Cross-domain Metadata Interoperability for Integrated Information Services

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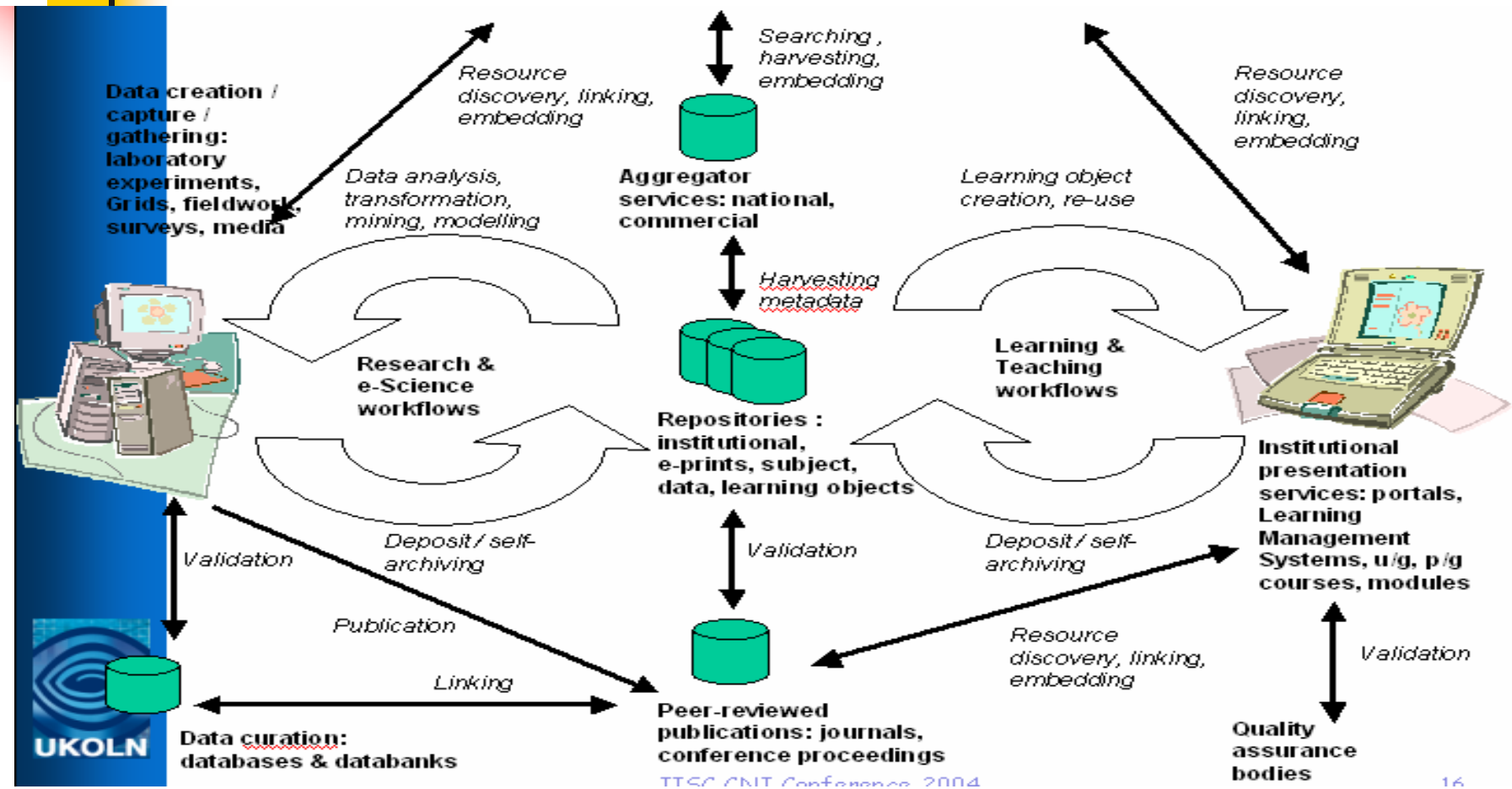
Cross-domain Metadata Interoperability

- 1. Converging fields and metadata
- 2. Metadata interoperability methodologies
- 3. Some roads to metadata interoperability

1. Converging fields and metadata

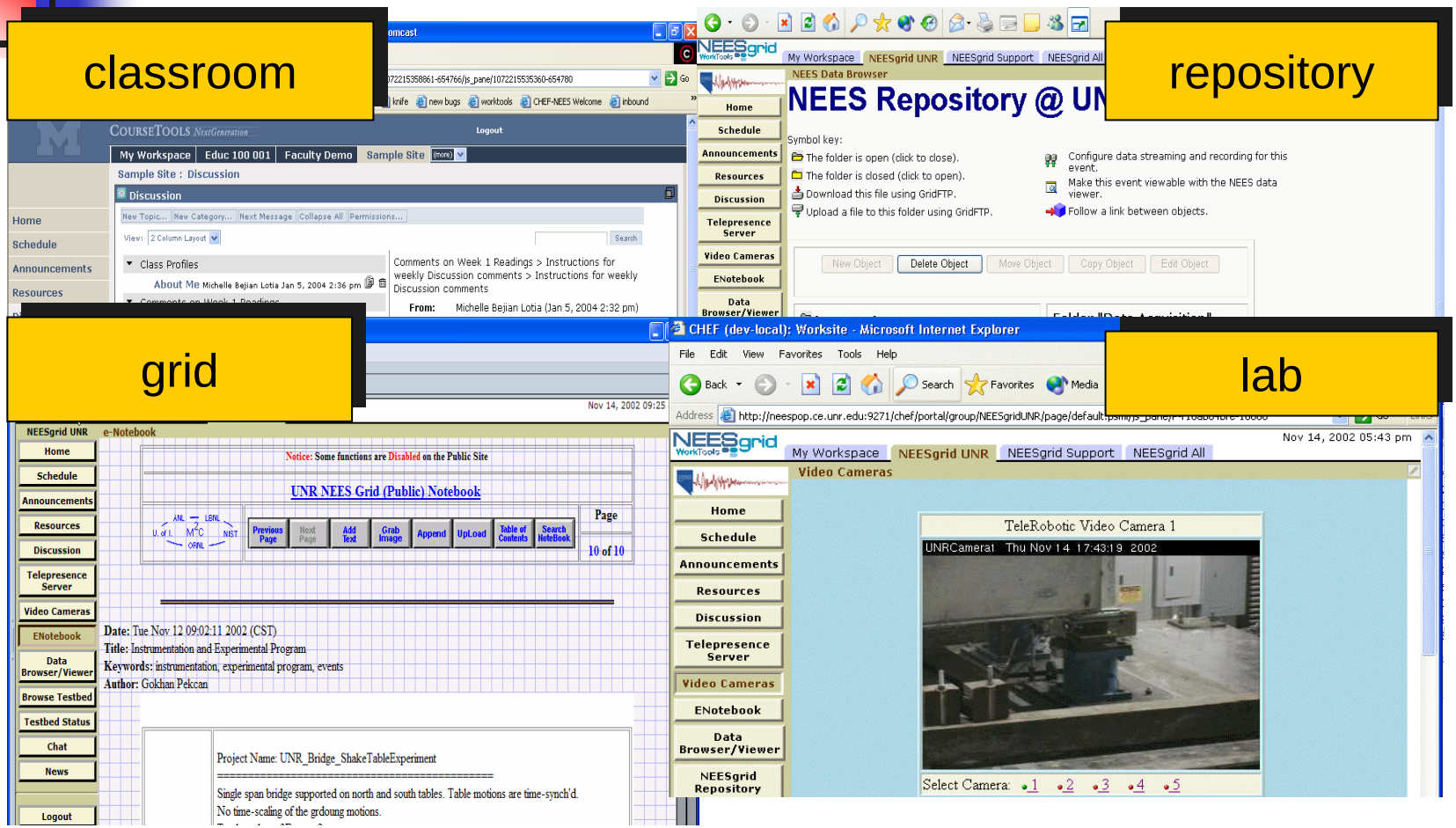
- Integrated information environment
  - With convergence of
    - e-science
    - e-learning
    - e-administration/e-government
    - e-media and e-publication
    - e-library

1. Converging fields and metadata



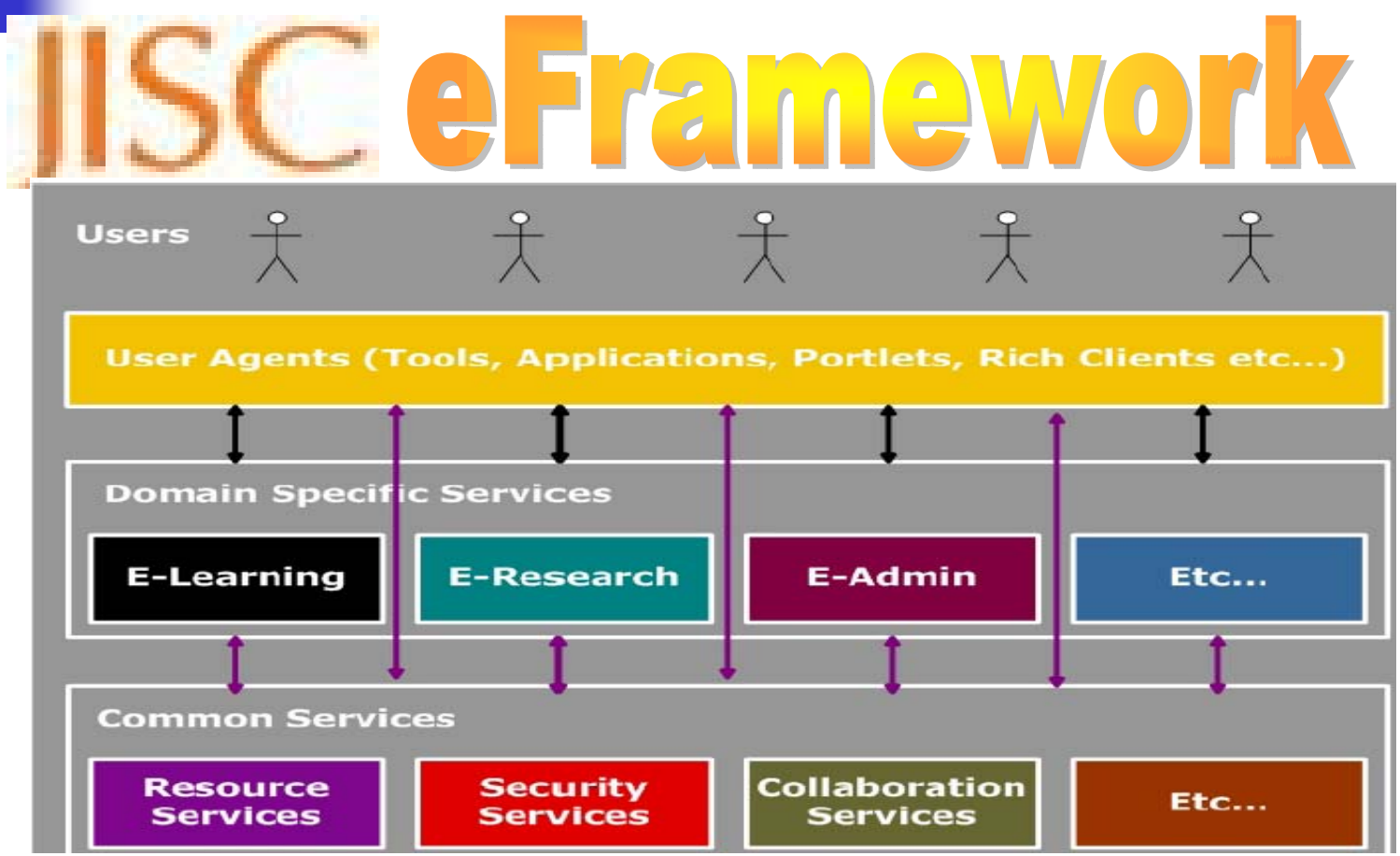
Scholarly Knowledge Cycle of eBANK-UK Project

1. Converging fields and metadata



Sakai Project Overview. Educause 2004.

1. Converging fields and metadata



1. Converging fields and metadata

- Many faces of Metadata
  - Need for metadata is recognized by every field to describe content objects
  - Many metadata formats
    - For different fields
    - Within each field

1. Converging fields and metadata

- Many faces of metadata
  - Digital libraries: Dublin core, MARC/MODS, ONIX
  - Education: LOM
  - Science: FGDC, CCLRC SMDM, CIP, DDI, CERA
  - Government: e-GMS, AGIL
  - Museum and archives: VAR Core, EAD, CDWA
  - Content Objects: DIDL, SCORM/CPS, METS, CDF, XSIL, GML, CML, etc.

1. Converging fields and metadata

- Open field for metadata applications
  - Different metadata formats for different content
  - Different metadata formats for different purposes
  - Different metadata formats stressing different aspects of an object
  - Dynamic metadata for dynamic and interactive content objects
  - Cross-system and cross-domain utilization of objects and application of metadata

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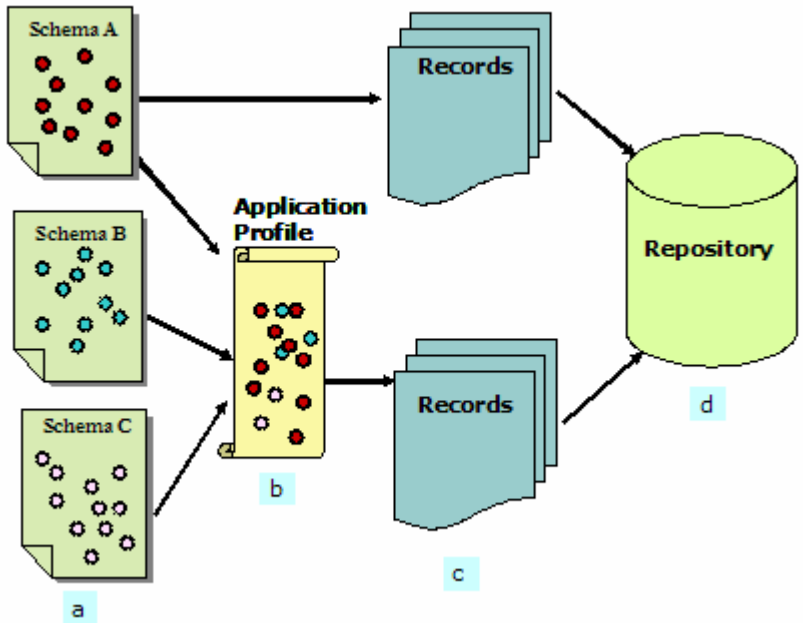
2. Metadata interoperability methodologies

- 2.1 Interoperability at Scheme, Record, and Repository Levels
- Interoperability when creation, exchange, and use
- Lois Mai Chan and
- Marcia Lei Zeng
- Metadata Interoperability
- and Standardization –
- A Study of Methodology
- Part I & Part II
- D-Lib Magazine, June 2006



2. Metadata interoperability methodologies

- 2.2 Interoperability at Scheme Level (Chan and Zeng)
  - Derivation (e.g., MARC family)
  - Application profiles (e.g., AGIL, GEM, BDP, CDLS)
  - Crosswalks
  - Switching-over (e.g., Getty's CDWA, OCLC MSTS)
  - Metadata registries
  - Metadata framework (e.g, OAIS, AND)

2. Metadata interoperability methodologies

- 2.3 Interoperability at Record Level (Chan and Zeng)
  - Record conversion
    - Picture Australia, NSDL
  - Reuse and Integration
    - Based on modularity of metadata framework
    - METS
    - RDF

2. Metadata interoperability methodologies

- 2.4 Interoperability at Repository Level (Chan and Zeng)
  - Metadata harvesting
    - NSDL Via OAI-PMH (converting into a common format)
    - DLESE via DCS Framework
  - Aggregation into “normalized” and enriched records
  - Element-based and value-based crosswalking service
  - Value-Based Mapping for Cross-Database Searching
  - Value-Based Co-Occurrence Mapping

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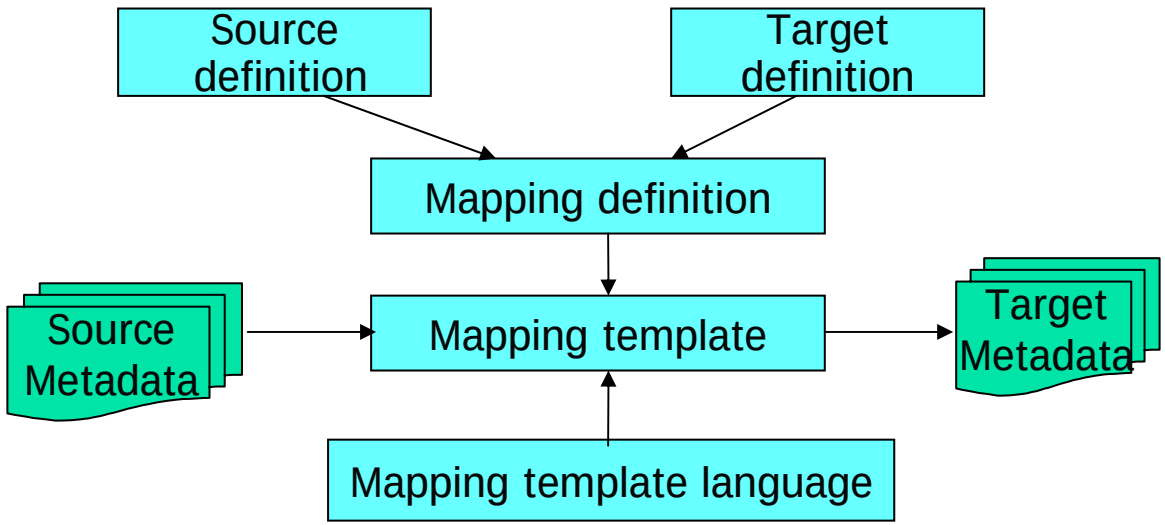
3. Some roads to metadata interoperability

- 3.1 Metadata crosswalks
  - Crosswalking Model
  - Pierre, M. and LaPlant, W. Jr. Issues in Crosswalking Content Metadata Standards http://www.niso.org/press/whitepapers/crsswalk.html



3. Some roads to metadata interoperability

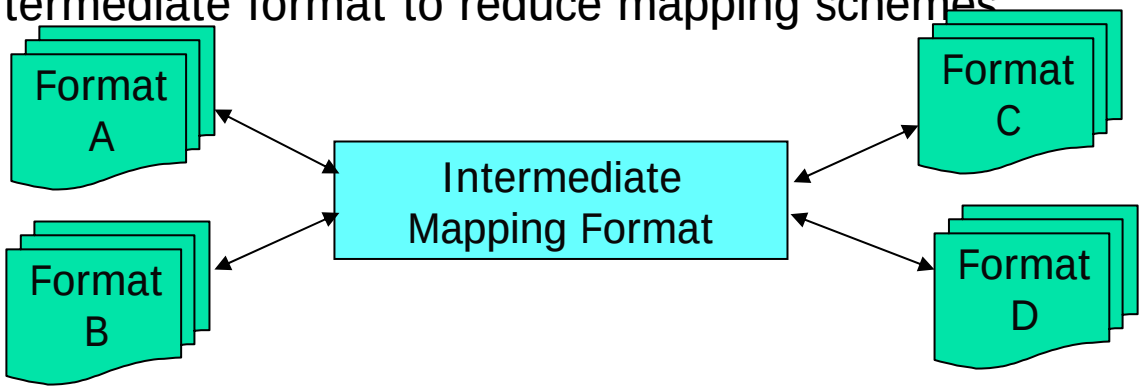
- 3.1 Metadata crosswalks
  - Crosswalking Examples
  - UKOLN Metadata Mapping (GILS to MARC, FGDC to MARC, USMARC to EAD, USMARC to FGDC, ...
  - http://www.ukoln.ac.uk/metadata/interoperability/
  - Metaform (Göttingen, SUB)
  - http://www2.sub.uni-goettingen.de/metaform/crosswalks.html
  - ADL Crosswalks (ADL to Others) http://www.alexandria.ucsb.edu/public-documents/metadata/crosswalks.html
  - Getty Metadata Crosswalk: http://www.getty.edu/research/institute/standards/intrometadata/3_crosswalks/

3. Some roads to metadata interoperability

- 3.1 Metadata crosswalks
  - Challenges to metadata crosswalking
  - Zeng, M. & Xiao, L. Mapping metadata elements of different formats. 2001
  - **Too many mapping crosswalks**
    - From A to B, only one mapping crosswalk
      - Schema A Schema B
    - From A to B **AND** B to A, two mapping crosswalks
      - Schema A Schema B
    - Two-way mapping among N formats
      - P(N,2)=N!/(N-2)!
      - =N（N-1）.....（N-2+1）
      - When N=3, 4, 5, 6, 7, ...
      - P(N,2)=6, 12, 20, 30, 42, ...

3. Some roads to metadata interoperability

- 3.1 Metadata crosswalks
  - Challenges to metadata crosswalking
  - Zeng, M. & Xiao, L. Mapping metadata elements of different formats. 2001
  - Inaccurate/Inadequate Intermediate formats
  - Intermediate format to reduce mapping schemes



  - But Too many special elements and idiosyncratic structures
  - Metadata Schema Transformation Services
  - http://www.oclc.org/research/projects/mswitch/1_schematrans.htm

3. Some roads to metadata interoperability

- 3.1 Metadata crosswalks
  - Challenges to metadata crosswalking
  - Zeng, M. & Xiao, L. Mapping metadata elements of different formats. 2001
  - Complicate matching relationships
    - One-to-One
    - One-to-Many
    - Many-to-One
    - One-to-Zero
    - Overlapping horizontally or vertically
  - Semantically inconsistence

3. Some roads to metadata interoperability

- 3.2 Metadata Registries
- DELOS Principles of Metadata registries
  - http://delos-noe.iei.pi.cnr.it/activities/standardizationforum/Registries.pdf
- Types of Metadata Registry (MR)
  - Single-schema MR
    - DCMI Metadata Registry
  - Single-domain cross-schema MR
    - MEG Metadata Registry
  - Cross-domain cross-schema MR
    - JISC IEMSR (SCHEMAS Registry, CORES)
  - Project specific MR
    - NSDL Metadata Registry, TEL Metadata Registry
  - Distributed MR: X.500 Name Registry

3. Some roads to metadata interoperability

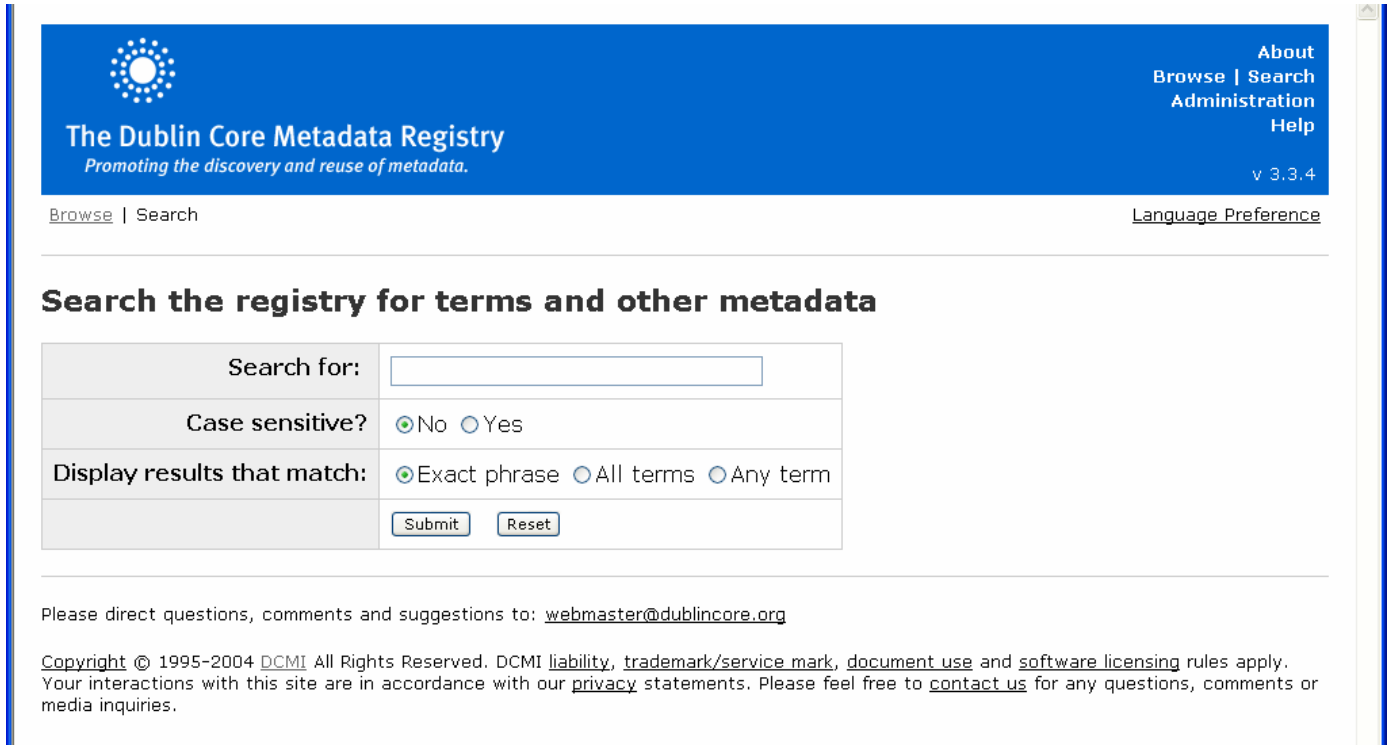
- 3.2 Metadata Registries
- Fundamental components of MR
  - Data models
  - Element identification
  - Scheme (element sets) identification
  - Encoding scheme identification
  - Application profile identification
  - Element usage identification
  - Element crosswalking identification

3. Some roads to metadata interoperability

- 3.2 Metadata Registries
- Examples of Metadata Registries
  - CORES Registry
  - http://cores.dsd.sztaki.hu/
  - Dublin Core Metadata Registry http://dublincore.org/dcregistry/
  - MEG Registry (Registry of MEG-related schemas)
  - http://www.ukoln.ac.uk/metadata/education/registry/contents.html
  - SCHEMAS Registry
  - http://www.schemas-forum.org/registry/
  - JISC Metadata Schema Registry
  - http://iemsr.ukoln.ac.uk/iemsr/
  - NSDL Metadata Registry
  - http://eg2.ischool.washington.edu/registry/documents/proposalDocs/

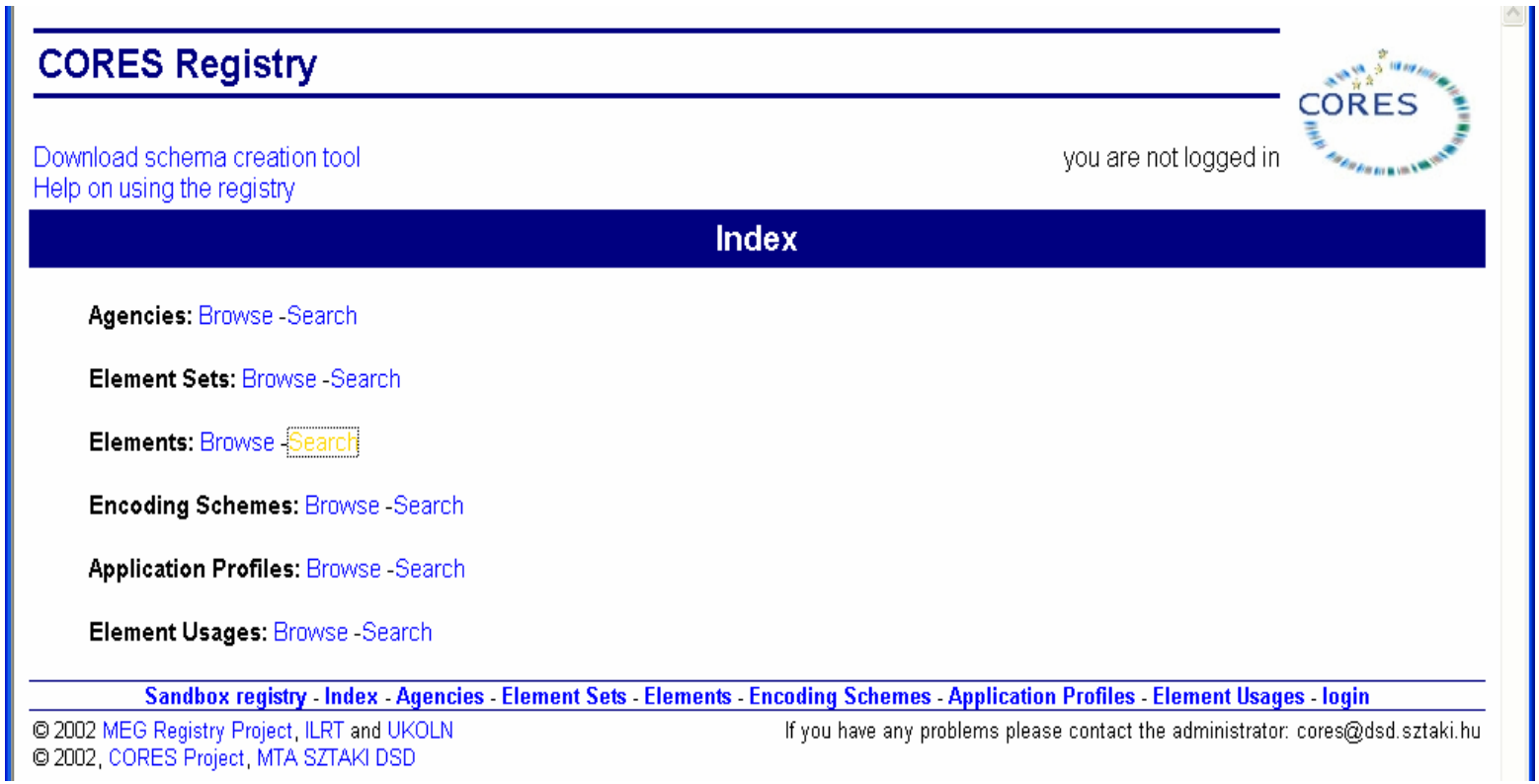
3. Some roads to metadata interoperability

- Dublin Core Open Metadata Registry



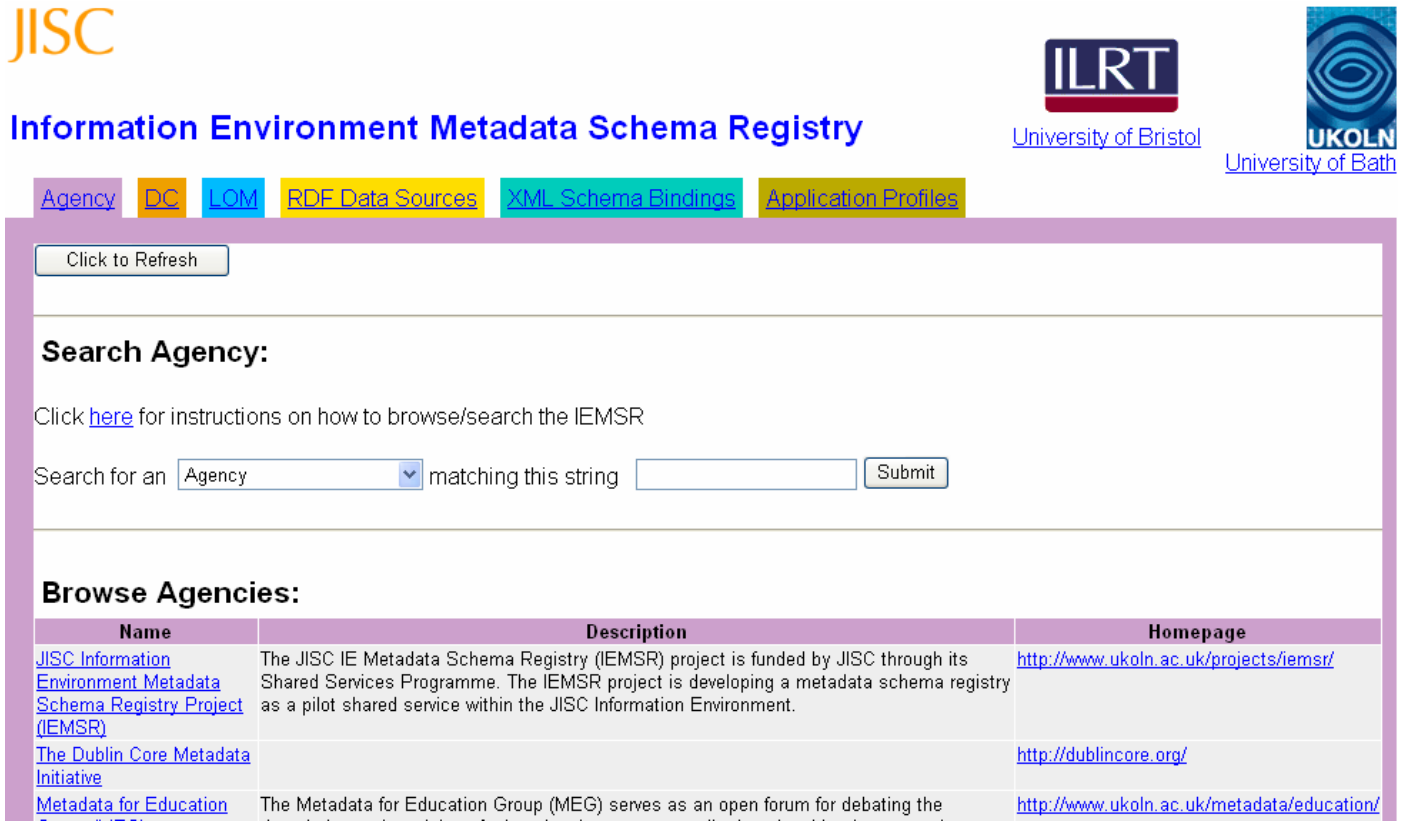
3. Some roads to metadata interoperability

- CORES Registry



3. Some roads to metadata interoperability

- JISC IEMSR



3. Some roads to metadata interoperability

- 3.2 Metadata Registries
- ISO 11179 metadata registry
  - ISO JTC1/SC32
  - ISO 11179 Metadata Registries
  - ISO 20943 MDR content consistency
  - ISO 20944 MDR interoperability and binding
  - http://metadata-standards.org

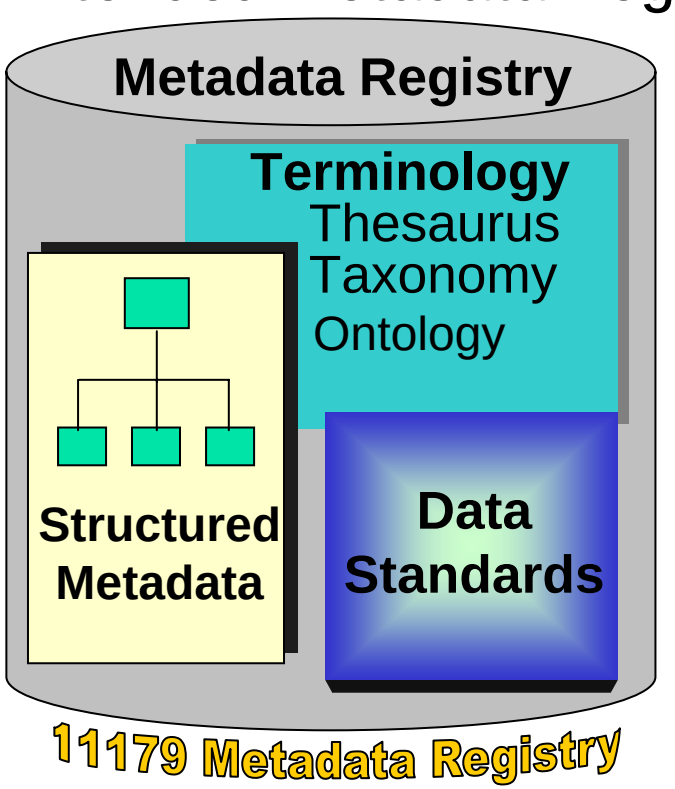
- From: Rachel Heery Report on Eighth Open Forum on Metadata Registries DCMI Registry WG meeting, Madrid, September 14 2005

3. Some roads to metadata interoperability

- 3.2 Metadata Registries
- Extended Metadata Registry (XMDR)
  - Extend Capabilities of 11179 Metadata Registries to Register Complex Metadata Structures (Concept Systems, Terminologies)
    - Ontologies, Graphs, Taxonomies, Thesauri, …
  - Extend Capabilities of 11179 Metadata Registries to Record Correlations and Interrelations Between
    - Concept Systems and Data (e.g., Data Elements, Permissible Values & Value Domains)
    - Concept Systems Themselves
  - http://xmdr.org

3. Some roads to metadata interoperability

- 3.2 Metadata Registries
- Extended Metadata Registry



3. Some roads to metadata interoperability

- 3.3 Open Metadata Development
- Metadata principles
  - simplicity, modularity, reusability, extensibility, and interoperability
  - Duval, E., Hodgins, W., Sutton, S. & Weibel, S.L. Metadata principles and practicalities. *D-Lib Magazine*, 8(4), 2002
- Design for Open Metadata
  - Monolithic vs. Multiple variations
  - Functionality vs. Interoperability
  - Completeness vs. Extensibility
  - Centralized vs. Distributed
  - Stand-alone vs. Interrelatedness
  - Dynamic structure
  - Application Profile Approach

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Thanks!

谢谢！