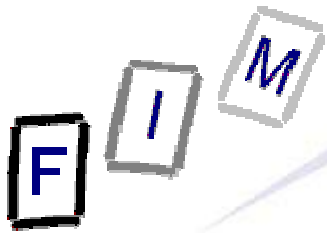Mag. iur. Dr. techn. Michael Sonntag

E-Learning

Teaching → Learning, assessments, as/for business

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E-Mail: sonntag@fim.uni-linz.ac.at
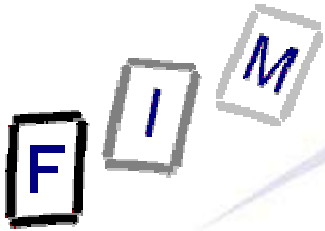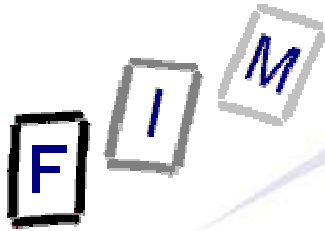http://www.fim.uni-linz.ac.at/staff/sonntag.htm

Questions?

Please ask immediately!
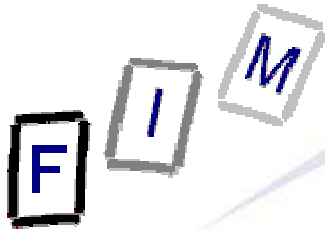
- E-Learning as/for business
- From Teaching to Learning
  - → The role of coaches
  - → Elements of the learning process
- Different modes
  - → "Pure" and blended learning
  - → Technical and organizational issues
  - → Synchronous/Asynchronous learning
- Assessments and certifications
  - → Pre-/post-/formative assessments
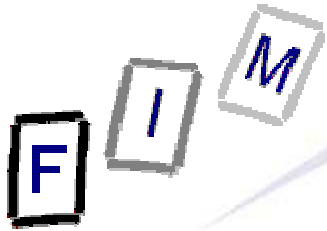- Standards
  - → Importance; SCORM & IMS
- Evaluation

- In small companies, E-Learning is still uncommon, because
  → No structural plan for personnel development
    » Usually done ad-hoc if needed: Rarely and individually
  → Large parts of such companies are not ideally suited
    » E.g. craftsmen: Only for a smaller part
    » Continuous learning has traditionally low or no value
      – Suspicions about new technologies and learning methods
  → No immediate/quick return on investment expected
    » Driven by need, not by strategy and planning
  → Suspicion: Education → Leaving for a better job/higher salary
    » At least suspected; if real, this is much more of a problem for smaller companies than for large one!
  → Higher initial investment for electronic material is a problem
    » No scaling possible, as (targeted) employee count is low
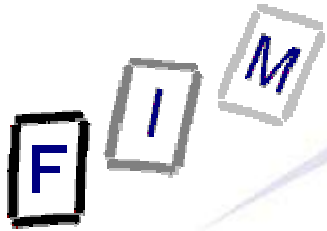   » Frequent changes: Keeping the material up to date

- Advantages of E-Learning for SMEs
  - → Standardized courses (if matching ones exist!) are a very easy way to educate employees
    - » Probably cheaper than other training methods
      - – Problem: Standardized courses usually exist only for supporting business functions (e.g. secretary: computer use), which are of low (educational) value to SMEs, compared to their main business process (without standard courses, but higher education needs!)
  - → Better fitting in with other work: Employees must be continuously available (no stand-in available)
  - → Quick and easy to realize: Can be selected and participated over the web when the need arises
- Requirements for increase:
  - → Small courses on special topics available
 - → Quick and easy to organize and participate

- Often courses are quite "trivial", esp. in large companies
  - → Examples:
    - » New product is "presented" to the sales staff
    - » How to handle a new software application
  - → But these are distributed to a large number of participants
    - » Must be created fast; costs irrelevant compared to training thousands of employees!
  - → There also exist highly specialized courses
    - » E.g. aeroplane service: Very few people know the topic exactly, but a moderate number of highly distributed people must perform the service exactly
- Large companies usually employ platforms
  - → Courses offered regularly, although perhaps different people
  - → Sometime even "corporate universities"
    - » For internal teaching of new employees

- E-learning can also be "business". Most common areas are
  - → General providers: Consulting, project management, ...
  - → Platform provider: Selling/renting/adapting a software to perform courses, hold assessments, etc (LMS)
    - » There are a few large ones dominating the market
  - → Content provider: Creating courses for others
    - » Producing learning materials, didactic settings, teacher guides,...
      - – Often happens internally, especially in larger companies
      - – Specialized companies also create their own content: Topic experts!
    - » Highly competitive (world-wide), therefore bad consequences:
      - – Incompatibility: Use it with "our" product only
      - – Very specialized: Everyone looks for his own niche
      - – Large courses: Take it all and pay more for it
  - → Course providers: Holding courses for others
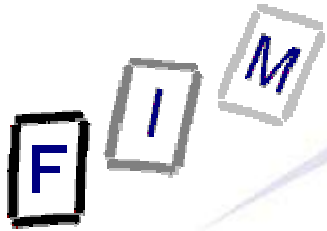   - » Provide teachers/coaches, facilities/hosting, etc.
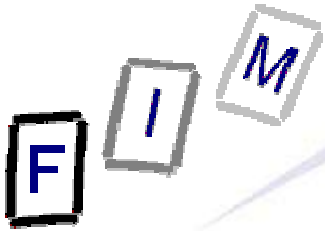
From "Teaching" to "Learning"

- Previously: Personnel was "complete" after school
- Previously: "Teaching"
  → Teacher centric; passive learner
  → Driven by presentation, telling, showing
  → According to the average speed
  → Training automated skills or memorizing knowledge
  → Suitable for fast, organized and mass instruction
- Goal for the future: "Learning"
  → Learner centric; active learner required
  → Driven by viewing, doing
  → Individual speed
  → Interpreting and discovery of "new" knowledge
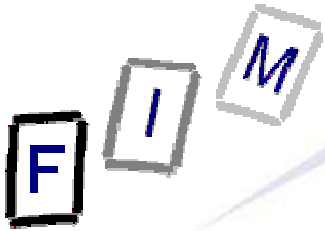 → Suitable for ad-hoc and individual instruction

Requires also changes in the tools!

- Different materials: Not a guide for teacher or a "supplemen-tal" for students but the main "content" for the learners
  - → But need not contain every detail → for learners to "discover"!
- Teacher replaced by coach
  - → Usually a "content creator" in addition to the coach
- Disassociation of time and place
  - → Communication means and tool support
    - » Real life: Learning platforms and Internet
- Smaller learning units
  - → Traditional & commerically interesting: Long courses (2-30 h)
  - → Learning: Short courses (10-30 min)
    - » Allows learning "in-between", better matches attention span
    - » Whole curriculum: Many short courses
      - – Either pre-defined structure or learner-selected (some restrictions)

- Help students learn by accelerating the learning process
- Roles and tasks of a coach:
  → Advisor and mentor: Can answer questions on difficult topics or knows where and how students can discover them
  → Guide through the content: Advises upon possible paths and helps select the best one for each individual
  → Preparing (or selecting/assembling) learning material
  → Initiating discussions: questions, provocative statements, etc.
  → Monitoring the learning progress: Informal evaluation
  → Administration of the course; timeliness of learning results
- Requires very close and "personal" supervision
  → Ratio coaches:learners is lower than teachers:learners!
  → Only then can he motivate students
 → Avoids "isolation" of learners
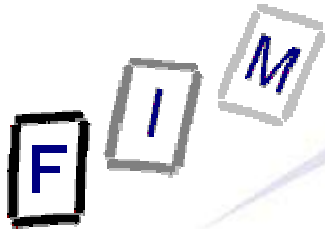
- Motivation: More important in learning than in teaching
  → Two kinds: motivation for learning or for content
    » For learning: Often extrinsic (grades, part of job)
    » For content: Often intrinsic (job req.; area interesting per default)
      – Business: The environment must be especially good to overcome problems caused by extrinsic motivation for learning; content can be slightly worse (e.g. presentation) as it is interesting by default
  → Differes largely from conventional teaching:
    » Conventional: "Simple" book + motivation through teacher
    » E-Learning: The material itself must be the motivation
      – But see coaches and blended learning!
- Communication: Important part of learning
  → Conventional: Relatively easy (teacher, colleague, friends, ...)
    » "State" (idle; topic) of co-learners known or easy to check
  → E-Learning: More difficult (unknown, scale factor, asynchr., ...)
    » Requires technical knowledge and tools
    » Might be available at the workplace, but not at home
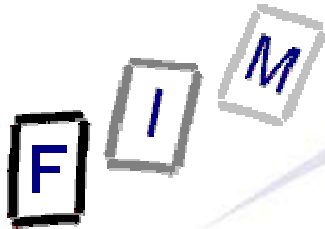
- Cooperation: Requires communication
  - → More difficult to initiate and perform in E-Learning
    - » Students don't know each other; their strength/weaknesses, interests, work habits, ... → difficult to form groups for teamwork!
  - → Partly easier to perform: Not all must meet at the same time
    - » Location/time independence is "built in" from start and customary from "ordinary" communication
- Self-Assessment: Differences
  - → Conventional: "Ambient" assessment
    - » What ask other students? Do I know this already?
    - » How is the person beside me doing on the task?
    - » Difficult to transform to E-learning!
  - → E-Learning: Individual assessment
    - » Each student can regularly perform an assessment and receive individual and detailed results
      - – Conventional this is not possible because of teacher workload!
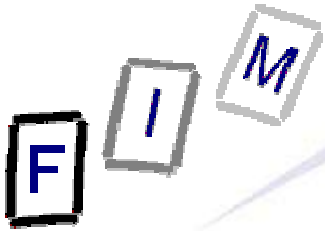
- LMS = Learning Management System
  - → Covers the presentation of the learning material, but also the administration of courses, student enrollment, etc.
    - » Practice: Most systems are severely limited and cover only administration of individual courses and presentation!
- CBT = Computer Based Training
  - → Structured offline presentation of topics; compare to WBT
- WBT = Web Based Training
  - → Integration of online communication/content into the training
- LO = Learning Object
  - → A single "course". This is typically rather small (15-90 min.)
    - » Usually consists of individual files/resources+abstract description

- E-Learning without any kind of personal contact
  - → Still, you could have your own "teacher" (e.g. DVD) and your personal "instructor" (video conference)
- Also called "Distance learning/teaching"
  - → Basic idea of "removing" the teacher
    - » Both "no teacher" and "no meetings" proved to be successful!
- Advantages:
  - → No need for travel: Always "different place"
  - → No synchronisation need: Can be performed/paused when and whereever desired or possible; no "term" requirement
- Difficulties:
  - → Social contacts missing: Especially important for teamwork
  - → Technical requirements extensive or process severely lacking
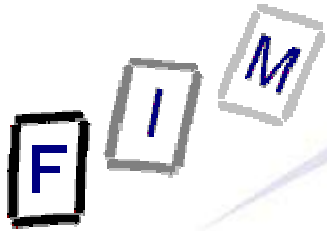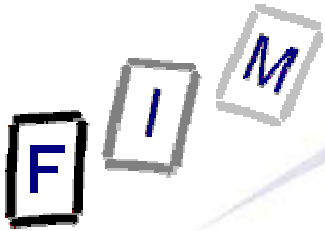 - → More difficulties for less-performing learners

- Mixing "pure" E-Learning with phases of physical presence
  - → Almost all methods can be performed in every way
  - → BL focuses on the strength of each kind of activity, e.g.
    - » Lecture/knowledge presentation: Offline, DVD
    - » Integration of knowledge, discussions: Online, Chat/Forum
    - » Practical examples, teamwork: Physical presence
  - → Allows better for individual learning style/methods
- Important aspect for cost-balancing!
  - → Pure online content is very expensive to develop
    - » Suitable for standardized long-lasting content for large groups
  - → Physical presence does not scale well
    - » Better matched for transient content for smaller groups
- Drawbacks:
  - → Identification of appropriate training modes for each element
  - → Proficiency/technical support with different media/methods

- Mixing presence phases, WBT and individual coach support
- Can contain:
  - → Kick-off meetings, final presentations/discussions
  - → Initial presentations (overview, introduction, raising interest)
  - → Offline and online materials in various forms (text, video, etc.)
  - → Discussions: online/offline, synchronous/asynchronous
    - » Moderated, supervised, free
  - → Individual advice through coaches
  - → Groupwork, esp. for reports or case studies
  - → Learning by teaching: One group asks the other
  - → Tests: For grades or self-assessment; on-/offline
- Different pedagogical methods for different elements
  - → Teacher/coach must know them all
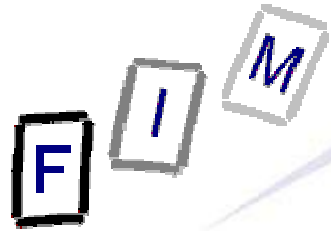 - → Learners might get confused
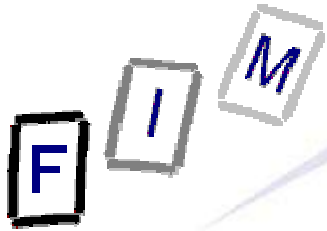
- Still most companies have rather diverse infrastructure
  - → Different OS/Browser (versions)
  - → Bandwidth/CPU speed/memory size/DVD availability
- LMS are expensive and difficult to setup and maintain
  - → Needed (future courses?) or overhead; supports all the elements you (will) need?
    - » Example: Which form(s) of online testing are available?
  - → Measurement of results (access, business impact, etc.)?
  - → Integration with existing systems (e.g. CMS)?
- Computers needed also for face-to-face meetings?
  - → Requires special computer rooms or laptops
- Online content availability for offline parts
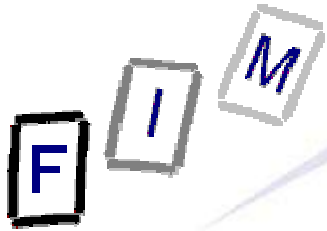 - → Printing it all out, laptop, few shared computers, ...?

- Payment for development/creation of course material, LMS and travel/time of face-to-face meetings
  → Whose budget will this come out of?
- Development support by topic experts
  → Are the topic experts available for "producing" the content?
    » Or is it completely "new" and can be done externally?
- Business process integration: Making sure employees do have actual time to perform the individual parts
  → Top-level support to tell managers to give workers time
- Motivating employees: So they don't just "click through"
  → Launch program, internal marketing, certific., part of work, ...
- Problem solving: Helpdesk availability, content producer
- Deployment process: Web or local installation?
 → Who will do the local installation and when?

Synchronous vs. asynchronous learning

- Synchronous = Same time, asynchronous = different time
  - → Communication/cooperation with other learners or coaches
  - → Different from 1:1 vs. 1:N (usually both possible)
- Synchronous communication:
  - → Chat: Unstructured communication; e.g. brainstorming
  - → Shared boards: Graphical examples, sketches
  - → Application sharing: Guided hands-on experience
  - → A/V-conferences: Presentation, questions; individual/grouped
  - → Virtual rooms, MUDs: separate discussions, 3D presentations
- Asynchronous communication:
  - → E-Mail: Individual questions/advice, document distribution
  - → Forums: Structured discussion on (sub-)topics
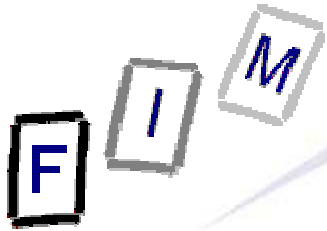 - → File exchange: Handing in examples, distributing material

- Synchronous communication suffers from social inhibitions
  - → "Unpersonal" compared to traditional means (e.g. chat)
  - → Asynchronous: Like writing a letter; custom sense works
  - → Contrary also common: flaming
    - » Rarely in more mature education: Repercussions possible!
- Synchronous communication obviates the advantage of time independence in E-Learning
  - → But improves cooperation and social contacts
- Asynchronous communication takes longer (intrinsic delays)
  - → But usually results in a better focus of the content
- Synchronous communication technically difficult (at distance)
- Synchronous communication is often a "gadget"
  - → Uncommon, nice to try out: Practical use requires very careful preparation by the coach!
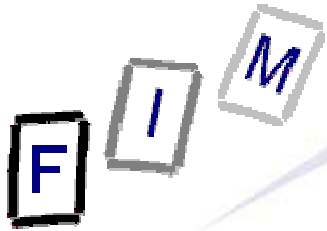
- Default: Asynchronous
  → This is the basic idea behind distance teaching
    » Time and location independence
- Special didactical/topical needs: Synchronous
  → Requires more preparation; scaling worse
- For blended learning:
  → Reserve synchr. comm. mostly for the physical meetings
 → Otherwise only for urgent (time critical) discussions

- Different target groups for the outcome
  - → Learner: Monitoring the own progress; sense of achievement
  - → Coach: Identifying areas requiring further guidance
  - → Company: What tasks the learner can now be given
  - → Course author: Areas not really understood → to be improved
  - → Third parties: Capabilities of the person (e.g. hiring)
    - » But see: Certifications!
- Different intentions require different methods
    - » There is no "perfect" test!
  - → Is it a pre- or post-assessment or a certification?
  - → Who is the target group and what should be the "outcome"?
    - » Single mark, interest profile, knowledge profile, confidence, speed, motivation, material quality, ...
  - → Determines: open/closed book, time limit, duration, coverage, answer availability, etc.
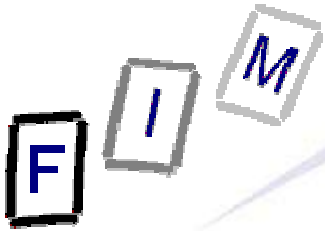
- Also called "diagnostic" assessments
  - → To determine existing knowledge: Areas already known
    - » Prerequisites known, missing elements, level of knowledge (details or overview),
  - → Identify skill gaps: What is still missing; what is needed
    - » Learning methods known?
    - » Can the learning system be used (technically)?
  - → Find out work style: How problems are solved
    - » For later deciding on e.g. the presentation style: text or video, ...
  - → Identify interests: What the students is most interested in
- Identify suitability of a course
  - → Requires exact description of the course, prerequisites, etc.!
- No grading, immediate feedback
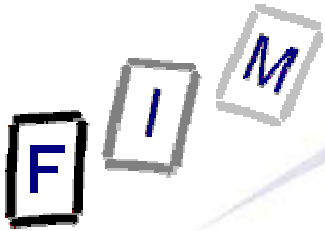 - → E.g. directly after each question (pointer to chapter, etc.)
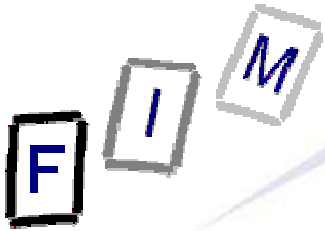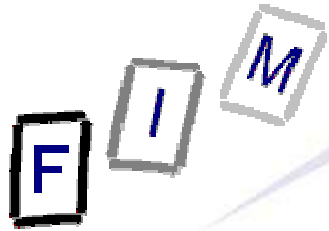
Formative assessments

- During the learning phase; used for:
  - → Determining the current success
    - » Intermediate/chapter tests: Was the last part really understood?
  - → Finding areas of difficulty
    - » What students didn't comprehend and must be reworked/repeated
  - → Measuring progress through the course
    - » Which part of the students have progressed to which position?
  - → Collecting data for grades (some say: should not be a part!)
    - » Proficiency/quality of students, resp. their work
  - → Preparation for post-assessments/certifications
    - » What is important, level of difficulty, style of testing?
- It should be:
  - → Directly linked to the goals to achieve
  - → Regularly and frequent, but rather short and focused
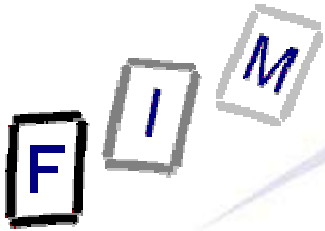 - → Fast feedback: Only then can future learning be improved

- Also called "summative" assessment
  - → To determine the overall success/meeting the final goals
    - » What was learned and what is still missing
  - → Quantitative grading (see also certification)
    - » "Quality" of the person with respect to this topic
  - → Comprehensive nature: Covers all areas in certain depth
    - » Should be a "complete" assessment to prevent skipping
  - → Should be able to stand alone: "Independent" of material
    - » In contrast to formative assessment, which is valid only with respect to the specific teaching material
  - → Provides no absolute grading, but rather a comparison
    - » To all other learners or the general population
    - » See certification!
  - → Validity and reliability are important
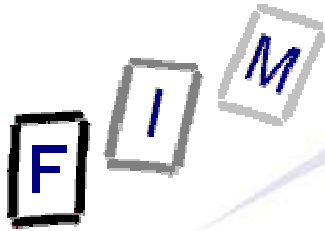   - » Results are shared with others!

- Assessments only provide relative results, while
- Certifications provide "pass/fail" measure on absolute level
  - → Usually both are combined: fail / quality of passing
    - » Example: Austria (1-4=pass, 5=fail); Germany (1-4=pass, 5,6=fail)
- Certifications are often associated with special permissions
  - → Moving to the next class, performing kind of business, ...
    - » Regulatory certifications (e.g. electrician)
- Assessments may suffer from grade inflation/deflation
  - → Same proficience is sufficient for better/worse results
  - → Certifications usually have rather strict (e.g. prescribed) tests or are common among a large area
    - » This allows easier comparison, but often results only in a "minimum profiviency level"
   - » E.g. finding out the "best" job applications is difficult then!

Business value of certifications

- Permission to perform tasks: Someone must be "certified"
- Apply for projects (e.g. public funding or complex projects)
  - → A kind of "pre-selection" to weed out those not expected to understand the project or unlikely to be able to complete it
- Credentials of competency: "All employees hold a ? certificate!"
- Proof of continued education: Cert. often expire fast (3 years)
- But be careful:
  - → Experienced personnel often has no time for certifications
  - → Certifications are only as good as the final testing
  - → Certifications deprecate fast: Development speed (IT!), forgetting/missing practice
  - → Certifications might result iin vendor lock-in
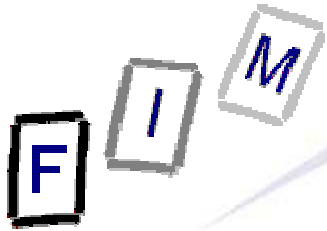   - » MCSE will rarely consider Linux; CCNP will only use Cisco

- Interoperability: Will it work together with other systems?
  - → Especially important for LMS (users, grades, etc.)
- Re-usability: Learning material from one system should also be usable in a different system
  - → Enables easier assmebly of courses from individual pieces
  - → Avoids "stranded costs" when changing the platform/LMS
- Manageability: Tracking users and content
  - → Who viewed what and how often?
- Accessibility:
  - → Technical (stability, availability)
  - → Content: suitable for different navigation and presentation methods (e.g. For handicapped persons)
- Durability: Will it be around later? Continuous development?
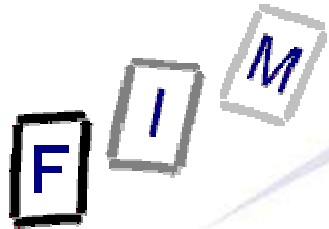
- The most important standards are currently
  - → Content packaging (CP): A single LO, including its internal structure and all resources + metadata (optional)
  - → Metadata (MD): Describing resources, CP, units, etc.
    - » Really standardized currently only on CP level and below
  - → Many other standards exist, but these are not widely adopted, sometimes very difficult to implement and not "sure bets"
- Currently most important and mostly widely used:
  - → CP: The Content Packaging Specification (CPS) from IMS
  - → MD: The Metadata Standard from IEEE
    - » LOM: Learning Object Metadata
  - → Both also used in the SCORM meta-standard
- Other standardization areas:
  - → Online testing (future importance!), learner profiles, sequencing, accessibility, repositories

- For content producers:
  - → Few investments to be able to run content on many LMS
  - → Pre-structure for easier rearrangement of LO
  - → Topic experts can focus on the actual content
- For LMS producers:
  - → More content available, increasing the attractiveness
  - → Importing data easier
- General drawback: More competition!
- For customers:
  - → Changing the LMS possible
  - → Reuse of content possible (different LMS, combining LOs,...)
  - → Uniform "style" of content (navigation, sequencing)
  - → Based on didactical models: Avoiding "bad" courses
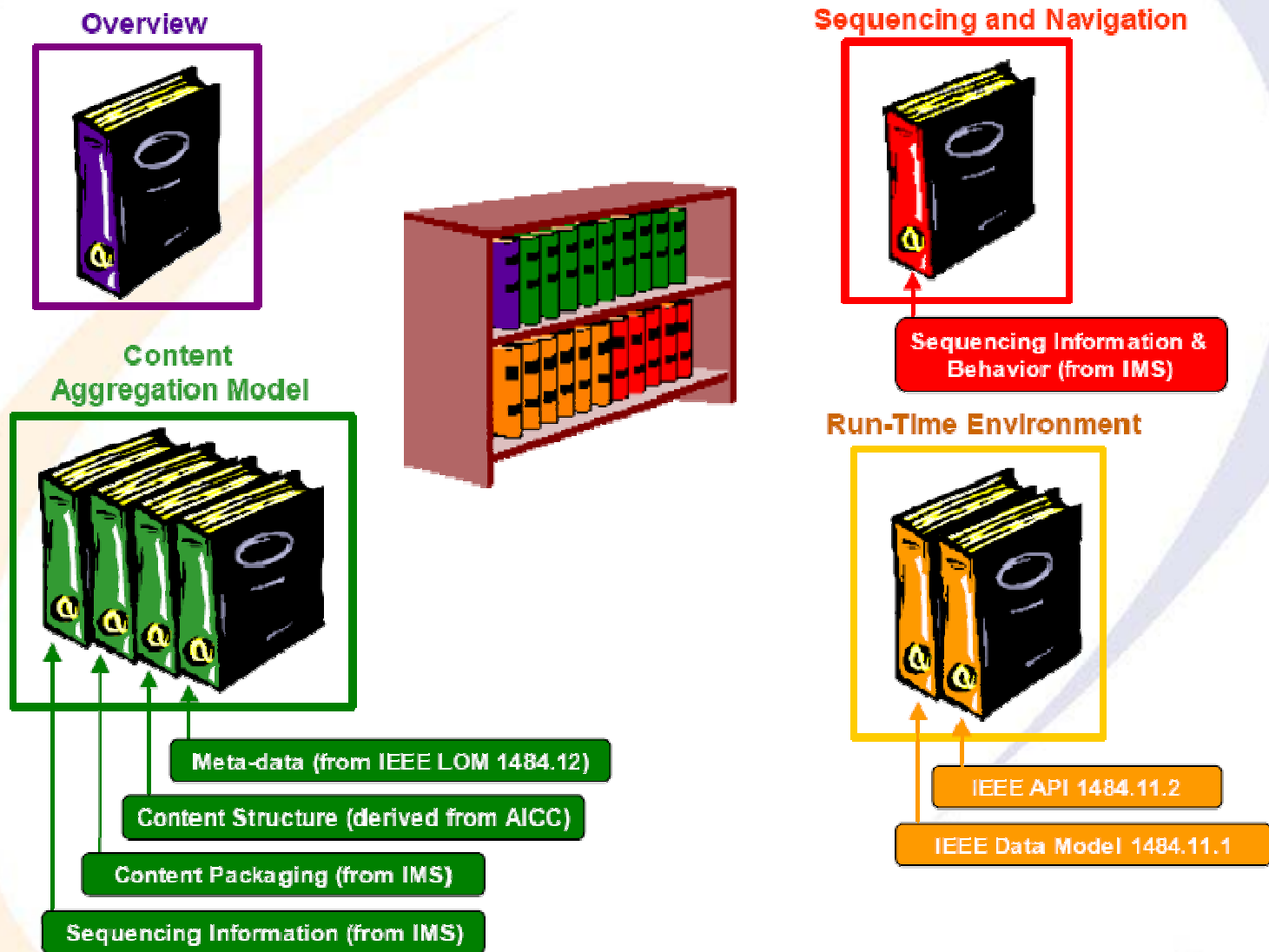   - » No guarantee for "good" ones, however!

Standards overview: SCORM

- SCORM: Shareable Content Object Reference Model
- No own standard; just assembles individual ones!
  - → Reference model for both content and its delivery
    - » Content: Data structure specifications
    - » Delivery: Software API
  - → Contains: Data on users, their progress, results; LO
  - → Focused on the web for instruction delivery
- CAM: Content aggregation model
  - → Assembling, labeling and packaging of learning content
- RTE: Run-Time Environment
  - → Launch content, tracking, data transfer, error handling, ...
- SN: Sequencing and Navigation
  - → Selecting which content to present and its ordering
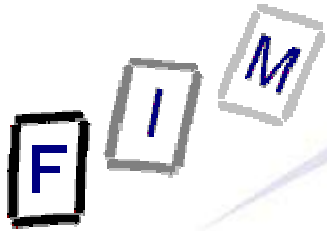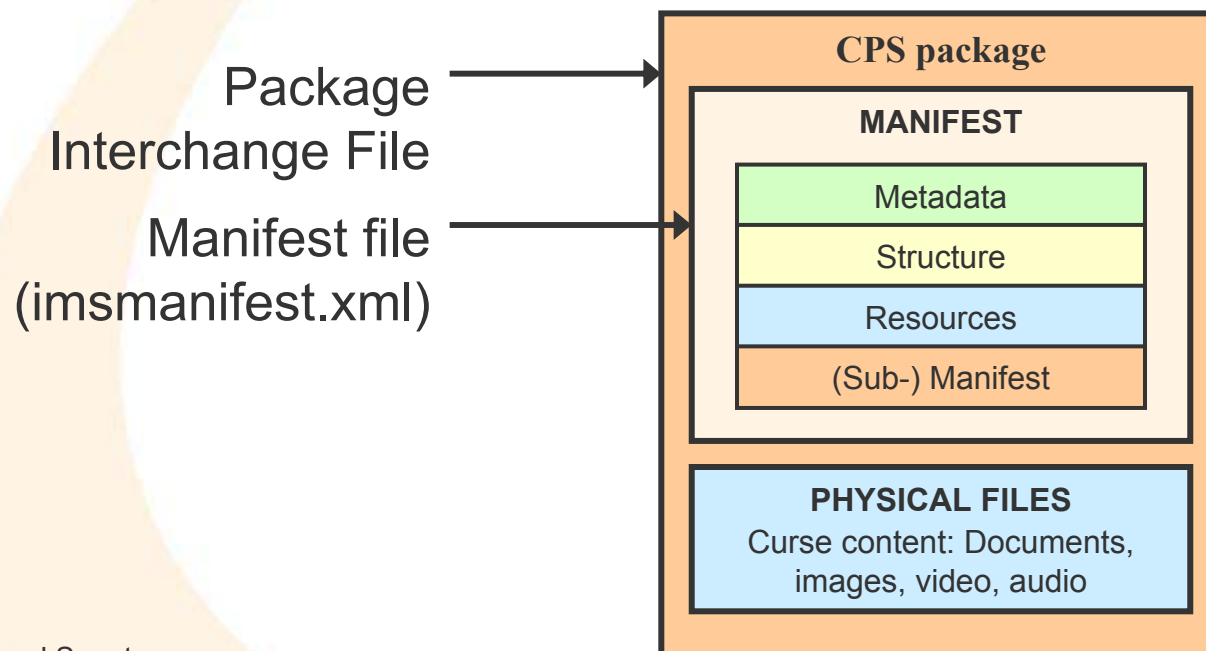
Official conformance testing available!

Overview

Content Aggregation Model

Meta-data (from IEEE LOM 1484.12)

Content Structure (derived from AICC)

Content Packaging (from IMS)

Sequencing Information (from IMS)

Sequencing and Navigation

Sequencing Information & Behavior (from IMS)

Run-Time Environment

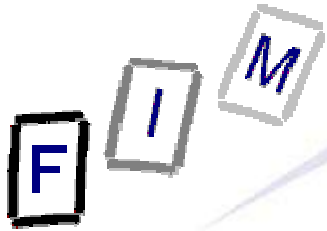IEEE API 1484.11.2

IEEE Data Model 1484.11.1

- Consortium for developing specifications
  - → Members: Large vendors of LMS and content producers
  - → Specifications will actually be supported by products!
- Created lots of specifications
  - → Some very important, some rather obscure
  - → Does not create any implementations; only partly samples
  - → No conformance testing
- Continuous development
  - → E.g. CPS: 1.0, 1.1, 1.1.1, 1.1.2, 1.1.3, 1.1.4
    - » Usually only small modifications/clarifications/errata
    - » Sometimes adaptation to international standards
      - – E.g. metadata (MD) was aligned to IEEE LOM (practical identically)
- Specifications are XML based; now mostly XML Schema

- CPS package = Learning package according to the CPS
- Structure of a CPS package:
  → Manifest „imsmanifest.xml" (XM file) in root directory
    » Metadata
    » Structure and references to the actual learning content
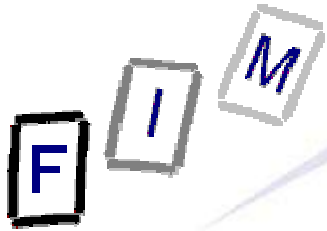 → Learning content in arbitrary formats

Package
Interchange File

Manifest file
(imsmanifest.xml)

CPS package

MANIFEST

Metadata
Structure
Resources
(Sub-) Manifest

PHYSICAL FILES
Curse content: Documents,
images, video, audio

- Information on the package, the resources used and the area of applicability (school types, age, ...)
  - → General: Title, language, description, ...
  - → Lifecycle: Version, status, contributors
  - → Metametadata: Schema, language, classification
  - → Technical: Format, size, technical requirements, platforms, ...
  - → Educational: Interactivity, context, age range, difficulty, etc.
  - → Rights: Cost (1/0), copyright (1/0), description
  - → Relation: Kind (e.g. hasPart, isBasedOn, requires), resource
  - → Annotation: Person, date, description
  - → Classification: Purpose, keyword, taxonomy, description
- Very similar to IEEE LOM!
- Potential problem: "Pure" XML; sometimes RDF prefered!

Directly contained within the manifest!

- Evaluation of the learning "result"
  1. Reaction: Asking learners (e.g. online questionnaires)
     - Environment suitable for learning?
     » The perceived value of the instruction
  2. Learning: Pre + post assessment
     - Learned anything?
     » The actual difference in knowledge and skills
  3. Behaviour: Observation, surveys
     - Was it useful?
     » Behavioural changes on the actual job; knowledge/skill retention
  4. Result: Observations, statistics, (control group)
     - Was it worth it?
     » Business impact of the instruction: Improvement-costs
- Often only levels 2 and 1 are completed; 3 and 4 are only rarely assessed, but are very important!
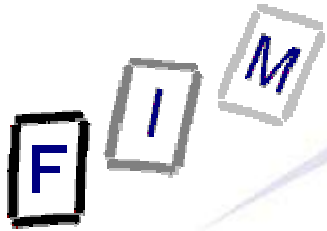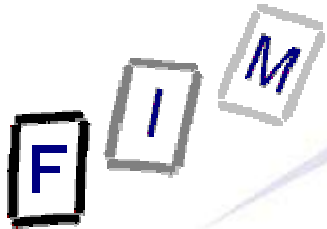
- Reusability of LO improves with small size (e.g. 10 min)
  → But this can break didactical models, e.g. continuing story arc, cross-connections, "as seen in the last chapter", ...
    » Small LO result in "trivial" tests, as they too must be short and cannot contain content from other LOs
  → Improves adaptive feedback: Wrongly answered questions can be easier tracked back to the content explaining them
- Design can be easier recycled than content
  → A common "teaching model" is easier to reuse than content
  → Similar for technical elements like scripts, graphics, etc.
- Recycling LO is not just rearranging them
  → Unified graphical, GUI, handling, teaching model, ... Required
- Size also depends on external factors:
  → Learning unit lengths, set curriculum (learner decisions?), ...

 Think about content reuse, but also assess the probabilities!
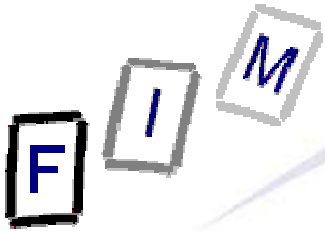
- Same standard ≠ Interoperability
  - → Different interpretations exists: Standards aren't perfect
  - → Custom extensions: To differentiate from others
    - » Provide some additional value or more options
  - → Incomplete realization: Some standards are very complex
    - » Some standards take this already into account, consisting of different levels (both for implementation and conformance)
  - → Many standards are only a kind of "metadata"
    - – Example: CPS (talks about arrangement of actual content)
    - – Counterexample: QTI (questions and their structure defined)
    - » But the format for the "real" content is not specified!
      - – E.g. requiring a custom player for special content obviates the advantage of the standardized manifest
  - → Standards evolve: Often only a one-way upgrade possible
    - Practice: Works quite good, but not perfect

- Informal learning is important; can be improved through various elements in electronic form
  - → Blogs with important events, how to solve things, etc.
    - » Letting them browse through this on starting a new job
    - » Get a general "feeling" on how to solve problems
- KM systems: Adding new elements and searching for existing ones on current problems
  - → But requires an overview on what is exactly contained!
- Business process documentation (e.g. ISO 9000)
  - → Intended for different use, but good introduction
    - » Might be hard to read, so perhaps only for qualified staff
    - » Not necessarily conforms to the actual way things are done ...
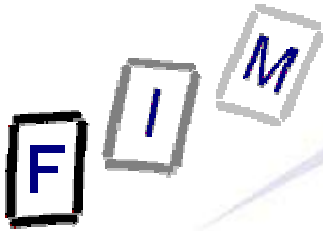
- Susanne Loidl-Reisinger: Mobile Intelligente Agenten als Wegweiser im Distance Teaching / Coaching / Learning
  http://www.fim.uni-linz.ac.at/Diplomarbeiten/dissertation_reisinger/Inhalt/Diss.html

- Le'a Kent: E-Learning Courseware Evaluation
  http://www.astd.org/pdfs/M208.pdf

- ADL: SCORM standard
  http://www.adlnet.org/

- IMS Global Learning Consortium:
  http://www.imsglobal.org/

- Kevin Kruse: e-Learning Guru
  http://www.e-learningguru.com/articles.htm