

Summary of expert contributions for the LIFE Manchester workshop (September 5th)

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1) Experts' overview on Learning Resource Repositories Interoperability

Lack of coherent strategies between 2 communities

- teachers, learners, researchers, scientists and all kinds of diverse communities are developing their own professional and personal information management and dissemination strategies using a host of web based resource management systems and services e.g. wikis, blogs, personal webpages, eportfolios, p2p networks, image and file sharing networks and other shared services

- learning technologists, who are turning to “learning object repositories”, often based on open standards, to ensure that their resources remain durable and accessible, rather than hard wired into proprietary delivery platforms.

Practitioner take-up

Implementation of Learning Object Repositories (LOR) as services, and the skills required to support their implementation with learning and teaching practitioners, remains an issue. Many institutions within the UK, certainly in their day to day learning and teaching practice, have not caught up with the research world in areas such as the standards/specifications and technologies they should be deploying, the solutions they should be purchasing or otherwise acquiring for the management, discovery and play of resources that fit in with any e-learning framework, or how they fit into regional, national and international frameworks for e-learning, (for example, within a distributed network of repositories).

Various packaging specifications

Though one interoperable packaging specification, IMS Content Packaging, is clearly dominant in the learning, education and training sector, it is equally clear that material from 'adjacent' communities such as multimedia content vendors and digital libraries will not use the same format. Likewise, the learning, education and training community is not homogeneous, and there is likely to remain a considerable degree of variation in the application of IMS Content Packaging or other content aggregation formats.

Inefficient metadata-based search results

In most cases where two or more Learning Object Repositories are exchanging metadata the metadata models are “forced” to harmonize. This is often done by extracting the smallest common set of metadata which causes the metadata model to be transformed from an often fairly primitive metadata model to a very primitive metadata model. As the quality of metadata drops, the amount of redundant information returned from queries increases rapidly and the usability of the service drops substantially – especially as a part of a brokerage system where the overall amount of metadata tends to get very extensive.

2) Key Issues, Obstacles and Drivers

Semantic ambiguity

There is a certain confusion regarding the semantics of the term “repository”. On a technical level, the service oriented approach adopted by the JISC / DEST E-Framework for Education and Research provides an opportunity to start identifying common cross domain repository services. Maclean and Blinco’s “Repository Ecology” diagram represents a useful tool to help facilitate the identification of key functional characteristics and how these may be configured to create different instantiations or “types” of repositories.

There is a lack of actual, practical, *usable* current community agreement on such issues as: the use of the LOM and LOM application profiles; the development and use of shared vocabularies; the use of IMS Content Packaging and management of granularity; and anything to do with IPR and digital rights management within repositories.

Repository developers should be able to easily ask this type of question: “What vocabularies are other repositories in my subject area using to describe learning resource type?” and get an answer; a VDEX or ZThes compliant file to download; a link to the user community for that vocabulary so they can feed back local augmentations and comments; and a handy cataloguers’ guide to applying that vocabulary to real resources. Such work has been under way for example with CanCore, UK LOM Core, MEG Metadata Schemas Registry, CEN ISSS LT.

Learning object metadata models

The large scale application in the use of application profiles of the IEEE LOM and the influence this may have on workflow models, as well as researching the requirements for how cataloguing should be tackled on national and international scales, are required. The take up and use within metadata records of the IMS AccessForAll Meta-data Specification, the use of the education fields, agreement on the long term strategy for identifiers, metadata tagging at asset level, the range of vocabularies being implemented and the approach to how the quantity and quality of metadata should be tackled in large scale community learning and teaching

LOR services all require further investigation. JISC has funded a cataloguing team to work with JORUM that includes 12 specialist cataloguers; this team is managed by the JISC Resource Discovery Network (RDN)¹. Experience already indicates that cataloguing of LOs that follow an aggregation model is a new experience for many cataloguers. The outcomes of this process will be made available in a preliminary report in Dec 05. Other issues, such as the application of correct entries for Educational Levels, have been highlighted as particularly problematic by this team. Where an aggregation model has been used for developing LOs, metadata is still only being applied at the top level. Clearly a strategy for ensuring resources are tagged at resource level needs further investigation, as does expanding the use of automated metadata creation to assist in all these areas.

Learning resource repositories' ownership and control

Ownership, management and access control may be administered close to the point of creation or may be distributed across institutional roles (e.g. librarians, learning technologists, authors, teachers, researchers, learners, etc.) and communities of practice. They are increasingly assuming control over whom they choose to share their resources with and are adopting a wide range of related informal tools and applications.

The combination of cheap digital storage and very sophisticated retrieval tools is shifting the balance of costs: digitally it is becoming cheaper to collect and more expensive to select, and cheaper to search than to organise. (Beagrie, 2005).

Institutions are starting to recognize the value of their information and educational resources. There is a strong economic imperative to manage information more effectively particularly when this information is the primary product of many institutions and organisations. Promotion of these resources includes the maintenance of repositories of digital learning resource descriptions (i.e., metadata) and sharing with others to capitalize on the re-use, as well as to take part in a global initiative to share knowledge sources.

Digital Rights Management (DRM)

Rights expression and management models, and their implementation within an e-learning framework, remain a significant barrier in community sharing activities. The fields provided by the metadata standards are inadequate and rights expression languages are more extensive than required by practitioners' current understanding of the issues. Taken alongside different IP ownership models within institutions, and the current focus on Creative Commons solutions, there is a great deal of confusion about what should be used as a DRM solution for any repository solution or wider framework. Agreed formats for transport of rights information, and indeed their availability to end users through learning management systems (LMS), also require consideration. Many commercial providers of LMS do not provide the facility to make even well established metadata elements on rights, for example rights description (element 6.3), available to any users of a resource. In addition, discovery services such as portals will face the same issues until the wider community reaches agreement on models, expression languages and a standardised approach to their implementation.

¹ <http://www.rdn.ac.uk>

Resource discovery and contribution

The focus remains on the development in resource discovery technologies and associated services that are being offered. Extensive work is being undertaken on RSS, OAI exposure and harvesting, SRW/SRU, federated searching etc. Some concentration in other areas, such as the development of web services for repository submit/store under IMS DRI, using an open standards approach that is taken up by vendors, would be a move forward. Indeed a more formal standardisation of the DRI specification in general would no doubt assist in this process.

With regard to resource discovery services, in the main, the focus is on providing users with access to web resources where metadata has largely been harvested from existing 'referatories' and therefore they are not providing access to the resources themselves directly. From a repurposing point of view with regard to content objects, where users are expected to retrieve objects as IMS content packages, a standardised approach to providing a range of content services for LOs to portals is required, to include: content package preview service, content package export service, metadata export service etc.

Resource adaptation for content aggregation format interoperability

To facilitate exchange content between different, standardised aggregation formats means to overcome the difference of feature sets in aggregation formats such as IMS Content Packaging, MPEG 21 Digital Item Description, Metadata Encoding and Transmission Schema (METS), IETF Atom, RSS, OASIS Open Document.

Although the objective is clear, it is not easy to rapidly adapt not just the structure of an aggregation of assets, but the structure of resources themselves. Areas of application include localisation, multilingual resources, accessibility and adaptation to suit different playback environments. The latter can include adapting learning designs for a different network environment or even different user's clients. Examples of current work in the field includes the ALOCoM learning resource model (Katholieke Universiteit Leuven, 2005), ongoing SCORM localisation work (Canale, 2004) and various format independent content production workflows.

Semantic adaptation

The problems with metadata quality could be addressed by setting up objectives such as:

- making better use of Semantic Web technologies for Learning Object metadata,
- By a more extensive use of application profiles.

Together they are likely to increase quality of metadata and metadata semantics and in the same time provide mechanisms for mixing different metadata models and schemas as well as enhancing semantic interoperability – which will ultimately lead to a higher degree of Learning Object repository interoperability.

This aspect involves the informational properties of resources. Typical uses for this type of technology is the building of community or even learner specific knowledge bases and e-portfolios. Forging meaningful relations between different bits of content can help learners learn about that content, or even about their own learning. Current examples of such activity includes the Topic Map initiative (estandard, 2005) and semantic web aware repositories such as SCAM (2005) or non-standard repositories such as VUE (Tufts, 2005).

As metadata quality increases and the semantics improve it will be necessary to make use of query languages that supports richer metadata semantics. This is most of all essential in order to allow for metadata filtering at “LOR -level” in order to avoid huge amounts of redundant metadata - even though the metadata might be of good quality. This is especially important with a P2P approach.

Interoperability between repository metadata

Lack of interoperability between repository metadata occurs because they are hidden behind their repositories discovery procedures, which make them unreachable by search engines such as Google.

The European Treasury Browser (<http://etb.eun.org/>) proposes to describe learning resources available on-line in a given format and to publish these descriptions in a central metadata repository.

Another approach consists of interconnecting metadata repositories that comply with a common query language, a common metadata format, and a common communication framework for querying. The latter can be based on either a peer-to-peer network or a brokerage system.

The Simple Query Interface (SQI) is a standard Application Program Interface (API) for querying heterogeneous learning resource repositories. SQI is neutral in terms of results format and query languages, which makes it a good starting point to overcome the weaknesses of the previous solutions. But, until now, SQI has mainly been used to connect existing networks of learning resources using web services rather than to build new federations of repositories.

European MoEs consider none of these initiatives as a valid option for exchanging their learning resources across Europe as they try to provide a solution to each of the issues raised by the exchange of learning resources (e.g., resource discovery, intellectual property, ergonomics, resource exchange). They lead to global solutions that are too monolithic and thus lack the flexibility needed to enable adaptation to national configurations.

3) “To Do” List, Recommendations and Actions

Dialog between all educational stakeholders

We need to open cross sector dialogue involving all educational stakeholders and domains in order to establish a common language to address semantic ambiguity and identify common and specific repository services.

Key recommendations are :

1. To continue work on bringing grassroots repository developers and their communities into building consensus around non-technical areas that will support interoperability.
2. To continue to raise awareness of, and draw upon, the lessons that can be adapted from the considerable expertise of the information professions such as library and information science, knowledge management, records management, archivists and museum documentation.
3. To disseminate good practice, successes and indeed failures.

Practitioner take-up

A concentrated effort into embedding interoperability into everyday working practice of learning and teaching practitioners, both nationally and internationally, is required to overcome the significant gap that remains between research activities in learning and teaching and actual take up. A whole range of issues are included within this, but of particular importance is providing clarity to the community of how they should be participating at institutional, regional, national and international levels.

More participation in projects by day to day practitioners in an attempt to bridge the gap between the leading edge research and its implementation in real learning and teaching services is required. This should lead to a greater degree of organised sharing and dissemination on good/successful practice.

Plug-and-play facilities

The use of metadata must be integrated into the daily work-processes in a seamless way in order to gain acceptance. At the same time as we need sophisticated metadata and semantics there is a need to hide complexity through the implementation of good tools.

It seems important to get more plug-and-play functionalities between VLE and repositories. The search interface should be integrated in the VLE (IMS Digital Repositories Interoperability makes this possible) and inserting resources from the search result should be done through just some mouse clicks.

Digital Rights Management

The development of rights expression/management models, that the community and implementers can take up on a national and international basis, seems to be a high priority. Involvement with commercial vendors, who remain the greatest supplier of content management and play facilities in institutions in the education sector, is also important.

Open standards

The basis for large scale interoperability is an extensive use of open standards. Open standards for, especially metadata, have gained a wide spread acceptance during the last 5-10 years. There are however still a lot to do and it is important to promote open standards for all layers of the learning (and learning objects repositories) architecture. Emerging standards must therefore support mechanisms for determining which sets of standard is supported by a specific LOR in terms of query language, application profiles etc.

Promote further the use of open standards by developers/commercial software suppliers; testing, through closed forums such as the CETIS codebash events, form an important element of working with vendors. Their involvement, if achievable, in the development and implementation of e-learning frameworks at the research and daily practice levels would be beneficial.

Content services

Increased activity away from resource discovery and into submit/store of content resources

via web services, including a more formal standardised approach to DRI, is recommended. In addition, a standardised approach for content repositories to provide a range of content services to portals would be beneficial.

Independent learning resource discovery service

The idea is to design a discovery service in a way that is flexible enough to transparently replace the initial search service by something more efficient.

The approach consists in designing independent services (e.g., resource discovery, digital rights management) that can be used alone or in any combination depending on the user requirements. It makes possible accessing learning resources freely available on the web as well as adding new services such as securing exchanges of learning resources or digital rights management.

Federated searching

The core of a federation search consists of asynchronous messaging services whose efficiency in supporting federated searches was demonstrated by CELEBRATE.

Fire discovery service

FIRE, the EUN Federation of Internet Resources for Education, is a first attempt to produce an independent learning resource discovery service.

Once the FIRE discovery service is in place, it will be possible to start finding and accessing learning resources freely available on the web. It will offer an easy, flexible and cost-effective way to share learning resources through federated searching. FIRE is based on the Simple Query Interface (SQI). From a technical standpoint FIRE is a Java Message Service (JMS) implementation of a subset of SQI. Actually FIRE has taken the best of both (SQI and Celebrate) and put them together which results in an easy set-up for the system.

Semantic-based metadata

Key recommendations are:

- To work for a shift towards Semantic Web based technologies for metadata.
- To develop and promote methods and tools for conceptual modelling, concept maps and development of vocabularies ontology's, application profiles etc.
- To establish open catalogues for application profiles.
- To favour R&D on sophisticated technologies for metadata exchange – such as federation and P2P in combination with semantically rich query languages and Semantic Web technologies.

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