



Cross-domain Metadata Interoperability for Integrated Information Services

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Library of Chinese Academy of Sciences
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Cross-domain Metadata Interoperability

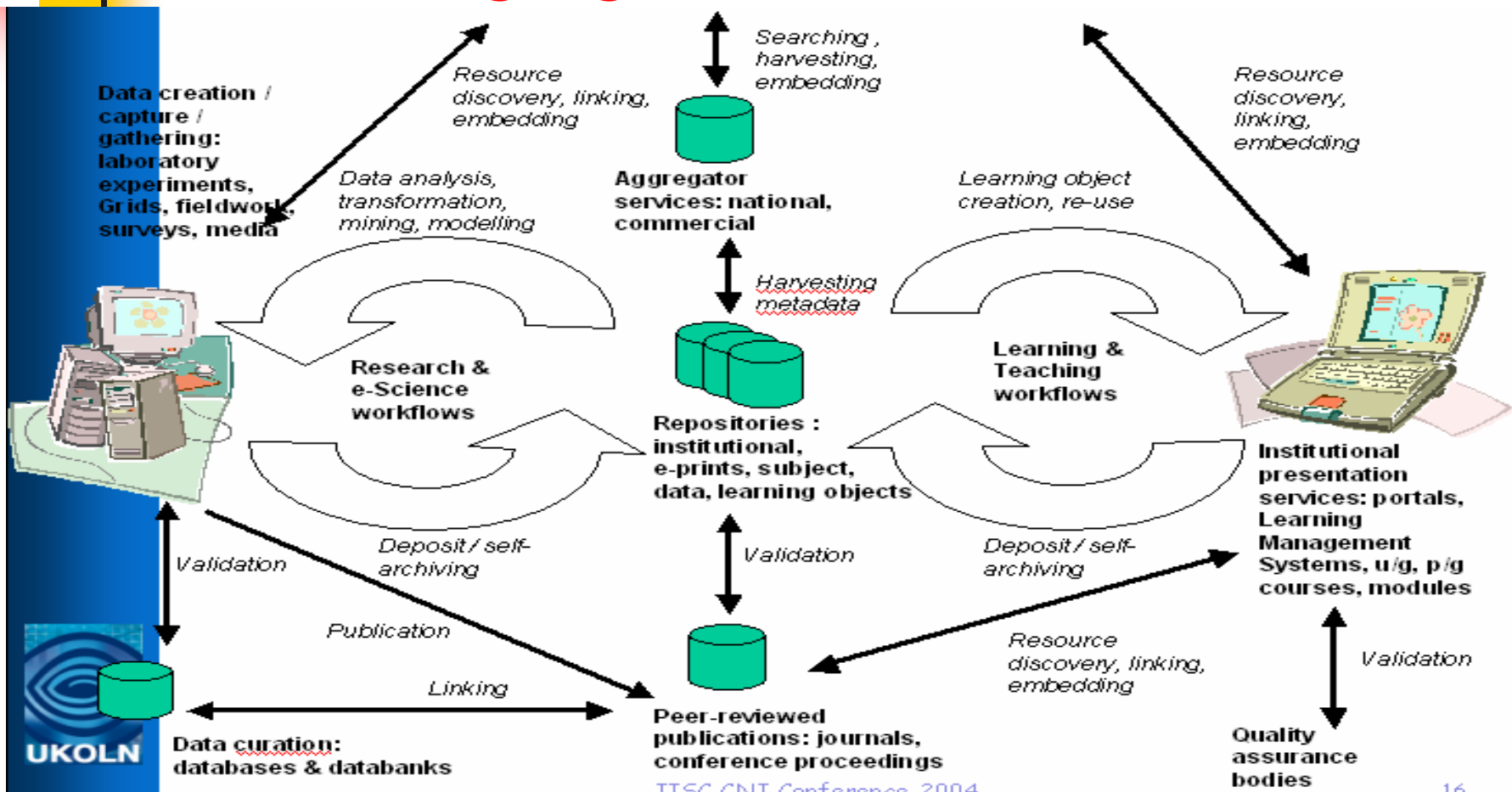
- 1. Converging fields and metadata
- 2. Metadata interoperability methodologies
- 3. Some roads to metadata interoperability



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

The collage consists of four overlapping screenshots from the Sakai Project interface, each with a yellow label:

- classroom:** A screenshot of a discussion forum titled "Sample Site : Discussion". It shows a "New Topic" button, a search bar, and a list of class profiles. A comment from Michelle Bejian Lotia is visible.
- repository:** A screenshot of the "NEES Repository @ UNR". It features a sidebar with navigation options like Home, Schedule, Announcements, Resources, Discussion, Telepresence Server, Video Cameras, ENotebook, and Data Browser/Viewer. The main area shows a "NEES Data Browser" with a "Symbol key" and buttons for "New Object", "Delete Object", "Move Object", "Copy Object", and "Edit Object".
- grid:** A screenshot of the "UNR NEES Grid (Public) Notebook". It displays a grid interface with navigation buttons like "Previous Page", "Next Page", "Add Text", "Grab Image", "Append", "Upload", "Table of Contents", and "Search Notebook". Metadata is shown below the grid, including "Date: Tue Nov 12 09:02:11 2002 (CST)", "Title: Instrumentation and Experimental Program", "Keywords: instrumentation, experimental program, events", and "Author: Gokhan Pekcan".
- lab:** A screenshot of a "Video Cameras" page. It shows a "TeleRobotic Video Camera 1" feed displaying a laboratory setting. Below the feed are "Select Camera" buttons numbered 1 through 5.

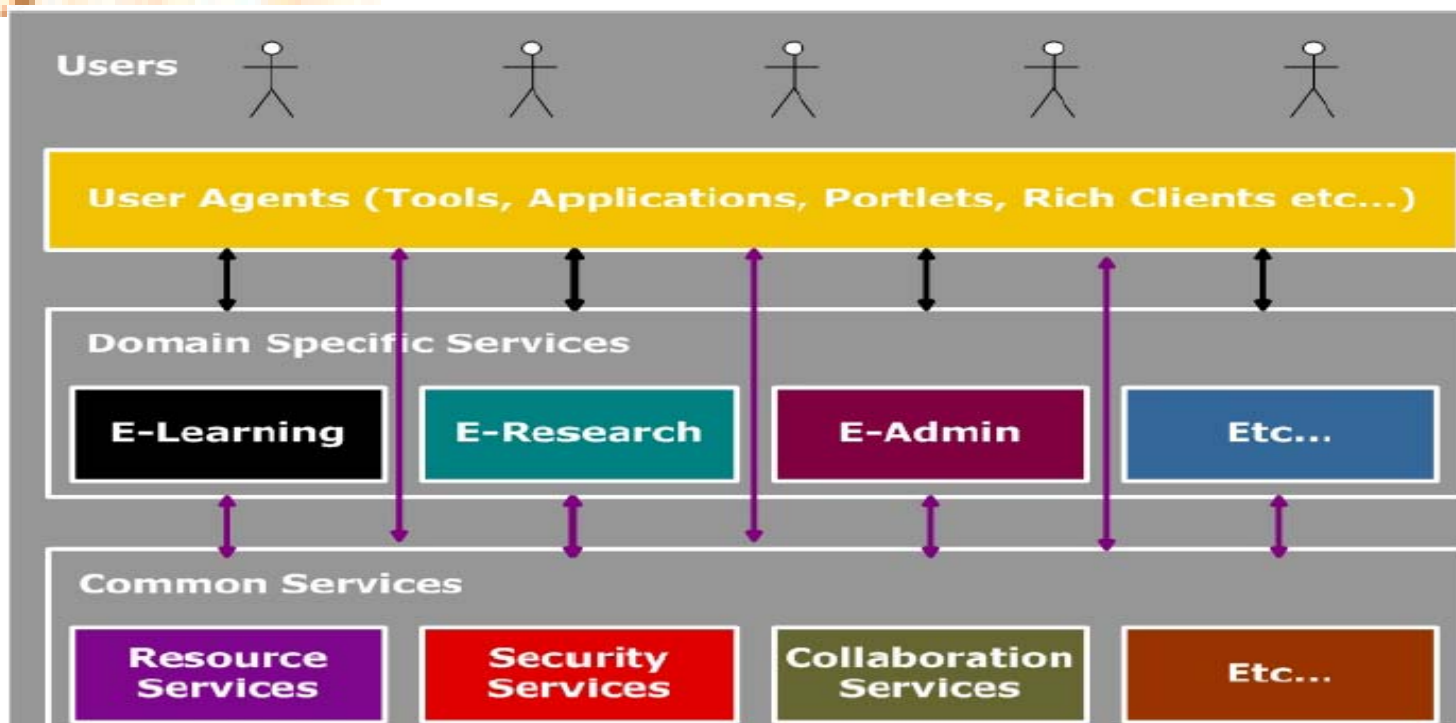
Sakai Project Overview. Educause 2004.

2007-3-29

CODATA2006 Beijing China

1. Converging fields and metadata

JISC eFramework





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

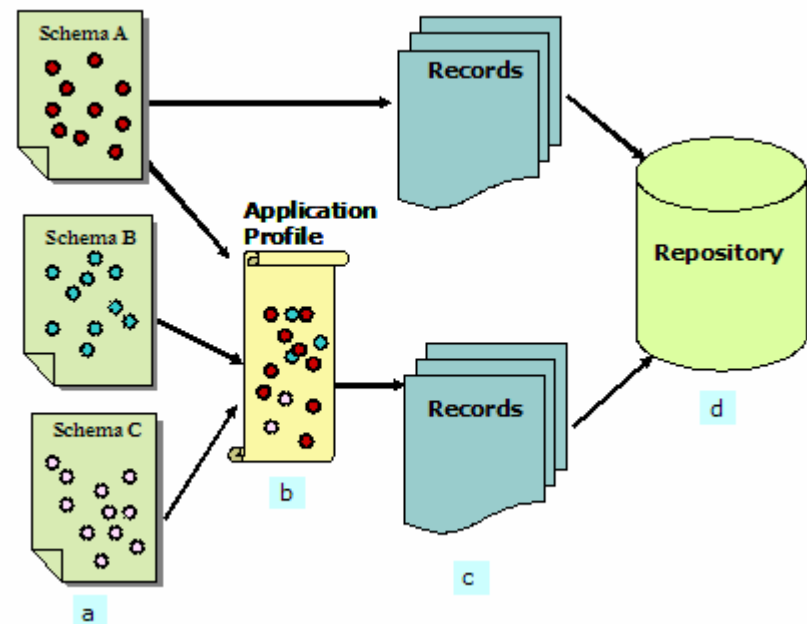


Cross-domain Metadata Interoperability

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

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



Cross-domain Metadata Interoperability

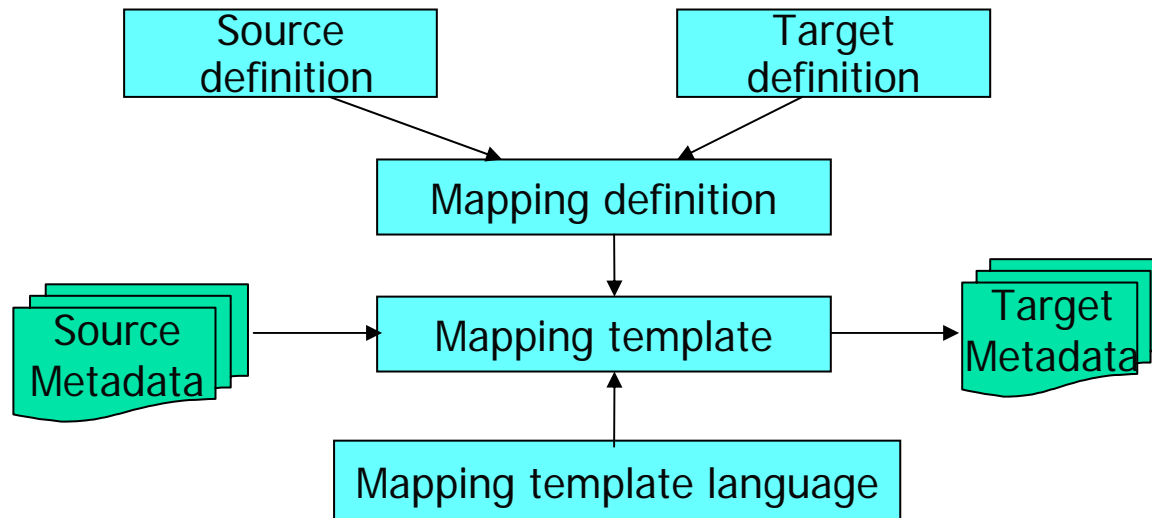
- 1. Converging fields and metadata
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3. Some roads to metadata interoperability

■ 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

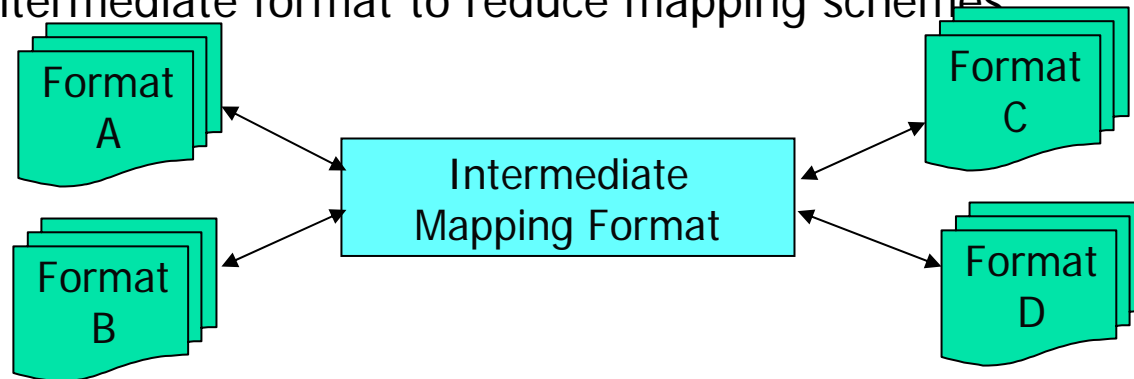
■ 3.1 Metadata crosswalks

- 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
 - $P(N,2) = N! / (N-2)!$
 - $= N (N-1) \dots (N-2+1)$
 - When $N=3, 4, 5, 6, 7, \dots$
 - $P(N,2) = 6, 12, 20, 30, 42, \dots$

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



The Dublin Core Metadata Registry
Promoting the discovery and reuse of metadata.

About
Browse | Search
Administration
Help

v 3.3.4

[Browse](#) | [Search](#) [Language Preference](#)

Search the registry for terms and other metadata

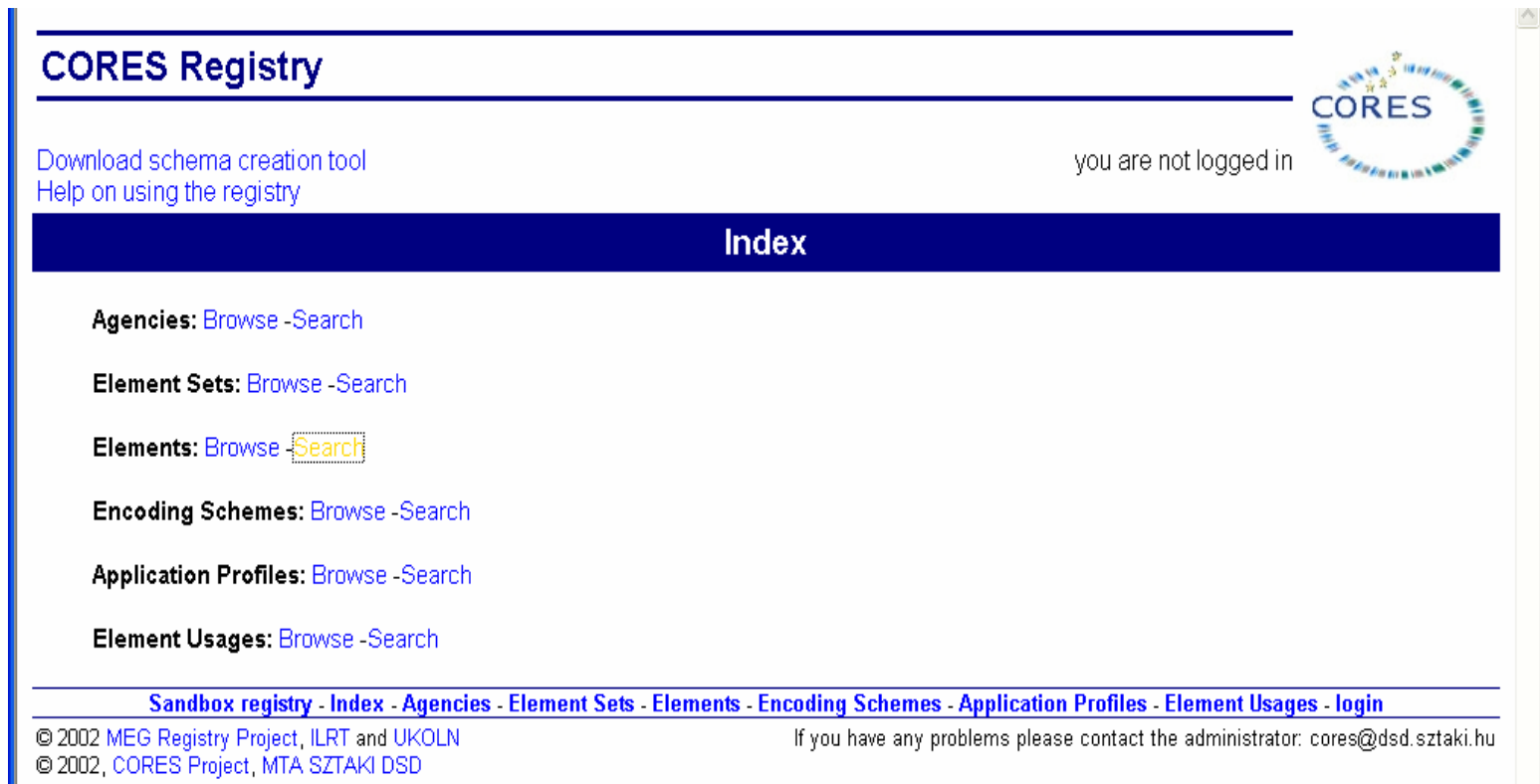
Search for:	<input type="text"/>
Case sensitive?	<input checked="" type="radio"/> No <input type="radio"/> Yes
Display results that match:	<input checked="" type="radio"/> Exact phrase <input type="radio"/> All terms <input type="radio"/> Any term
	<input type="button" value="Submit"/> <input type="button" value="Reset"/>

Please direct questions, comments and suggestions to: webmaster@dublincore.org

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3. Some roads to metadata interoperability

■ CORES Registry



The screenshot shows the CORES Registry website. At the top left, there are navigation links: "Download schema creation tool" and "Help on using the registry". On the right, it says "you are not logged in" next to the CORES logo, which features a circular arrangement of stars. Below this is a dark blue bar with the word "Index" in white. Underneath, there are several menu items, each with "Browse" and "Search" links: "Agencies: Browse - Search", "Element Sets: Browse - Search", "Elements: Browse - Search" (where "Search" is highlighted with a yellow box), "Encoding Schemes: Browse - Search", "Application Profiles: Browse - Search", and "Element Usages: Browse - Search". At the bottom, there is a navigation bar with links: "Sandbox registry - Index - Agencies - Element Sets - Elements - Encoding Schemes - Application Profiles - Element Usages - login". Below the navigation bar, there are two copyright notices: "© 2002 MEG Registry Project, ILRT and UKOLN" and "© 2002, CORES Project, MTA SZTAKI DSD". To the right of the second notice is the contact information: "If you have any problems please contact the administrator: cores@dsd.sztaki.hu".

3. Some roads to metadata interoperability

- JISC IEMSR

JISC

Information Environment Metadata Schema Registry



University of Bristol



University of Bath

[Agency](#) [DC](#) [LOM](#) [RDF Data Sources](#) [XML Schema Bindings](#) [Application Profiles](#)

Click to Refresh

Search Agency:

Click [here](#) for instructions on how to browse/search the IEMSR

Search for an matching this string

Browse Agencies:

Name	Description	Homepage
JISC Information Environment Metadata Schema Registry Project (IEMSR)	The JISC IE Metadata Schema Registry (IEMSR) project is funded by JISC through its Shared Services Programme. The IEMSR project is developing a metadata schema registry as a pilot shared service within the JISC Information Environment.	http://www.ukoln.ac.uk/projects/iemsr/
The Dublin Core Metadata Initiative		http://dublincore.org/
Metadata for Education	The Metadata for Education Group (MEG) serves as an open forum for debating the	http://www.ukoln.ac.uk/metadata/education/



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

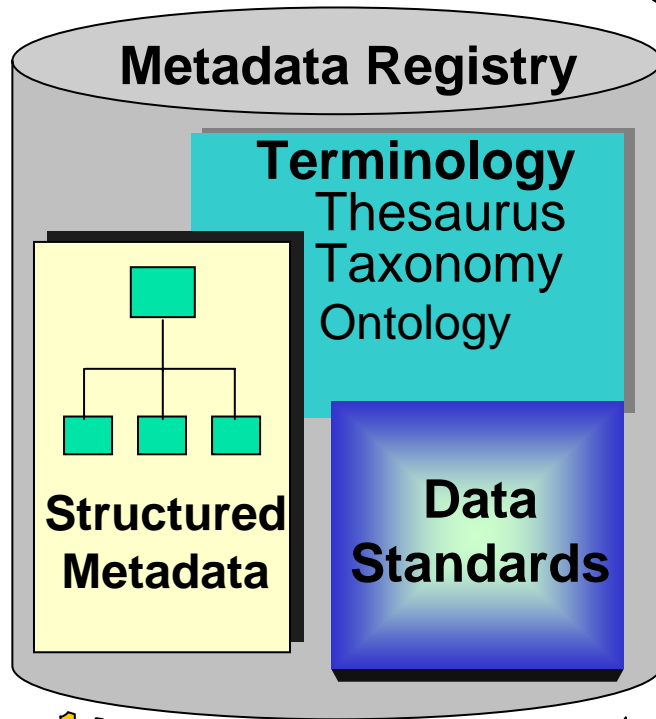


3. Some roads to metadata interoperability

- 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



11179 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



Cross-domain Metadata Interoperability

Thanks!

谢谢!