CYPHER Learning®

WHITE PAPER

CONTENT STANDARDS

for Learning Management Systems (LMS)

November 2024

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Executive summary

Content standards are critical for enabling seamless interoperability, scalability, and adaptability in Learning Management Systems (LMS). These standards define the framework for content creation, delivery, tracking, and assessment within e-learning platforms. Standards like SCORM, xAPI, AICC, IMS Common Cartridge, LTI, cmi5, H5P, PENS, and QTI serve different purposes and provide unique capabilities.

This white paper explores these standards, their features, benefits, and limitations, and their role in shaping the future of e-learning.

Introduction

Content standards are the foundation of effective e-learning platforms. They ensure that learning materials can function across diverse LMS platforms, improving interoperability and scalability. From legacy standards like AICC to modern frameworks like xAPI and cmi5, these specifications enable organizations to meet the demands of learners in a variety of contexts.

Overview of major content standards

Course-to-LMS communications

Facilitates seamless data exchange and interoperability between courses and the LMS.

AICC
(Aviation Industry CBT Committee)

OVERVIEW

AICC, developed in 1993, introduced interoperability between LMS platforms and e-learning content. While its adoption has declined due to SCORM adoption, AICC laid the groundwork for future standards.

KEY FEATURES

Basic interoperability and reporting.

PROS

Simple architecture; influenced later standards.

CONS

Limited tracking capabilities; requires conversion for modern LMSs.

cmi5
(Computer-managed instruction)

OVERVIEW

Combines SCORM and xAPI, addressing their limitations while enabling offline tracking.

KEY FEATURES

xAPI-compatible; supports immersive learning; supports tracking of instructor led training in an xAPI environment.

PROS

Advanced tracking; online and offline learning.

CONS

Limited adoption; requires support from both LMS and authoring tools; requires xAPI.

SCORM (Sharable Content Object Reference Model)

OVERVIEW

SCORM defines how e-learning content is packaged and communicated with LMSs.

KEY FEATURES

Content reuse, progress tracking, and bookmarking.

PROS

Universally supported; simple implementation.

CONS

Limited to static environments; not backward compatible across versions; limited tracking customization.

LTI
(Learning Tools Interoperability)

OVERVIEW

LTI enables seamless integration of third-party tools into LMS platforms.

KEY FEATURES

Secure data exchange; simplifies tool integration.

PROS

Enhances collaboration; integrates diverse resources.

CONS

Limited to tool integration; does not manage content packaging.

xAPI
(Experience API or Tin Can API)

OVERVIEW

xAPI tracks learning experiences across multiple environments, including simulations, mobile apps, and real-world tasks.

KEY FEATURES

Real-time tracking, data collection via Learning Record Stores (LRS).

PROS

Flexible; advanced analytics; easier integration into third party systems; suitable for modern learning environments.

CONS

Requires additional infrastructure; complex implementation.

PENS (Package Exchange Notification Services)

OVERVIEW

PENS automates the submission of content packages from authoring tools to LMSs.

KEY FEATURES

Content upload notifications; workflow automation.

PROS

Streamlines content delivery; works with SCORM and xAPI.

CONS

Limited adoption; focused only on content deployment.

H5P
(HTML5 Package)

OVERVIEW

H5P is an open-source framework for creating interactive content.

KEY FEATURES

Interactive videos, quizzes, and games; responsive design.

PROS

Improves engagement; integrates with major LMS platforms.

CONS

Provides limited analytics compared to xAPI and primarily tracks the initiation of an activity rather than its completion.

Migration, reusability, and customization

Enables uploading, downloading, repurposing, and tailoring of content to meet specific needs.

IMS Common Cartridge

OVERVIEW

Facilitates the exchange of educational content between LMS platforms by standardizing course structure.

KEY FEATURES

Assessment and multimedia integration.

PROS

Simplifies content sharing in education.

CONS

Limited tracking capabilities; generally not supported outside of the academic market.

QTI
(Question and Test Interoperability)

OVERVIEW

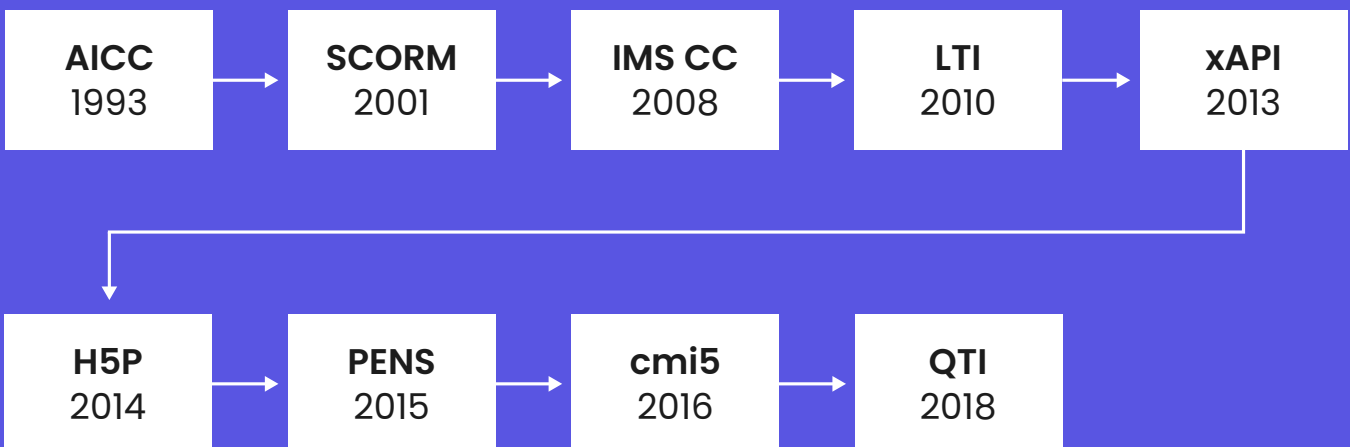QTI standardizes the representation and exchange of assessments.

KEY FEATURES

Advanced question types; metadata tagging.

PROS

Facilitates interoperability of assessments; supports adaptive testing.

CONS

Complex implementation; limited analytics.

AICC 1993	→	SCORM 2001	→	IMS CC 2008	→	LTI 2010	→	xAPI 2013

H5P 2014	→	PENS 2015	→	cmi5 2016	→	QTI 2018

Pros and cons summary

STANDARD	PROS	CONS
AICC	Early interoperability; simple architecture	Outdated; lacks advanced tracking and reporting
SCORM	Universally supported; reusable content	Limited real-time tracking; not backward compatible
xAPI	Flexible; tracks diverse learning experiences; advanced analytics	Complex implementation; requires additional infrastructure
LTI	Simplifies integration; enhances collaboration	Limited to tool integration; does not handle content packaging
cmi5	Tracks online/offline learning; supports immersive learning	Requires adoption by LMS and tools; less widespread
H5P	Open-source; improves learner engagement	Limited analytics; reliant on LMS for tracking
PENS	Simplifies content delivery workflows	Limited adoption; does not address tracking
IMS CC	Facilitates LMS-to-LMS content migration; supports educational use cases	Limited tracking; less suitable for corporate environments
QTI	Standardizes assessments; supports adaptive learning	Complex implementation; limited tracking and analytics

Challenges in implementing standards

ADOPTION BARRIERS

Emerging standards like cmi5 and QTI face slower adoption in organizations accustomed to legacy standards.

INFRASTRUCTURE NEEDS

Advanced standards like xAPI and cmi5 require robust infrastructure for tracking and data storage.

COMPLEXITY

Requirement for consistency across diverse platforms, evolving technologies, and varying stakeholder requirements.

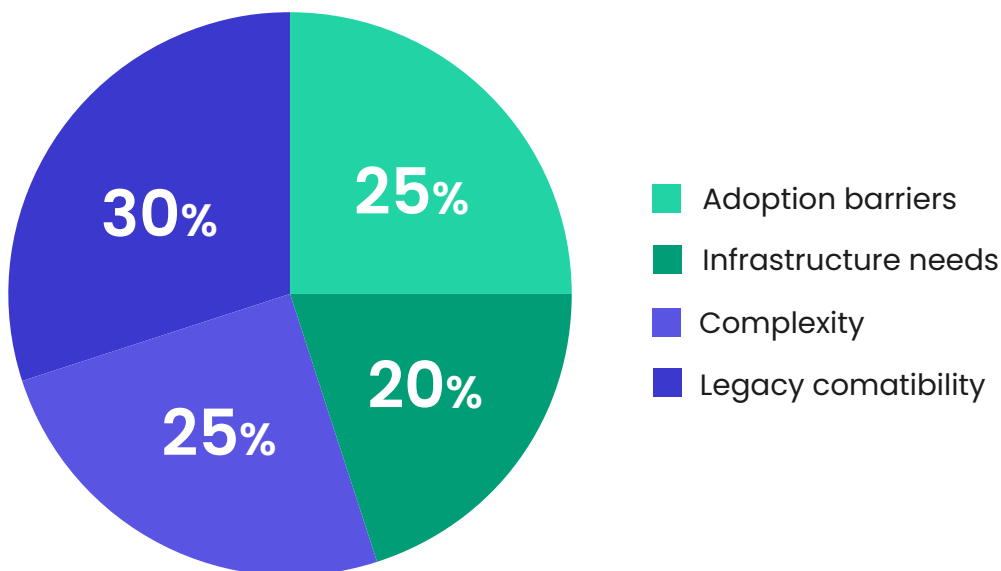### LEGACY SYSTEM COMPATIBILITY

Standards like SCORM and AICC require careful integration to avoid incompatibilities.

Identifies barriers to implementing LMS standards

- 30%
- 25%
- 25%
- 20%

Legend:
- Adoption barriers
- Infrastructure needs
- Complexity
- Legacy comatibility

Future trends in LMS content standards

The future of LMS content standards will be shaped by the growing demand for adaptive, data-driven, and immersive learning experiences:

xAPI & cmi5

Expected to dominate due to their flexibility and tracking capabilities.

DECLINE OF LEGACY STANDARDS

AICC and older SCORM versions are expected to see further decline as organizations adopt modern alternatives.

H5P

Will continue to gain traction for enhancing learner engagement.

Projected adoption rates over the next five year

- SCORM
- xAPI
- cmi5
- AICC
- H5P

About CYPHER Learning

CYPHER Learning supports a wide range of e-learning standards to ensure seamless interoperability and scalability:

- **STANDARDS SUPPORTED**
  SCORM (1.2 and 2004), xAPI, IMS Common Cartridge, and LTI (1.1 and 1.3) for secure third-party tool integration.

- **INTERACTIVE CONTENT**
  Create engaging learning experiences with H5P and QTI.

- **ROBUST VIDEO SUPPORT**
  Automatically transcode videos to MP4 (H.264), embed YouTube/Vimeo, and add .VTT closed captions for accessibility.

- **SEAMLESS INTEGRATION**
  Connect with CleverSIS and OneRoster for student information management.

- **SECURE ACCESS**
  Single sign-on support for Google Workspace, Microsoft Entra ID, SAML, and OAuth.

CYPHER Learning is your versatile, future-ready platform for modern e-learning needs.

CYPHER Learning exists to give learners the power to succeed in a rapidly changing world. Trainers, learning and development (L&D) pros, HR pros, and educators get everything they need in one platform to deliver faster, more personalized, and better learning outcomes. We provide the only all-in-one AI-powered learning platform that is easy-to-use, beautifully designed, and built to power hundreds of millions of learning moments every day. Create courses faster. Train and teach better. Learn even quicker. Experience our "just in time, just for you, just the way you want to learn" approach that puts people first.

www.cypherlearning.com

Appendix A

CYPHER Learning supported formats and versions	
Content migration	Blackboard zip, Common Cartridge, and Moodle zip.
Integrations with third-party content providers	Coursera, edX, Go1, LinkedIn Learning, OpenSesame, and Udemy.
Integrations with other teaching and content tools	H5P, Kaltura, MathJax, Panopto, and Turnitin.
SCORM packages	SCORM 1.2 and 2004
Quizzes	Supported Question Types: T/F, multiple choice (one or more answers correct), fill in the blanks, freeform, matching, hotspot, and arithmetic. Bulk import: Accepted formats and versions of QTI's. 1.1.3, ExamView - standard, WebCT CE 4-6 / Vista, Blackboard 6-7, Blackboard 7-9, Angel - standard.
Video	CYPHER offers a video transcoding feature that automatically converts any video into an H.264 encoded MP4 file so it shows in all devices, including iPhones and iPads. If a video is an MP4 using the H.264 or H.263 format, has a frame rate between 15 and 60 FPS and its height is smaller than 1100 pixels, the video transcoding won't be supported. CYPHER automatically embeds YouTube and Vimeo videos.
Closed captions for videos	.VTT format
SSO	Google Workspace, SAML 2.0, Microsoft Entra ID (Microsoft 365), OAuth 2.0, Auth0, LDAP, and Custom SSO.

CYPHER Learning supported formats and versions	
Web-conferencing tools	ZoomUS (API and LTI), Google Meet, MS Teams, Webex, GoTo Webinar, GoTo Training, and GoTo Meeting.
E-commerce	PayPal, PayPal Payments Pro, Authorize.net, Stripe, PayUbiz, PayU Latam, PagSeguro, Flywire, YooMoney, Mercado Pago, Conekta, and Purchase Orders. Shopify and WooCommerce through Zapier.
LTI tool version	LTI 1.1 and LTI 1.3
Google Workspace tools	Google Drive, Google Workspace SSO, Google Drive Assignments, Google Fonts, Google Assignments, and Google Meet.
Microsoft 365 tools	MS Immersive Reader, MS Teams, Microsoft Entra ID SSO, OneDrive, and OneDrive for business.
SIS integration	CleverSIS, OneRoster

Appendix B

Additional accessibility, file formats, and standards

ACCESSIBILITY STANDARDS

• **WCAG (Web Content Accessibility Guidelines)**
Standards for ensuring content accessibility to users with disabilities, including features like screen reader compatibility and keyboard navigation.

• **Section 508 Compliance**
Guidelines mandating accessibility for U.S. federal electronic and information technology to provide equal access for individuals with disabilities.

• **EN 301 549**
European standard defining accessibility requirements for ICT products and services, aligning with WCAG.

FILE FORMATS

- **PDF/A**

  Format designed for archiving and long-term preservation of digital documents.

- **HTML5**

  Format widely used for creating interactive and multimedia-rich web-based content.

- **MP4**

  Format for video content that ensures compatibility across devices and platforms.

- **DOCX/ODT**

  Formats for textual and document-based content creation.

- **ePub**

  Format for distributing digital content, particularly for offline use.

ASSESSMENT STANDARDS

- **APIP (Accessible Portable Item Protocol)**

  Protocol for ensuring accessibility of test items for learners with disabilities.

- **ISO 23988**

  Standard for maintaining the integrity and security of online and offline assessments.

- **ISO/IEC 24751 (Personalized Learning and Accessibility)**

  Standard for creating accessible and personalized learning experiences.

DATA STANDARDS

- **Caliper Analytics**

  Framework for capturing and analyzing learning data to generate insights into learner engagement and progress.

- **Ed-Fi**

  Framework for enabling interoperability of educational data across systems.

- **IEEE Learning Object Metadata (LOM)**

  Standard for structuring metadata for learning objects to enhance reusability.

- **ISO/IEC 19788 (MLO - Metadata for Learning Resources)**

  International standard for organizing metadata for educational resources.

INTEGRATION STANDARDS

- **REST/GraphQL APIs**

  Standards enabling seamless integration between LMS platforms and external systems.

- **OAuth 2.0/OpenID Connect**

  Protocols for providing secure authentication and user data sharing.

- **IMS Global Standards (LTI, Common Cartridge)**

  Standards facilitating interoperable integration of tools and content in e-learning environments.