
- ▶ Bad timing, e.g., technical breakthroughs or changes in market structure

Current Standards Projects at the LTSC

- ▶ SCORM Renewal, 1484.11.3 ..., Andy Johnson
- ▶ Student Data Governance, P7004, Marsali Hancock
- ▶ AR Learning Experience Model, P1589, Fridolin Wild
- ▶ Mobile Learning Platforms, P7919.1, Robby Robson
- ▶ Reusable Competency Definitions, P1484.20.1,
- ▶ Adaptive Instructional Systems, P2247.1
- ▶ xAPI, P9274.1.1

P9274.1.1 xAPI

- ▶ xAPI 1.0.3 base standard
- ▶ Recommended practice standard for implementers
- ▶ Future
 - xAPI profiles standard
 - Individual xAPI profiles
 - xAPI 2.0
- ▶ Jono Poltrack, Chair. <http://sites.ieee.org/sagroups-9274-1-1/>
- ▶ Meeting this afternoon at IDA

P 1484.20.1 Reusable Competency Definitions

- ▶ Revision of a 10-year-old standard with limited impact, but the time is ripe.
- ▶ Based on the common elements identified in the Ecosystem Mapping Project's crosswalk of existing standards for representing competencies and competency frameworks.
- ▶ Chair, Jim Goodell
- ▶ Kickoff meeting, Monday, September 10
- ▶ <http://sites.ieee.org/sagroups-1484-20-1/>

P2247.1 – Standard for the Classification of AISs

- ▶ Enable consumers to make comparisons among current and future products
- ▶ Inform purchasing and deployment decisions
- ▶ Serve as a reference for subsequent technical standards for data exchange
- ▶ Promote “ethically aligned design” for the use of AI
- ▶ Define:
 - The operation and common features of AISs, and the way they use AI
 - Categories of AISs
 - Standardized component definitions
 - Levels of functionality and adaptation “power”
 - Design approach & methods used
- ▶ Bob Sottolare, Chair. Bi-weekly meetings. Silicon Valley Conference, October 30-31
- ▶ <http://sites.ieee.org/sagroups-2247-1/>



ICICLE – The IEEE Industry Connections Industry Consortium on Learning Engineering

- ▶ Is there a need for a new engineering discipline to deal with the automation of education and training?
- ▶ Conference, May 2019, Arlington, VA
- ▶ Special Session at I/ITSEC 2018 – Forming Military Training chapter of ICICLE
- ▶ Shelly Blake-Plock, Chair.
- ▶ Meetings monthly. www.ieeeicicle.org

For more information:

IEEE LTSC

www.ieee-ltsc.org

ICICLE

www.ieeeicicle.org

IEEE Standards U.

<http://www.standardsuniversity.com>

Standards Lifecycle

<http://standards.ieee.org/develop/index.html>

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Robson & Barr: *The New Wave of Training Technology Standards*

I/ITSEC 2018

