Specialised repository;
on the storing standards of scientific and educational content

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Outline

- **Importance of multimedia content;**
  - case: Institute of Physics
- **Repository**
  - Solution for storing and reuse of scientific and educational content
  - Organisational aspects (centralised, decentralised, general, specialised)
- **Learning objects**
  - Description by metadata
- **Storing standards**
  - Categories and attributes (IEEE LOM, MERLOT)
  - Extending the LOM: classification schemes
- **Conclusions**

Problems of storing, search, reuse

- **Most of content produced at IF is stored by owners at their personal computers**
  - Content is not accessible by other users
  - Content is stored in unsystematic fashion and extremely difficult to locate (even by owners)
  - Great risk of loosing the content

- **Some of the content is highly integrated and difficult to reuse**
  - Diploma works, PhD – some parts have a general educational value
  - User have no expertise to extract segments of multimedia (web pages, movie clips…)

Repository

Solution for efficient storage, search and reuse of digital content

- **Repositories** are collections of learning objects that have well defined user interfaces and architectures that make them easy to store and search digital content.
  - Online search engines that search the whole web bring back **too many results**
  - increase visibility of content
  - stimulate authors to make their content **accessible** for other users
- With respect to web catalogs, repositories offer possibility to search the content according to **pedagogical characteristics** i.e. with respect to their role in educational process.
  - specification of **primary audience**
  - whether **assignments** are available or not

Repository

Indicator of scientific production

- Repository of digital educational content **is indicator of production** (scientific and educational content) of a particular institution, society.

Webometrics Ranking of World Universities

http://www.webometrics.info/

Webometric indicators *are provided to show the commitment of the institutions to Web publication and to the worldwide Open Access to knowledge.*

If the web performance of an institution is below the expected position according to their academic excellence, university authorities should reconsider their web policy, ***promoting substantial increases in the volume and quality of their electronic publications****.*

Repository

Stimulates new approach to coarse development

- Repositories can greatly increase dissemination and **access to research results** that can be used in educational process.
- Repositories can influence the way higher education institutions use educational content (shearing, reuse).
- Advances application of e-learning
- Repositories are organised also to **decrease the costs** and time of online course development

Organisational aspect

- Organisation of repository with respect to: *where a content is stored*
  - **CENTRALISED:** stores original content and accompanying metadata
  - **DECENTRALISED:** stores metadata and links to original data
  - **HYBRID:** combination of centralised and decentralised approach

Centralised repository

MIT Open CourseWare

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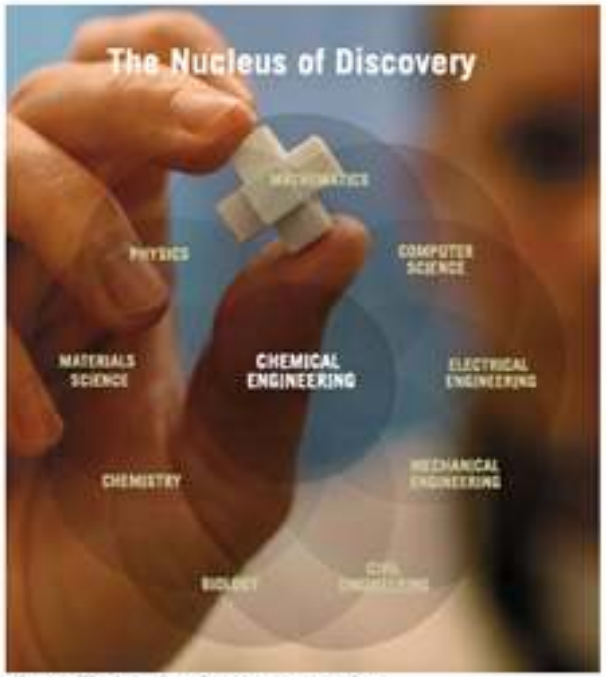
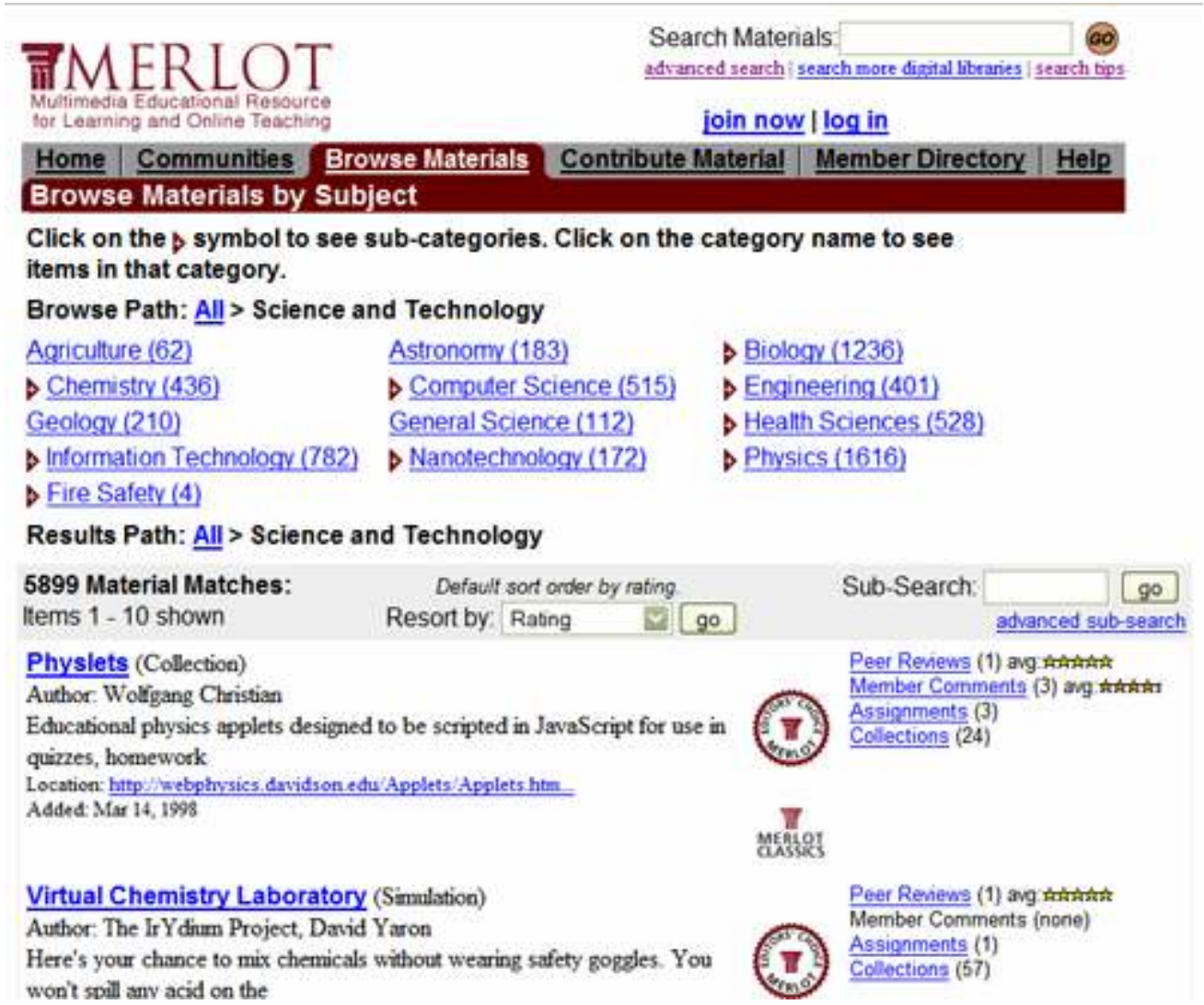


Photo illustration by Greg Sands.

Decentralised repository

Multimedia Educational resource for Learning and Online Teaching



General vs. specialised

CARNet's document suggest two scenarios for the organisation of repositories at national level:

- Repository associated with National and University Library (NSK)
  - Provide access to all resources of general interest (e.g. diploma works, PhD)
- Specialised repositories supported by "System of Scientific Information" (SZI *http://www.szi.hr/*)
  - **SZI goal:** transform specialised libraries into information centres that would process information, provide searching facilities and access to information of scientific and academic value.
  - Specialised repositories can greatly increase effect of **cross-fertilization** between different scientific disciplines

Softvare solutions

- **A Guide to Institutional Repository Software**
  Open Society Institute
  http://www.soros.org/openaccess/software/

- They are available via an Open Source license—that is, they are available for free and can be freely modified, upgraded, and redistributed.

- They comply with the latest version of the **Open Archives Initiative metadata harvesting protocols**—this OAI compliance helps ensure that each implementation can participate in a global network of interoperable research repositories.

-
  - Implementation Guidelines for the Open Archives Initiative Protocol for Metadata Harvesting
  - *http://www.openarchives.org/OAI/2.0/guidelines-repository.htm*

Learning Objects

- **Learning object**
  - A learning object is an object or set of resources that can be used for **facilitating intended learning outcomes**, and can be **extracted and reused** in other learning environments. **(*)**
  - Learning object is defined as **any entity** - digital or non digital - that **may be used for learning**, education or training ($)
- **Information object(*)**
  - The intent of a learning object's designer is **to facilitate learning**, while information objects are designed to be a reference, and not necessarily for the purpose of retaining skills or concepts by the user.

What distinguishes an educational resource from other types of resources?

*(*) **Sandy Mills AliveTek, Inc.***

($) *Phil Baker, Institute for Computer Based Learning*

Description of LO by metadata

Metadata are “data about data” – information about digital object that are used to describe learning object and facilitate easier search.

Educational resources are indexed using information grouped into several categories that describe their general, semantic, pedagogical and technical properties.

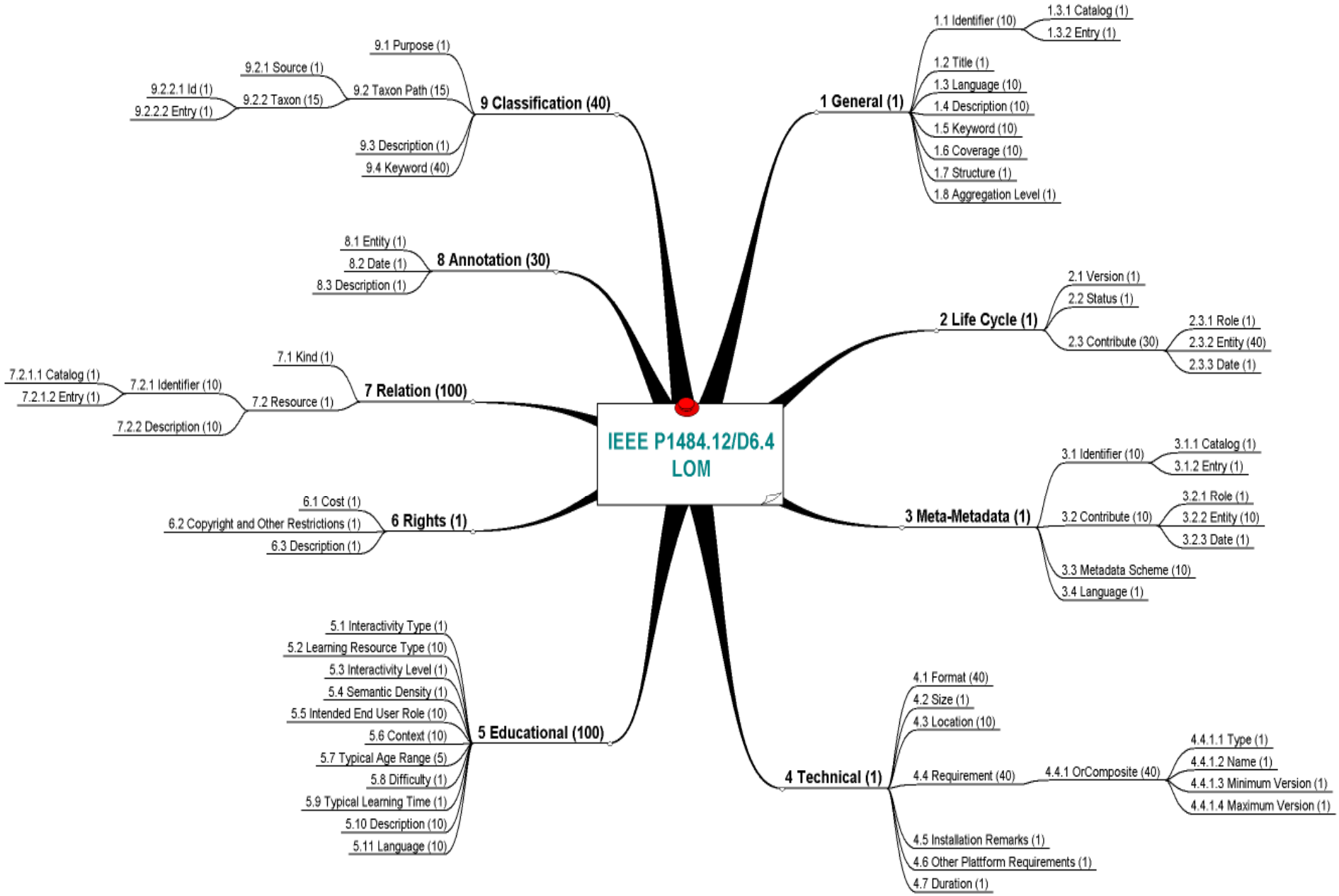
Metadata standards

- **IEEE LOM (Learning Object Metadata) 1484.12.1**
- Built on work undertaken by:
  - US IMS Project (now IMS Global Learning Consortium).
  - EU ARIADNE Project (now ARIADNE Initiative).
  - Dublin Core Metadata Initiative.

- Standard IEEE LOM is complex and it contains nine categories

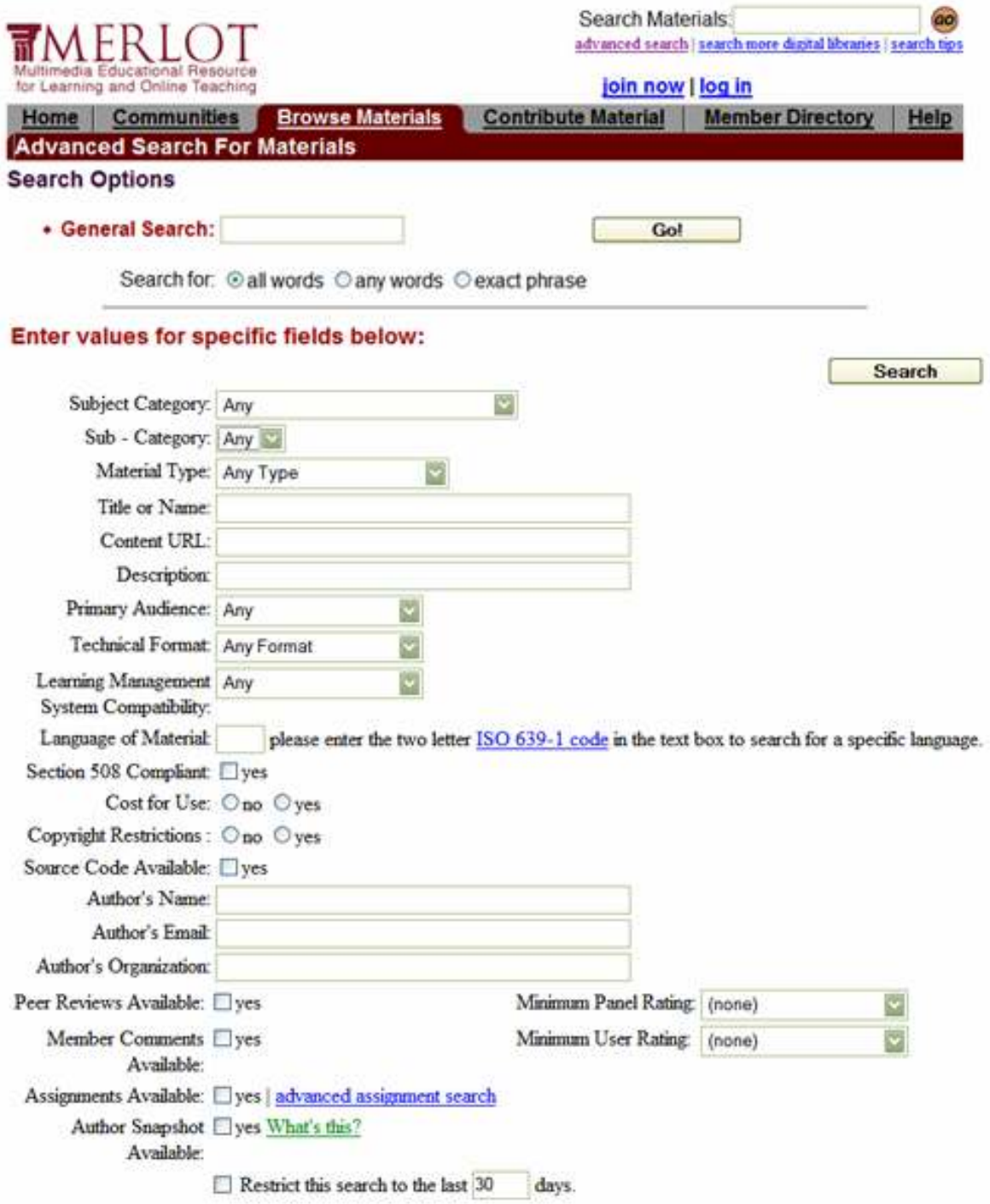
  - General
  - Lifecycle
  - Meta-metadata
  - Technical
  - Educational
  - Rights
  - Relation
  - Annotation
  - Classification

- **MERLOT (Multimedia Educational Resource for Learning and Online Teaching)**
  - Standard IEEE LOM is complex in its structure and has several fields that are not obligatory.
  - In practice it is not necessary to use all elements allowed by standards. CARNet's paper suggests reduced implementation used by MERLOT.



Overview of LOM draft 6.4

The numbers in parenthesis show the multiplicity of the element. Numbers greater than 1 indicate the smallest permitted maximum of entries an implementation must allow. This mind map was prepared by Thomas Herrmann, Teleteach GmbH, Germany. Please send any comments to th@teleteach.de



Fields used by the MERLOT Search:

For **Materials** Searches:

- Title
- Description
- Author
- Subject Category

For **Members** Searches:

- First Name
- Last Name
- Organization
- Address
- Phone
- Email
- Associations

Specialised repositories

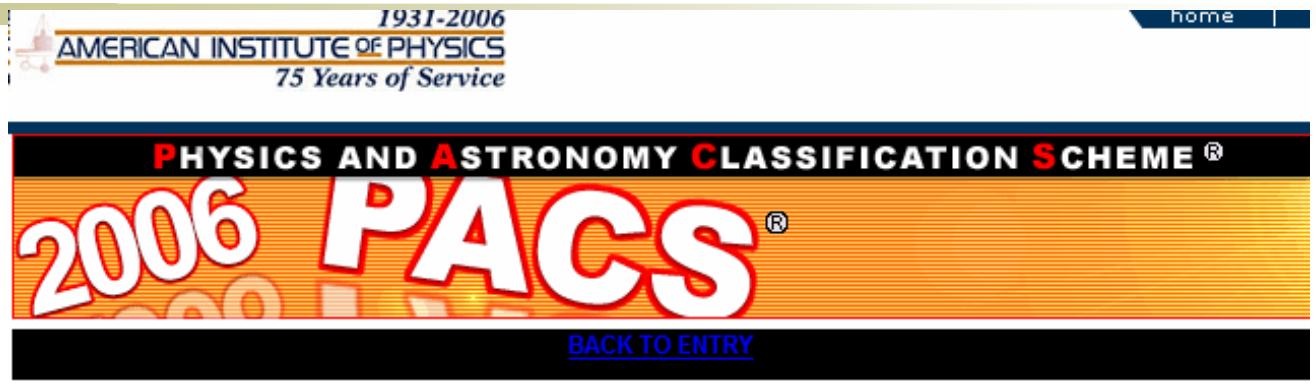
Need for improved access to data

- Keyword searches have a tendency to return large amounts of irrelevant information
- The use of **classification schemes** offers one solution to providing improved access to repository resources
- Advantages of using classification schemes include
  - Improved subject browsing facilities
  - Potential multi-lingual access
  - Improved interoperability with other services.
  - Possibility of broadening and narrowing searches: classification schemes are hierarchical and therefore can be used to broaden (i.e. for improved recall) or narrow a search when required.

classification schemes

- **classification schemes** group documents into a hierarchical structure of subject categories
- Classification schemes vary in scope and methodology, but can be divided into universal, national general, subject specific and home-grown schemes.
- **GENERAL:** Dewey Decimal Classification (DDC); Universal Decimal Classification (UDC); Library of Congress Classification (LCC);
- **SUBJECT SPECIFIC:** Physics and Astronomy Classification Scheme (PACS), National Library of Medicine (NLM); Engineering Information (Ei); Mathematics Subject Classification (MSC) and the ACM Computing Classification System (CCS).

Physics and Astronomy Classification Scheme



To connect to any category of PACS 2006, please click on the blue link of your choice, listed below.

A green background color has been used for all new codes.

- PACS Category 00: General
- PACS Category 10: The Physics of Elementary Particles and Fields
- PACS Category 20: Nuclear Physics
- PACS Category 30: Atomic and Molecular Physics
- PACS Category 40: Electromagnetism, Optics, Acoustics, Heat Transfer, Classical Mechanics, and Fluid Dynamics
- PACS Category 50: Physics of Gases, Plasmas, and Electric Discharges
- PACS Category 60: Condensed Matter: Structure, Mechanical and Thermal Properties
- PACS Category 70: Condensed Matter: Electronic Structure, Electrical, Magnetic, and Optical Properties
- PACS Category 80: Interdisciplinary Physics and Related Areas of Science and Technology
- PACS Category 90: Geophysics, Astronomy, and Astrophysics
- Appendix to 43: Acoustics
- Appendix to PACS 91-94, 96: Geophysics
- Alphabetical Index

Hierarchical structure of subject categories

70. CONDENSED MATTER: **ELECTRONIC STRUCTURE**, ELECTRICAL, MAGNETIC, AND OPTICAL PROPERTIES

73.Electronic structure and **electrical properties of surfaces**, interfaces, thin films, and low-dimensional structures

73.20.-r Electron states at surfaces and interfaces

73.22.-f Electronic structure of nanoscale materials: clusters, nanoparticles, nanotubes, and nanocrystals

73.40.-c Electronic transport in interface structures

Extending the LOM

- LOM conceptual data schema may be extended by:
  - Adding new vocabularies to existing elements
  - Adding new elements.
- Current recommended practice is to use Category 9 ***Classification*** elements to accommodate extensions.
- By adding new terms to *Classification*. ***Purpose*** vocabulary and identifying **classification schemes** to describe these terms can accommodate characteristics not be covered elsewhere. ($)

($) *Phil Baker, Institute for Computer Based Learning*

Specialised repository

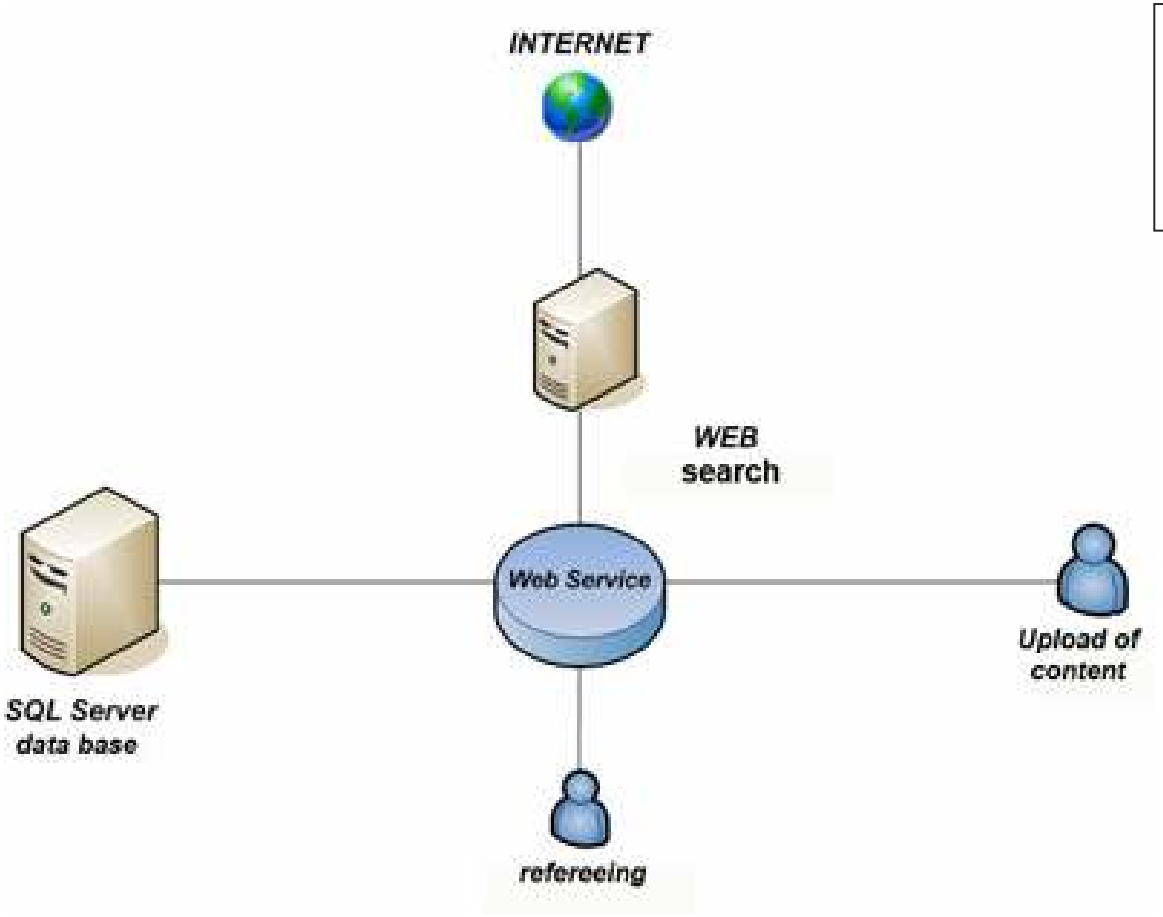
case: Institute of Physics

Institute of Physics produces large amount of information that have **scientific and educational value** that are not visible and accessible even to institute's employees

- The goal is to organise repository of:
  - Scientific content in the field of **solid state physics, atomic, molecular and optics**
  - Educational content of related to the scientific expertise of the Institute
  - Educational material of **general interest**
- It is planed to be centralised repository
- Implementation of IEEE LOM standards (MERLOT application)
- We will use **classification schemes** to improve access to repository resources

Institute of Physics repository

Centralised repository



Upload and search are executed trough platform independent **WEB service**

Role of referee

(protection from junk LO)

All documents are uploaded with the status – ***unpublished.***

Only referee can change the status to **publish or to delete** the content from the data base.

Conclusions

- Organisation of repositories (general and specialised) is necessary step to advance e-learning at all academic levels
- Repository should comply with the **Open Archives Initiative metadata harvesting protocols**
- IEEE LOM standard with MERLOT “reduction” is applicable for description of LO in most of repositories.
- The use of classification schemes offers one solution to providing improved access to resources of specialised repositories