SWORD: Cutting Through the Red Tape to Populate Learning Materials Repositories

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This article by Sarah Currier introduces SWORD (Simple Web-service Offering Repository Deposit) to those interested in sharing, reuse, repurposing and management of teaching and learning materials. The article provides an overview of the tool, technical details of how SWORD works and four case study vignettes, or SWORD Stories, on work that is already under way, which illustrate how SWORD streamlines the process of depositing learning materials into repositories.

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1. Why SWORD? – Encouraging Deposit, Sharing, Reuse

Repositories for teaching and learning materials are usually provided to encourage sharing, reuse and repurposing of such materials, for a number of reasons, including the altruistic, the educational, and the managerial. However, populating such repositories with good quality resources remains a problem [1].

From the start, the vision for repositories was that of easy self-deposit by resource authors, and widely available access to as many educators as possible (ibid.). However, the reality to date has been somewhat at odds with this vision, due to, for example, requirements for good quality metadata [2], accurate attribution and rights metadata [3] and, until the recent emphasis on open educational resources, silos of resources protected for legal reasons behind authentication walls [4]. The labyrinth of barriers, some of which need good technical or usability solutions, some of which require cultural shifts, and some of which demand courageous decisions from funders and managers to side-step, have given many potential contributors to repositories too much of a headache to fully participate.

Teachers are a key stakeholder group, and for teachers to deposit their own educational materials for the sake of sharing and/or resource management requires attractive incentives, including the promise of time-saving rather than time-suck. Teachers at all levels of education are notoriously time-poor, particularly when it comes to administrative tasks such as those required by repository workflows. This often applies for other contributors of educational materials as well, such as educational developers, learning technologists, project teams, and, in some cases, students.

Moreover, there is a long-standing dream of sharing large banks of resources across organisations or groups with similar interests, but even with interoperability standards such as OAI-PMH [5], SRU/SRW [6], IMS Content Packaging/SCORM [7] and metadata standards, there have not been many such activities in the e-learning domain.

So, in amongst many efforts to overcome the multitude of barriers to use of repositories, in 2006 the first JISC Repositories Programme [8], along with JISC CETIS [9] and UKOLN [10] (in the form of the original Repositories Research Team [11]), identified enabling remote and bulk deposit as a work item that could make a huge difference for all kinds of repositories. Agreeing an open protocol that could be supported by the major repository systems, and used by anyone creating tools and widgets for deposit, became a top priority, and SWORD was funded [12].

This article gives an introduction to SWORD from an educational technology perspective; most other resources on SWORD focus on research outputs repositories. Because of this, the vignette case studies are largely based around intraLibrary [13] and tools that work with intraLibrary, because it was the only e-learning-specific repository system to take part in the SWORD and SWORD2 projects. However, it should be noted that other developments are afoot. For instance, the JISC-funded EdShare project has created a light-weight learning materials repository powered by EPrints [14]. Project Manager Debra Morris says:

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“SWORD is implemented and enabled by default on any EPrints 3.1 install. So SWORD is enabled on EdShare, we migrated to ePrints 3.1 in December 2008. When the EdShare codebase is made available to the community at the end of the EdSpace Project, this functionality will also be made available.” [15]

In Europe, the CEN/ISSS Workshop on Learning Technologies (WS/LT) [16] has been investigating requirements for repository deposit specifications, and have been testing implementations of SWORD to support publishing of resources to learning materials repositories [17]. They are holding a workshop in Vigo, Spain, on March 9, 2009, to disseminate their findings and find out what others are doing in this area [18].

2. What is SWORD?
The SWORD specification is a light-weight protocol that supports remote deposit of resources into repositories and similar systems. It enables the following:

1. Remotely querying a repository for information about collections available for deposit (i.e. requesting a SWORD service document);
2. Depositing resources into available collections, with or without specifying user log-in details.
3. Mediated deposit, where a user, e.g. an administrator or librarian, deposits on behalf of another user, e.g. a teacher; the resources are only deposited to collections the teacher has access to, and are recorded by the repository as belonging to that teacher.
4. Developer support functions: No0p and Verbose.

2.1 Technical aspects of SWORD
This section summarises technical information only in a high-level way; please see the SWORD website [19] for technical details.

SWORD is a profile of the Atom Publishing Protocol [20] (known as APP or ATOMPUB). The Atom Publishing Protocol is a widely used open standard, similar to RSS [21], with the purpose of publishing and editing Web resources. To date it has mainly been associated with newsfeeds for blogs, wikis and other web-based resources. It is based on the HTTP transfer of Atom-formatted representations of resources.

The SWORD APP Profile specifies a subset of elements from the APP, and some element extensions, for use in depositing content into repositories. SWORD also makes use of the Atom Syndication Format [22] as used in APP, with extensions.

As a deposit spec, SWORD focuses only on the POST feature of the APP, with a few additional elements to assist repository managers and deposit tool developers. It also ensures that certain common content types can be identified for deposit, including the IMS Content Packaging specification for e-learning content [23].

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2.2 SWORD Conformance
To conform to SWORD, an application must conform to the mandatory elements of SWORD; it is also possible for a SWORD-compliant system to support non-mandatory SWORD elements, and any other part of the APP that they wish. So, while SWORD focuses only on POST, it is in theory possible for a repository system to also support, for instance, PUT (used for update) and DELETE. To date none of the repository systems involved in SWORD have done so.

2.3 SWORD 1.2 and SWORD 1.3
The original SWORD spec, SWORD APP Profile 1.2, which was completed as part of the first SWORD project, includes two compliance levels (0 and 1), as well as optional developers’ elements (including No0p, and Verbose for detailed logging). The four repository systems involved in SWORD (intraLibrary [13], DSpace [24], EPrints [14] and Fedora [25]) all currently support this version of the spec.

The SWORD2 project began in mid-2008 and involved some revision of the spec. The SWORD APP Profile 1.3 will be the final version, and does away with levels of compliance. It also tidies up some aspects of the specification document, including bringing it closer to the APP. All repository systems involved in SWORD2 will support this version soon.

All versions can be accessed from the SWORD web site [26].

2.4 SWORD Client
In order to deposit into a SWORD-compliant system, it is useful to have access to a SWORD client. The SWORD project created an open source reference deposit client in both Web and downloadable (GUI and command-line versions available) formats. These can be used for requesting service documents and depositing into SWORD-compliant repositories; testing any implementation work; and can also be used as a basis for developing deposit tools. Downloadable versions are available on SourceForge [27].

The Web-based client is also available [28]. However, the old SWORD project client has been replaced with one that supports the SWORD APP Profile 1.3 and is not backwards compatible with implementations of SWORD APP Profile 1.2.

3. SWORD Stories: Implementations for e-Learning
The remainder of the article presents four stories to illustrate how SWORD is being used in e-learning. Each story will outline the user requirements, a scenario of use (user journey) and technical solutions required to realise that scenario.

3.1 SWORD Story A: Drag-and-Drop Desktop Tool

Requirements
One of the most frequently cited barriers to academics depositing their teaching materials into repositories is the keystroke-count involved in logging into a repository, uploading

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the resource, creating metadata, perhaps selecting a licence, and publishing the resource. It was a quick win, therefore, to create a drag-and-drop desktop tool to allow a single keystroke deposit of resources, including multiple resources in one action. For a repository that supports automatic metadata generation, administrative metadata can be created at the point of entry to the repository without the user needing to create any. In addition, the fact that SWORD can support deposit of IMS and SCORM Content Packages means that packages with metadata already in the manifest can be directly deposited into the repository with that metadata intact.

**User Journeys**

David is a lecturer whose university requires him to deposit his teaching materials into its institutional repository, the University Learning Depot. David's departmental IT support person, Lisa, came round his department and set up a brightly coloured icon on everyone's desktop called "Shortcut to UniLearningDepot". Whenever David has completed some teaching materials (e.g. reading lists, lecture notes, PowerPoint slides, groupwork exercises) for an upcoming module, he simply opens the folder they are sitting in, selects all of the materials, and drags-and-drops them onto the icon. A command line window opens very briefly on his desktop, indicating that the deposit is taking place. He then gets on with his other work.

The resources are immediately published to the repository with an upload date, his name as author of the resources, identifiers, copyright metadata (indicating the university as the rights holder with a note about legal uses for the materials), technical format and size information about the resource, and an appropriate classification in the repository's departmental taxonomy, so that David or anyone else in the university can browse to his department and access all the resources deposited there.

David's colleague Mhairi is a bit more technically minded and likes to create Flash-based interactive learning resources in IMS Content Packaging format for easy delivery in the university VLE. She creates some additional metadata in her packaging tool; when she drags-and-drops her packages into the repository, it indexes the additional metadata.

Lisa is quite excited about further possibilities for this drag-and-drop tool and, inspired by the SWORD Facebook App [29], plans to create a small form that pops up at the point of deposit, allowing lecturers to add titles, descriptions and keywords, which are then added to the resource metadata in the repository. She also wants to add OfficeSWORD [30] plug-ins to every computer in her department so that lecturers like David don't even have to drag-and-drop; they can simply click a button while in their Word or PowerPoint application. Finally, she knows that JorumOpen [31] is coming, and hopes to give lecturers an additional desktop icon so they can share their resources nationally as well as locally by dragging-and-dropping to "Shortcut to JorumOpen".

The following screenshots show a sequence of depositing resources into intraLibrary using SWORD.

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Step 1. Browse view in intraLibrary, showing 6 resources classified at JACS – Medicine and Dentistry (these resources don't REALLY fit this classification; just for demo purposes). User = "sword".
Step 2. "sword" goes to their desktop where there are two intraLibrary drag-n-drop SWORD icons- one says deposit2repository, the other says JorumOpenDeposit.
Step 3. "sword" highlights all 10 images on their desktop and drags them to the deposit2repository icon.
Step 4. "sword" goes back to repository and browses to JACS – Medicine and Dentistry again: there are now 16 resources there, with the 10 new ones list at the top of the list.
Step 5: "sword" clicks "View images only" to make sure all files uploaded correctly, and sees a thumbnail gallery of images.
Step 6. "sword" has downloaded some learning materials from the IRISS LX repository - there's a content package about crisis intervention. It's licensed for non-commercial, educational use, so "sword" decides to put it in local repository to use with students.
Step 7. "sword" drags the IMS Content Package zip file containing Crisis Intervention to the deposit2repository icon.
Step 8 "sword" goes back to the repository and sees Crisis Intervention is immediately published there.
Step 9. "sword" clicks “More” to view more information about Crisis Intervention, and sees that there is rich metadata included from the content package.

Step 10. "sword" clicks to preview the content package and sees it rendered in a content package viewer with the organisation listed in the left-hand frame. Each item in the package can be previewed, or can have an individual Public URL created for it.

Technical Solutions
The user is able to drag-and-drop single or multiple resources and packages into a workflow stage/collection in one action, and the repository system automatically generates certain IEEE LOM metadata fields as selected by the repository administrator. Both SWORD and the intraLibrary repository support IMS Content Packages.

3.2 SWORD Story B: Bulk Deposit for Sharing Metadata

Requirements
When two large-scale public-sector educational resource providers decide to work in partnership to share their learning materials, they look to open standards to help. The IRISS Learning Exchange repository [32] in Scotland provides learning resources for social services education across Scotland, including universities, colleges, workplace learning, and continuing professional development. NHS Education for Scotland [33] provides the NHS Scotland e-Library [34], giving access to a wide range of resources to Scotland's NHS staff. NHS Education for Scotland are soon to launch the pilot NHS Shared Learning portal, which will include a repository of learning materials for NHS workforce education, alongside such tools as content creation and review, and social software to support professional communities of practice.

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Social services and healthcare are two areas where there are many mutual affordances in both education and practice; the NHS Scotland e-Library has provided access to the IRISS Learning Exchange for some time. However, the new pilot provided an opportunity for more integrated resource sharing. Important requirements include allowing NHS staff to see IRISS Learning Exchange resources in e-Library and Shared Learning portal search results, and within their own content creation tools and repository. Both organisations worked together with software providers Intrallect [35] and MyKnowledgeMap [36] to investigate and implement the appropriate standards to make this happen.

User Journeys
One of Gita's responsibilities is supporting trainee occupational therapists on placement at her hospital. She uses the Shared Learning portal to discuss good resources and teaching tips with occupational therapy colleagues across Scotland. She also uses it to find online training packages covering key learning scenarios that she can refer her practice students to. One issue common across healthcare and social services is ensuring that service users from different cultures are appropriately supported. Gita decides to see if the Shared Learning portal has any new teaching materials on this topic, so she goes into the portal repository and searches. Her search results include some materials produced by NHS Education for Scotland (NES), some gathered from around the UK by NES staff, and IRISS Learning Exchange resources. She can read descriptions and keywords for resources, see which organisation created them, view licence information about how she may use resources, and preview, get a link for, or download resources.

Technical Solutions
The NHS Education for Scotland technical team had two options for extracting the IRISS repository's open collection metadata catalogue for inclusion in their own catalogue: nightly harvest using OAI-PMH, or nightly search using SRU. They required a Public URL [37] and a Public Package URL [38], to give their users access to both viewing and downloading the resources in question.

The harvesting solution would bring out all resources in the requested collection. Each subsequent harvest would only bring new and updated resources. However, the results would only include LOM metadata, with no extensions. The IRISS Learning Exchange’s LOM metadata did not include Public Package URLs for all resources.

With SRU, which uses Contextual Query Language (CQL) [39] search queries, it is difficult to construct a search that returns all resources in a collection, and finding only new resources each time would require a significant amount of extra development. However, intraLibrary's SRU service supports a number of extensions including providing a Public URL and a Public Package URL for the resource.

In the end, IRISS agreed to facilitate harvesting by making sure that their metadata records include both a Public URL and a Public Package URL in appropriate harvestable metadata fields.

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Regardless of the solution chosen above, the result is an XML file containing IEEE LOM records. When an XML LOM record with a URL in the LOM Technical Location field is deposited via SWORD into intraLibrary, intraLibrary ingests this as a Web resource and indexes its metadata for search, browse and display.

The NHS Education for Scotland instance of intraLibrary includes a SWORD Deposit Collection of Web resources, each of which has all of the rich metadata created by IRISS (one of the earliest learning materials repositories to employ professional cataloguers), with a local NES identifier additionally created by intraLibrary automatic metadata generation at the point of ingest. Thus the NHS repository has a collection that includes resources deposited by their own users, those collected by their team in partnership with other health and related services, those deposited by their users directly from Compendle [40], and resources ingested as Web links from IRISS Learning Exchange.

NHS Education for Scotland then uses OAI-PMH to harvest all the metadata from their own repository and deposit it in their e-Library catalogue for inclusion in search and browse results. Their local catalogue does not support SWORD deposit so they use a bespoke solution.

3.3 SWORD Story C: Deposit from a Content Creation Tool

Requirements
The Holy Grail for content creation tools supporting interoperable formats such as IMS Content Packaging or SCORM is to enable direct deposit of these materials straight from the tool into either a VLE, a repository, or both at the same time. The development of repositories that support acceptance of SWORD deposits has opened the way for this. In 2008 Intrallect formed a partnership with MyKnowledgeMap to meet the large-scale needs of NHS e-learning requirements in England and Scotland. The advent of SWORD was the final building block needed for a user-friendly round-trip between the Compendle course authoring tool and intraLibrary within two single sign-on user portals: one provided by NHS Education for Scotland, and one by the National Library for Health [41] in England. Both portals are currently in Beta pilot test stages: final roll-out will be at a later date. Details of functionality may change.

User Journeys
National Library for Health e-learning portal (NHS England), and NHS Education for Scotland Shared Learning Portal [42]
John is a technically-minded lecturer in a medical school who also works and supervises medical students in a local hospital. He creates good quality learning resources to upload to his university's VLE. He finds that his national NHS portal helps a great deal with this task by providing the Compendle and Question Builder [43] tools, and by providing a repository of existing files and content packages that he can reuse. He uses the repository as a safe backup for the content packages he creates, and doesn't mind sharing them with others across the NHS, since he gets so much benefit from what others have shared.
As an authenticated user of the portal, John can search or browse the repository, preview learning materials, create shareable links (Public URLs) for them, and download them as content packages. He can also go directly into a number of content creation tools, including Compendle for creating structured SCORM courses, and Question Builder for creating IMS QTI assessments for inclusion in his Compendle courses. NB: A Compendle "course" may be anything from a small tutorial structured around a few PDFs and slides, to an entire module made up of numerous IMS Content Packages.

Within Compendle, John can import a resource from his own computer, or search the portal learning materials repository directly for files and packages. The repository search results he sees allow him to read descriptions of and preview content. Any resource he wishes to include in his Compendle course can be downloaded into his work area in a single click.

Once John is happy with his new course, he has several options for output. He can publish the entire course as a SCORM package, or he can publish it to a CD-ROM, or as HTML. When publishing a SCORM package, his options are to download it, to publish it to the portal's Review Panel for others to feed back on, or publish it directly into the repository.

When John publishes a course to the repository, administrative metadata is automatically generated, e.g. upload date, contributor details, file size and identifier. If he logs into the repository, he will see the course in his list of resources. The package can either pass through a review and cataloguing stage within the repository before being published, or it can be made immediately available to other users who search the repository.

Once the course is publicly available, it will be picked up by any newsfeeds or podcasts users have set up based on search criteria that the package meets. John's institutional web page or VLE may include such feeds, allowing John's work to be immediately seen and used by others.

**Technical Solutions**

* **Content and Metadata:** Compendle creates courses as hierarchically structured SCORM packages; intraLibrary ingests the SCORM package, understands how to render its components, and indexes any IEEE LOM metadata that comes in with it. IntraLibrary also augments the metadata with additional automatically generated fields, and allows users to manually improve the metadata. Additionally, Compendle can edit IMS QTI packages output from its sister tool Question Builder, and include these in a course for deposit to intraLibrary.

* **Search:** IntraLibrary offers an SRU service, configurable by collection. Both NHS e-learning portals and the Compendle tool use SRU to externally search intraLibrary without having to log an individual user into intraLibrary. Search results are returned in IEEE LOM format, and are transformed into a user-friendly web page designed as part of the respective portals' look and feel.

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* **Download Packages into Compendle:** The XML returned by the SRU search includes extensions such as Public URL (allowing the user to click on a link to preview the resource with any package structure rendering) and Public Package URL (allowing the user to click to download the resource into Compendle as an IMS Content Package).

* **Publish Packages:** Compendle already had a facility to publish SCORM packages to VLEs. IntraLibrary's support for SWORD deposit enabled them to develop a new feature allowing publication of SCORM packages straight back into intraLibrary.

3.4 SWORD Story D: Drag-and-Drop NewsFeed Resources into a Repository

**Requirements**
The FeedForward project [45], funded by the second JISC Repositories and Preservation Programme [46], developed a desk-top tool for easy management, aggregation and dissemination newsfeeds from blogs, wikis, repositories, and so on. Users can pull all of their feeds into one tool, configure how many or what kind of feed results they want to see at any given moment, and push them out the other end in a range of formats into other systems. One of their use cases was aggregation of one or more feed outputs into a single IMS Content Package, with the ability to deposit the package straight into a learning materials repository, including lightweight metadata, both drawn from the feed XML, and created in the FeedForward interface.

**User Journey**
Josie is a sociology lecturer who subscribes to many newsfeeds with different purposes (social, hobby-related, news, work-related). She uses FeedForward to gather and monitor all her feed results. She has three feeds that often include resources she can use with students: the Guardian Society site [47], the Sociological Images blog [48], and the Intute sociology news channel [49]. She can configure FeedForward on-the-fly to show only those feeds when she is gathering teaching resources in the morning, and to de-emphasise them when she is catching up with the news and her friends' blogs at lunchtime.

One morning she finds several different feed items of relevance to courses she will be preparing for the following term. To deliver these to her students she:

1. Pulls the feed results together by dragging-and-dropping;
2. Names the resulting package: "Representation of Social Class";
3. Drags-and-drops the aggregated resources to her institution's learning materials repository;
4. Describes the package: "Some interesting examples, images, and discussions of the representation of social class in the media";
5. Gives it some tags: "class, media, representation, 2ndYearSociology".

FeedForward picks up the feed titles and authors from the feed XML, and adds them to the package's metadata, and the repository automatically generates some additional

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metadata (e.g. naming Josie as the contributor, recording the date of contribution, giving the package a unique identifier), and publishes the deposited package.

Josie has previously set up a feed out of her institutional repository into her 2nd year class' area in her institution's VLE, based on a search for the metadata keyword "2ndYearSociology". Because the new "Representation of Social Class" package is now sitting in the repository with this keyword, it is pushed into the VLE using this feed, without Josie having to do anything further. If the collection Josie publishes to has been made accessible externally, the published package can also be included immediately in local or SRU searches, or harvested into a metadata catalogue.

Finally, Josie drags-and-drops the package using FeedForward to the social bookmarking website Delicious, where she belongs to a network of sociology academics who share their favourite links.

**Technical Solutions**

FeedForward pulls in RSS and Atom feeds from any compliant source, and pushes the feed items out to a SWORD-compliant repository, aggregated into an IMS Content Package with IMS Learning Resource Meta-Data (v1.2). The IMS metadata fields map directly to IEEE LOM fields: title, description, and keywords.

The FeedForward packages include the user-created metadata at the package 'organization' level, and at the level of each individual feed item, along with the title and authors of the item given in the original AtomEntry/RSSItem data.

The package created consists of a manifest.xml file referencing Web resources ("webcontent") only. A repository or other target that supports IMS Content Packaging and IMS/LOM metadata will be able to read, index and render the resources.

Currently intraLibrary 3.0 (soon to be released) is the only repository system that is able to fully support IMS Content Packages and IMS or LOM metadata in a SWORD deposit. However, FeedForward also uses SWORD to deposit METS and OAI-ORE packages with metadata into DSpace, Fedora and EPrints repositories, and it enables feeds to be deposited to such Web 2.0 social software tools as Delicious, Twitter, Blogger, Wordpress, Magnolia, Simpy, Scribd, and Connotea.

The diagram below shows part of the 11 results from a newsfeed for a Flickr group that collects hazard signs from around the worlds. These feed items have been aggregated in FeedForward into a single IMS Content Package manifest. The user has added the title "Hazards signs from Flickr", the description "Here's some stuff on hazards" and the tags "graphic design, photos, signs, hazards, funny" in the FeedForward tool. These have been added into the metadata in the manifest at the top manifest level, with the description and tags also added to each individual item within the manifest. However, the items have their own individual titles, taken from the feed XML.

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The following images show the intraLibrary results list after a keyword search for "hazards", the expanded view of the package in the results list, the View Metadata popup, and a preview of the content package with "Use caution near the edge" item showing.
Step 1: Results of key word search for “hazards”

Step 2: Expanded view of the results list

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Step 3: The metadata of the resource

Step 4: A preview of the resource

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4. Moving Forward with SWORD

The SWORD2 project is officially finished, but new tools using the SWORD protocol continue to be developed to work with a range of repositories systems. Great gains are possible in encouraging teachers and students to deposit materials: widely used content creation tools, the use of social networking software, and deposit from any website where potential contributors visit, are all fertile areas for exploration. There are openly available experimental tools currently available in all of these areas, e.g.:

- The OfficeSWORD tool [51] which allows direct deposit from within any Microsoft Office document;

- A SWORD Facebook app [52] which allows someone to deposit while in logged into Facebook;

- The open source SWORD Widget [53], enabling SWORD deposit from any website, co-ordinated by ICO3 Ltd [54] and funded by the JISC Digital Repositories Programme [55].

Current funding opportunities hope to promote a flood of high quality open educational resources [56]. Provision of light and easy SWORD tools are a key building block in ensuring that such teaching and learning materials are more likely to be stored, shared, re-used and managed sustainably into the future, without causing too much trouble to teachers and other resource developers.

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For more information on Intrallect's intraLibrary repository software, go to: http://www.intrallect.com or email enquiries@intrallect.com

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5. References


[7] IMS Content Packaging is an XML-based specification for storage, transport and delivery of structured e-learning materials: [http://www.imsglobal.org/content/packaging/](http://www.imsglobal.org/content/packaging/) - SCORM is a profile of IMS Content Packaging alongside bits of other specs: [http://www.adlnet.gov/scorm/](http://www.adlnet.gov/scorm/)


[14] EPrints is one of three open source repository systems that took part in SWORD and SWORD2: http://www.eprints.org/ The other two were Fedora ( http://www.fedora.info/) and DSpace ( http://www.dspace.org/) 

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[27] SWORD on Sourceforge: http://sourceforge.net/projects/sword-app/


[29] Experimental SWORD Facebook APP created by Stuart Lewis of Aberystwyth University: http://fb.swordapp.org/

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[32] IRISS Learning Exchange: [http://www.iriss.ac.uk/learnx](http://www.iriss.ac.uk/learnx)


[37] Public URL is a feature of intraLibrary, providing a persistent URL for resources in the repository which gives access to viewing the resource to anyone via the Web, regardless of whether they are logged into the repository.

[38] Public Package URL is a feature of intraLibrary, providing a persistent URL for resources in the repository which allows download of resources as IMS Content Packages with metadata in a zip file to anyone via the Web, regardless of whether they are logged into the repository.


[42] Note: while the English and Scottish portals have somewhat different user interfaces, the functionality they use for this story is basically the same, so this story can be read as happening in England or Scotland


[45] FeedForward website: [http://legolas.cetis.ac.uk/](http://legolas.cetis.ac.uk/)


[http://jisc.cetis.ac.uk/](http://jisc.cetis.ac.uk/)

[48] Sociological Images blog feed:  

[49] Intute sociology feed:  
http://www.intute.ac.uk/socialsciences/rss/latest_sociology.xml

[50] Example XML output from Feedforward:  
http://www.elearning.ac.uk/features/imsmanifest.xml/file_view

[51] OfficeSWORD project, creating a SWORD deposit plug-in for Microsoft Office applications:  
http://www.codeplex.com/OfficeSWORD

[52] Experimental SWORD Facebook APP created by Stuart Lewis of Aberystwyth University:  
http://fb.swordapp.org/


[55] JISC Digital Repositories Programme:  

[56]  http://www.jisc.ac.uk/fundingopportunities/funding_calls/2008/12/grant1408.aspx

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