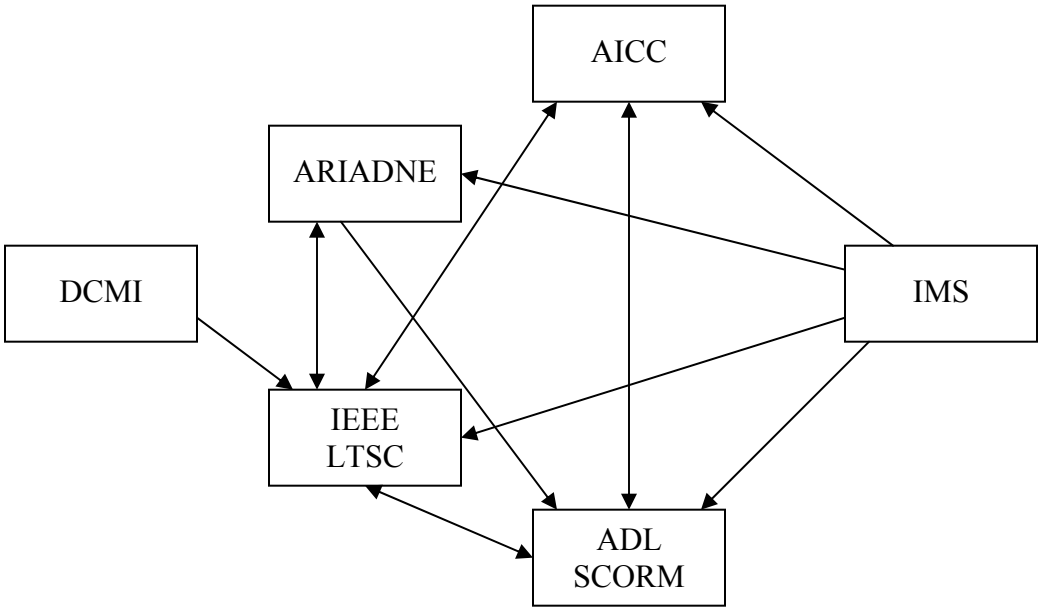
De-Facto Efforts for Standardization



arrows represent influence

Dublin Core Metadata Initiative – DCMI
http://dublincore.org/documents

The Learning Technology Standards Committee – LTSC
http://ltsc.ieee.org/wg12/index.html

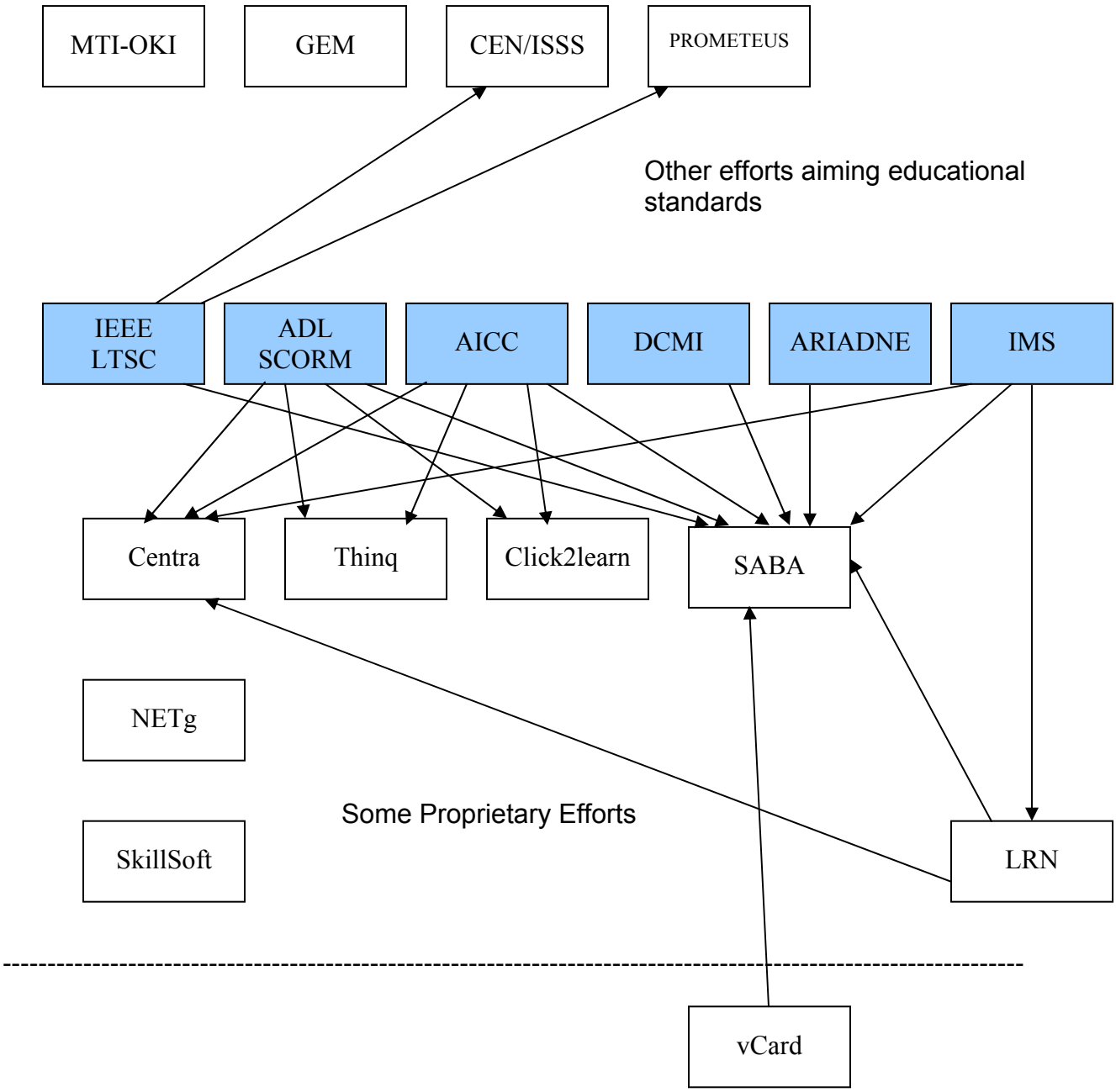
Advanced Distributed Learning - Sharable Courseware Object Reference Model - ADL-SCORM
http://www.adlnet.org

The Aviation Industry CBT (Computer-Based Training) Committee – AICC
http://www.aicc.org

Alliance of Remote Instructional and Distribution Networks for Europe – ARIADNE
http://www.ariadne-eu.org/

IMS (Instructional Management Systems) Global Learning Consortium
http://www.imsproject.org/

Other Efforts



http://web.mit.edu/oki Open Knowledge Initiative - OKI

http://www.cenorm.be/isss/ Center de European Normalization / the Information Society Standardization System - CEN/ISSS

http://www.geminfo.org Gateway to Educational Materials – GEM

http://www.prometeus.org/ PROmoting Multimedia Access to Education and Training in EUropean Society - PROMETEUS

http://www.imc.org/pdi/ Personal Information (from vCard Schema)

http://www.saba.com/standards/ulf/ Universal Learning Format - ULF

Probably the most comprehensive and current site devoted to the interoperability standards, the Center for Educational Technology Interoperability Standards (CETIS) web site, is an essential resource for anyone working in the fields of learning objects or learning content management systems.

Another interesting site for metadata resources on metadata standards and specifications for describing people and their interests is http://www.ukoln.ac.uk/metadata/resources/people/ last updated in June 2002.

Specification Areas for Educational Materials

This table from Cetis (Centre for Educational Technology Interoperability Standards) shows some "de facto" efforts* for standardization of educational metadata and what specification areas each of them is involved in. To access the relevant part of their websites related with the respective specification area, it is possible to click on the appropriate cell of the table:

Specification Areas	IMS	ADL SCORM	Dublin Core	IEEE Learning Technology	ARIADNE	AICC
Metadata	Yes	Yes	Yes	Yes	Yes	-
Content	Yes	Yes	-	Yes	-	Yes
Enterprise	Yes	-	-	Yes	-	-
Learner Information	Yes	Yes	-	Yes	-	-
Question & Test	Yes	Yes	-	-	-	-
Accessibility	Yes	-	-	-	-	-
Learning Design	Yes	-	-	Yes	-	-
Collaboration	AFC	-	-	-	-	-
User requirements	NLS	-	-	-	-	-
Competency	Yes			Yes		
Digital Repositories	Yes					
Sequencing	Yes			Yes		

http://cetis.ac.uk/static/who-does-what.html

* CEN/ISSS, Prometeus and BSI/ISO were deleted

NLS – Not Longer Supported – there is no actual work on the subject
AFC – Among Future Concerns (?)

Learner Information Category Correspondence

IEEE LTSC (http://ltsc.ieee.org) has become the first group to have a “de facto” standard approved by an accredited standards organization related to learning, the IEEE 1484.12.1™ LOM Standard.

IEEE LTSC WG2 has 6 predefined categories. We added a 7th, the competency category that is matter of a separate working group, the WG20 (there are cross-references between learner and competency instances).
There are data extension mechanisms to accommodate information that could be considered important but is not present in the specification.

IMS has 11 predefined categories. We added a 12th, the meta-data category.

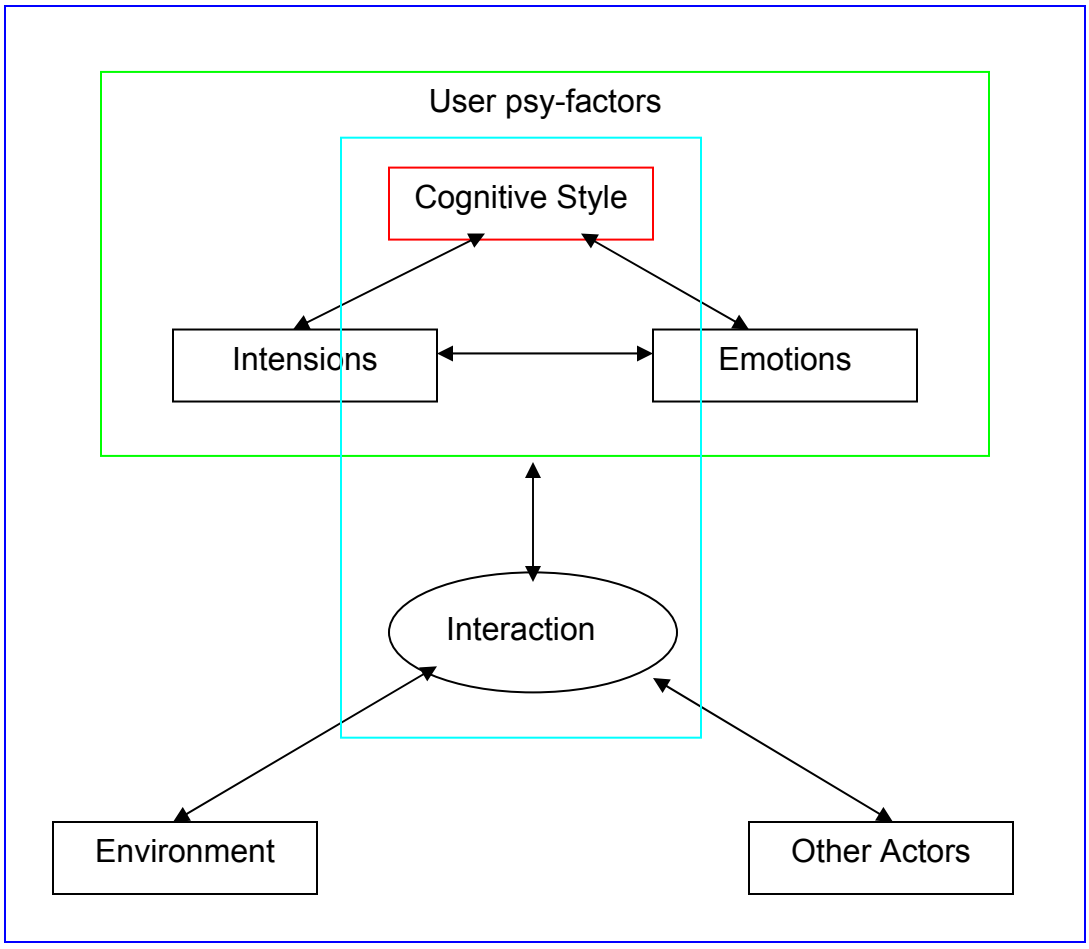
ADL SCORM has no defined categories, but 5 data model structures inside its run-time execution specification.

SABA has 5 scheme formats, one of them named learner and other two related to user modeling (there are references to external instances), competency and certification. The learner format is subdivided into 6 categories.

Learner Information Category Correspondence

IEEE LTSC	IMS	ADL SCORM	Saba
personal information	identification	core (part)	personal (part)
relations	affiliation		
	relationship		
security	securitykey		personal
preference	interest	student_preference	preference
	accessibility		
performance	qualifications, certifications and licenses	student_data (constraints to the student)	certification (external)
	activity (current)		learning (current)
	goal	core (part - current)	goal
	transcript (not detailed)		observation
competency (external)	competency		competency (external)
portfolio	activity (past)	core (part - past)	learning (past)
		objectives (accomplished)	
		interactions (measures)	
	meta-data (added)		profile information (meta)

Cognition Model



Cognitive Styles

Individual centered (structure, process or both)

- Cognitive complexity / cognitive simplicity
- Conceptualization
- Deep-elaborative / shallow-reiterative
- Divergent / convergent
- Field independent / field dependent
- Hemispheric preferences
- Holistic / analytic
- Impulsive / reflexive
- Leveller / sharpener
- Objective / nonobjective
- Organizer / nonorganizer
- …
- Reflectivity / impulsivity
- Sensory preferences
- Kolb's learning style model
- Bloom's Taxonomy

User modeling actual papers (individual centered - stereotypes)

- Field independent / field dependent

  (Triantafillou et al., 2002) – continuous

- Psyco Pedagogical Abilities

  (Souto et al., 2002) – stable features (analogue-analytic, concrete-generic, deductive-evaluative, relational-synthetic, and indefinite)

- Holistic-analytic and verbal-imagery dimensions

  (Bull et al, 2001) – discrete values

- Five major dimensions of cognitive styles

  (Liu & Ginther, 1999) – combination of continuous and discrete values

  - Field independent / field dependent – value-neutral
  - Hemispheric preferences – degree (left / right)
  - Holistic / analytic – exclusive values
  - Sensory preferences – discrete values (visual, auditory, and kinesthetic)
  - Kolb's learning style model – discrete values (converger, diverger, assimilator, and accommodator)

Cognitive model considering psychological factors, other than cognitive

- Emotions
- Intentions

Learning Orientations (Martinez, 2001)

- ✓ transforming,
- ✓ performing,
- ✓ conforming, and
- ✓ resistant

3 scales for measuring

aspects of emotions and intentions

strategic planning and committed learning effort

learning autonomy

discrete measures, but learners may improve, perform or resist (seems to be profile “evolution” - modification)

Adaptive system considering user and usage characteristics

(Gaudioso & Boticario, 2002)

- ✓ usage data relates to the user interaction process with the system
- ✓ separate models (user & usage)

Human-Computer Interaction considering distributed cognition

(Wright et al., 2000)

- ✓ cognition is not an individualistic mental phenomenon
- ✓ cognition is a joint activity involving several agents (humans and computer systems) and environment
- ✓ representations for abstract representations (internal and external) and action
- ✓ abstract information types (plans, goals, affordances, history, action-efect relations, and current state)

Applications for user models, considering adaptiveness

- User collaboration (grouping)
- Learning interaction (learning & memory)
- Tutoring (pedagogical decision making and reasoning & recommendation)
- Information filtering, retrieval & rendering (information, expertise and peer location – matching)
- Simulation (immersion) and interface test

User modeling technologies

- Predictive statistical models
- Machine learning
- Database schemas
- Data mining
- Fuzzy Logic (?)
-

User modeling issues

- ✓ Learning / Training orientation
- ✓ Diagnose the audience (tools)
- ✓ Definition of learning environment design characteristics
    - Learning path patterns and learning strategies
    - Relationship between path patterns and leaner styles
    - Artifacts
    -
- ✓ Adaptive facilities need to be controllable directly by the user
- ✓ Data acquisition to adaptive abstraction

Interaction-Related Models vs Profile Category

Category	Model(s)		
	user	interaction	environment
personal	X		
relationship	X	X	
security	X		
preference	X		
performance	X	X	
competency (external)	X		
portfolio	X		
interactions		X	
meta-data			

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