ReMIT (Reference Management Integration Toolkit)

1 Introduction

This toolkit is intended to help institutions consider or implement an integration of Reference Management software into their learning environment. The toolkit is a deliverable of the TELSTAR (Technology Enhanced Learning supporting STudents achieve Academic Rigour) project[1] lead by the Open University[2] with collaboration from RefWorks-COS[3]. The project was funded by the JISC (Joint Information Systems Committee)[4].

The toolkit is divided into two parts:

The main toolkit, which describes what reference management is, why you might want to integrate it into an institutional learning environment, and what issues you should consider if you are carrying out such an integration.

The second part of the toolkit is a description of the integration carried out at the Open University by the TELSTAR project.

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[1] http://www.open.ac.uk/telstar/
[2] http://www.open.ac.uk/
[3] http://www.refworks.com/
[4] http://www.jisc.ac.uk/

2 What is Reference Management?

2.1 Introduction to Referencing

Using references and citations in academic writing is accepted as fundamental to a rich academic discourse.

> "When you cite a source, you show how your voice enters into an intellectual conversation and you demonstrate your link to the community within which you work. Working with sources can inspire your own ideas and enrich them, and your citation of these sources is the visible trace of that debt."[5]

A reference serves two general purposes:

- To acknowledge the work and ideas of others
- To describe or identify a resource to the extent a copy of the resource can be discovered by others

There is no real limit to the types of resource that you might reference, but when working in an academic environment typical resources could be:

- Course materials
- Web sites
- Books (electronic or print)
- Articles (electronic or print)
- Journals (electronic or print)

In order to ensure consistency in the format and layout of references, it is usual for an author to use a defined referencing and citation style. At a high level, there are two approaches to including citations in a piece of writing. 'Parenthetical referencing'[6] is the approach of including a brief reference in parentheses within a piece of text. The alternative approach to parenthetical referencing is to use a numbered footnote or endnote to point from the in-text citation to the full reference[7].

Probably the most widely used form of parenthetical referencing is the Harvard system, which uses the author name and date of publication in parentheses as the in-text citation, and then lists the full details for all references at the end of the text, ordered alphabetically by author name.

Within these two broad approaches there are a huge number of defined styles which dictate the formatting and layout that should be used for different types of reference. As a simple example the following two references are to the same book, but in two differing reference styles:

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[5] http://www.yale.edu/bass/writing/sources/why.html

[6] http://en.wikipedia.org/wiki/Wikipedia:Parenthetical_referencing
[7] http://en.wikipedia.org/wiki/Citation#Note_systems

Gash, S. *Effective Literature Searching for Research* (Gower Publishing Limited, Aldershot, 2000).[8]

Gash, Sarah. <u>Effective Literature Searching for Research.</u> Second ed. Aldershot: Gower Publishing Limited, 2000.[9]

The purpose of a referencing style is to bring consistency and make it easy for the reader to understand what is being referenced. However, the rules governing a reference style tend to be complex as they have to be able to deal with any material that may be referenced in a consistent manner.

2.2   Reference Management software

In order to help authors manage large sets of references, and to produce citations and references in a consistent style, a range of software packages is available. This type of software is often called 'Reference Management' software, but 'Citation management' and 'Bibliographic management' are also used.[10]

Reference Management software enables an author to build a library of references by entering the details of each reference in a structured format. They usually support mechanisms for organizing sets of references by tagging or use of 'folders', and will generate references, citations or bibliographies in a range of referencing styles.

Most packages support ways of importing records from library catalogues and other bibliographic data sources in order to facilitate the generation of references. In addition, many packages now offer plug-ins or add-ins for Word processing software which enable authors to insert references from their 'library' directly into a document as they are writing.

As Reference Management software has become more sophisticated functionality has extended beyond the basic use for producing references in a consistent style, and they may also offer tools for managing related documents (e.g. PDFs of the original items you wish to reference), social networking tools, and a variety of APIs (Application Programming Interfaces) to enable reference management functionality to be embedded in other environments.

As the software available in this area is subject to constant and rapid change, this toolkit does not include any summary or review of available packages or their functionality. Wikipedia has a comparison table of software that may be useful in this regard[11].

It may also be useful to consider the prompts provided by Martin Fenner at http://www.slideshare.net/mfenner/which-reference-manager, and his overview diagram at http://www.flickr.com/photos/mfenner/4379530289/.

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[8] 'Nature' reference style as produced by RefWorks 26/02/2010
[9] MLA reference style as produced by RefWorks 26/02/2010
[10] http://en.wikipedia.org/wiki/Reference_management_software
[11] http://en.wikipedia.org/wiki/Comparison_of_reference_management_software

In addition to the issues covered here, when considering integration into other environments the availability of an API (Application Programming Interface) is key, and a careful consideration of whether the available API supports all the functions you wish to provide to authors is necessary.

The UKOLN/JISC report on API Good Practice contains valuable advice on choosing and consuming 3rd Party APIs[12].

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[12] http://ie-repository.jisc.ac.uk/344/

3 Why Integrate Reference Management?

Some of the key benefits which can be gained from integrating reference management into a learning environment are:

- It supports students in developing key information literacy skills
- It supports lifelong learning by enabling students to keep a portfolio of past and current reading
- It supports good scholarly practice in the learning environment
- It integrates library services into the learning environment
- It can increase value for money invested in existing tools

How integration can help achieve these benefits is described in more detail in the following sections.

3.1 Information Literacy and referencing

The Chartered Institute of Library and Information Professionals (CILIP) define Information Literacy as "knowing when and why you need information, where to find it and how to evaluate, use and communicate it in an ethical manner."[13]

CILIP goes on to list aspects of citation and referencing as skills that are required to be 'information literate', including[14]:

"Knowledge of citation style"

"Use of appropriate software (spreadsheet / database / statistical / reference management / etc)"

Ensuring students understand how and when to reference is a key factor in combating plagiarism. A report commissioned by the Joint Information Systems Committee (JISC) in 2001 identifies several reasons why students plagiarise including the following statements[15]:

"The most common cause of minor plagiarism is a lack of understanding of how to cite material from other sources."

"Perhaps the most common reason people plagiarise is bad time management skills"

Unfortunately the complexity of practices in referencing and citation increase the barriers to students following good practice. Dr John Sanders, a tutor for the Open University, typified the current practices for referencing and citation as follows:

"Obscure rules, arcane vocabulary, a closed club remote from the experience and concerns of everyday folk, a system which only the insiders know how to work"[16]

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[13] http://www.cilip.org.uk/get-involved/advocacy/learning/information-literacy/pages/definition.aspx
[14] http://www.cilip.org.uk/policyadvocacy/learning/informationliteracy/definition/skills.htm
[15] http://www.jisc.ac.uk/media/documents/programmes/plagiarism/plagiarism.pdf

Two key potential benefits of providing tools which make it easier to reference accurately and appropriately, and which integrate good practice in the collation, management and use of references into the students' learning environment are:

- Improve students' information literacy
- Reduce plagiarism caused by ignorance and lack of time

3.2   ePortfolios and referencing

"An e-portfolio is the product, created by the learner, a collection of digital artefacts articulating experiences, achievements and learning."[17]

References may form part of an ePortfolio both as a record of resources read by the learner, and also in the form of references within written work, such as summative assessments. Potential benefits of integrating reference management tools with ePortfolio systems students include:

- Ability to build an annotated list of past reading
- Easy reuse references and resources as required
- Ability to share and discuss references (as pointers to relevant resources) with others

3.3   Library services and referencing

In a 2005 blog post Lorcan Dempsey argues that libraries need to "be in the flow"[18]. This argument is made with particular reference to a student's "learning landscape" as described by David Tosh and Ben Werdmuller[19]. Dempsey states that "as network behavior is increasingly supported by workflow and resource integration services, the library must think about how to make its services available to those workflows."

In a more recent article Smita Chandra and Vivek Patkar[20] argue "Library services should be integrated with LMS such as WebCT, Blackboard, DesireLearn, ANGEL or Moodle at the point of need to be most effective."

In "Building the 21st Century Library" it is recommended that:

"Libraries should look for increased value from their principal library-wide computer systems, ensure that those 'library management systems' are integrated with other institutional systems and look to break down barriers between library users and resources."[21]

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[16] http://intranet.open.ac.uk/making-connections/abstracts-C.shtm
[17] http://www.jisc.ac.uk/media/documents/publications/effectivepracticeeportfolios.pdf
[18] http://orweblog.oclc.org/archives/000688.html
[19] http://weblearn.ox.ac.uk/site/users/adamm/public/lusid/openconference%20PDP%20paper%203.pdf
[20] Chandra, S. and Patkar, V. (2007) 'ICTS: A catalyst for enriching the learning process and library services in India', *The International Information & Library Review*, Vol. 39, No. 1. 1-11. *doi: 10.1016/j.iilr.2006.11.001*

From the library perspective, benefits of integrating reference management tools into the learning environment will include:

- Provision of library services at point of need
- Increased usage of bibliographic management tools, providing increased value for money

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[21] http://www.jisc.ac.uk/media/documents/programmes/resourcediscovery/lmsstudy.pdf

4 Supporting good practice in Reference Management

4.1 Information literacy skills

Alongside any integration of Reference Management tools with a learning environment it is necessary to consider how students will gain and maintain the skills to make best use of the tools, and to manage and use references effectively.

In 2001 a SCONUL (Standing Council of National and University Libraries) position paper stated that "Both the literature and practitioners support the absolute necessity of information skills work being integrated into the subject curriculum"[22]. The integration of Reference Management tools into the learning environment is an opportunity to consider how information literacy skills are integrated into the curriculum.

A good starting point for considering the Information Literacy skills you wish to support are the benchmarks for information skills developed at South Bank University, described by Peter Godwin in 2002[23]. These benchmarks describe 7 'information skills', with each information skill being broken down into 'competencies' which indicate what might be expected of students at different levels of Higher Education.

Information skill 6 is "Organizing, applying and communicating information sources to others" and broken down into the following competencies:

Level 0 (Foundation)	• Understanding the need to keep records of searches and resources found
Level 1 (Undergraduate Year One)	• Ability to keep basic records of searches made and resources found • Ability to cite printed and electronic sources used for essay preparation as a book list • Compliance with copyright and plagiarism rules
Level 2 (Undergraduate Year 2)	• Ability to create bibliography of variety of materials used to write essays
Level 3 (Undergraduate Year 3)	• Ability to keep systematic records of material found for major project • Ability to compile a comprehensive bibliography of different types of sources : books, journals, Web sites, videos, and

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[22] http://archive.ifla.org/IV/ifla67/papers/016-126e.pdf
[23] Godwin, P. (2003) 'Information literacy, but at what level?' in Allan Martin and Hannelore Rader (eds) *Information and IT literacy : enabling learning in the 21st century,*London, Facet.

	use either Harvard referencing or referencing as specified by the course, and to reference electronic materials. • Understanding of copyright issues on the Web
Level M (Masters Level)	• Ability to construct major bibliography and reference range of materials in a major project

While integrating reference management tools into a learning environment consider how these competencies will be supported, and the level of students using the tools.

4.2   Referencing styles

In 2009 Alec Gill wrote in the Times Higher Education[24]:

"Some academics have a "fetish" for their chosen style of referencing source material, and students can be inhibited by lecturers' conflicting advice on which style to use. These were among the findings of a symposium earlier this month at the University of Bradford focused on referencing and writing. One conclusion was that there are far too many referencing styles - there are well over 3,000 esoteric ways of citing source material. What purpose is served by all the archaic typography? The question was asked: "why not have one standard system?""

The evidence from focus groups that the TELSTAR project ran with students very much supported this with students sometimes unclear which referencing style they should use, concerned they would be penalized (marked down) for using the wrong style, and asking that there should be more consistency in the referencing styles they were asked to use across different courses or modules. Quotes from the student focus groups include:

"if you don't do it right in the final ECA [End of Course Assignment] you're going to be penalized for it"

"whatever I'd been doing before which was a system of footnotes … was not what was required on the course I've just done … the issue for me this year was trying to move from one [citation style] to the other"

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[24] http://www.timeshighereducation.co.uk/story.asp?storycode=407112

> "when you look at the citation style they [the course] use, it's an absolute shambles in that it's subtly inconsistent with itself"

In a 2009 blog post James Atherton argues that we are in danger of paying too much attention to aspects of referencing that are not that important:

> So I am puzzled by this disproportionate attention paid to referencing. I am particularly puzzled by the insistence that it always be corrected. We emphasise the quality of feedback we give to our students, and we are keen that they should read it, discuss it with us in tutorial, and learn from it. And of course that will include correction of poor referencing practice, up to a point. What does obsessional attention to every detail of punctuation in a bibliography say about what we think is important about an essay or project? Indeed, what other aspect of marking should get less attention in order that this can get more? As I remember, the examiner suggested that work could even be referred until it was re-submitted with an immaculate list of references; what does that say about what is important?[25]

While there is no doubt that when writing for publication, there may be a requirement to use a specific referencing style (for example, the referencing style guidelines for 'Science' are given at http://www.sciencemag.org/about/authors/prep/res/refs.dtl), the requirements for students should be considered carefully, and communicated to them clearly.

Alec Gill proposes a 'unified academic referencing system' to simplify practice across academia[26]. While integrating reference management tools into a learning environment consider what styles you wish or need to support, and whether it is possible to agree on a small number of styles that can be used across the institution.

A final point on referencing styles is that reference management software will work on a 'garbage in, garbage out' basis. If you generate references from a structured form of the reference, you must ensure that the correct information is recorded in the correct places within structured format.

4.3   Copyright, Intellectual Property Rights, Licensing and Reference Management

Copyright, Intellectual property rights (IPR) and Licensing issues need consideration when integrating Reference Management into a learning environment.

When considering these issues, a risk management approach is recommended, as described by Brian Kelly and Charles Oppenheim in "Empowering Users and their Institutions: A Risks and Opportunities Framework for Exploiting the Potential of the Social Web"[27]

Firstly there is the question of whether the references themselves have any associated IPR. The JISC Legal information on the "Transfer and Use of Bibliographic Records: Guidance on Legal Issues"[28] is

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[25] http://www.doceo.co.uk/reflection/2009/04/on-shibboleth-of-harvard-referencing.htm
[26] http://academicreflexions.blogspot.com/2009/09/academic-referencing-second-version-of.html
[27] http://www.ukoln.ac.uk/web-focus/papers/cultural-heritage-online-2009/

useful in this case. Although the report is aimed mainly at Libraries, and focuses on the transfer and use of records in the context of library catalogues and similar systems, the same principles are likely to apply to records collected in a reference management system.

The report states "It is unlikely that a single bibliographic record will attract any IPR". However, "Obtaining, verifying, and presenting a set of bibliographic records can attract database rights if there has been substantial investment (which could include human, financial or technical resources)."

It is strongly recommended you consider the issue of User Generated Content (UGC), especially if you are providing services for students to create and share references. The JISC legal resource is once again extremely helpful suggesting:

> "If you allow users to create such content, it is sensible to get them to give you the necessary consent to use and transfer this content, as well as ensuring that the content and records which are supplied do not breach any other legal issues"

The resource also provides model terms and conditions for UGC in respect to bibliographic records[29], as well as a more lightweight set of terms and conditions[30] which you might use.

Fuller information and guidance is available in the full JISC Legal resource "Transfer and Use of Bibliographic Records: Guidance on Legal Issues" at
http://www.jisclegal.ac.uk/Projects/TransferandUseofBibliographicRecords.aspx

The second area that may need consideration is the storage of full-text resources alongside references. As noted in Section 2.2, on Reference Management software, the ability to store digital objects such as PDFs with references is often part of the functionality they provide. Some Reference Management software goes further to enable the sharing of documents between groups of users, usually on a limited basis.

When supporting this type of functionality, thought should be given to what the limitations of storing and sharing digital copies of documents should be. This should be informed by a consideration of copyright and contracts with suppliers of electronic information.

The Model NESLi2 license for Journals[31], which is the basis for many agreements with suppliers of electronic journals to the UK HE sector contains a term which allows authorized users to save material they find electronically:

28
http://www.jisclegal.ac.uk/Projects/TransferandUseofBibliographicRecords/TheBasics/Legalconstraints.aspx
29
http://www.jisclegal.ac.uk/Portals/12/ccfiles/Model%20Terms%20and%20Conditions%20for%20UGC%20Contributions%20to%20Bibliographic%20Records.pdf
30
http://www.jisclegal.ac.uk/Projects/TransferandUseofBibliographicRecords/Step4Respondingtorisks/Optimisingcontracts.aspx#UGC

> 3.1 The Licensee may:
>
>   3.1.3   allow Authorised Users to:
>
>   3.1.3.2   electronically save parts of the Licensed Material;

However, alongside this permission, it also contains a restriction on sharing electronic copies of the material:

> 4.1   Save as provided herein, the Licensee and Authorised Users may not:
>
>   4.1.4   display or distribute any part of the Licensed Material on any electronic network, including without limitation the Internet and the World Wide Web, and any other distribution medium now in existence or hereinafter created, other than by a Secure Network unless permitted in this Agreement;

While licenses may vary, and it will be necessary to check license terms that apply for any particular online resource, this suggests that in general there will be no issue in providing the ability for individuals to store copies of documents for personal use. However, directly providing mechanisms to share documents with others increases the likelihood of some staff or students breaking the license under which the material is made available to members of the institution.

Two final areas of consideration may be in providing full-text copies of resources, or links to resources, to students from the learning environment.

Providing links to resources from the learning environment is generally not a problem. However using specific licensing conditions, some resources do restrict some activities, such as providing persistent links to material they supply from a learning environment. A high profile example of this is the Harvard Business Review (HBR), published by Harvard Business School Publishing (HBSP) and provided online by a service called EBSCO[32]:

> As you may be aware, HBSP's license agreement stipulates that HBSP content may be used only for academic research.
>
> To date, this has meant that you have been required to seek additional permission from HBSP [Harvard Business School Publishing] for:
>
> • HBR articles in course packs
> • HBR articles assigned as other course work

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[31] http://www.nesli2.ac.uk/model.htm
[32] http://www.caul.edu.au/datasets/hbr2008course-use.pdf

• Access to HBR articles via persistent links
• Any other use that is not academic research

Providing full-text copies of resources alongside references, for example hosting a local copy of an electronic journal article in your learning environment, will require a review of both copyright and licensing terms.

There are a number of possibilities for including this type of material in your learning environment:

- Individual licensing terms may permit the use of digital material within a learning environment
- UK Universities may have, or could obtain, a license from the Copyright Licensing Authority (CLA)[33]
- Other UK institutions (e.g. Schools, FE Colleges, Adult Education providers) may also be able to use a CLA license[34]
- Terms may be negotiated directly with the copyright holder

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[33] http://www.cla.co.uk/licences/licences_available/he/uuk
[34] http://www.cla.co.uk/licences/licences_available/

5 Integrating Reference Management into a Technology Enhanced Learning environment

5.1 Stakeholders

The stakeholders in any project to integrate Reference Management tools into a learning environment will vary depending on how responsibilities are allocated within an institution. Although practices may vary across institutions it is likely that those responsible for, or involved in, the following areas of activity will be key stakeholders:

- Use of teaching materials, resources and services to learn (e.g. students)

- Creation of teaching materials (e.g. academic staff)

- Provision of information literacy training (e.g. library)

- Provision of and support for reference management software including any related training (e.g. library)

- Provision of physical and online resources to support teaching and learning (e.g. library)

- Provision and development of a Virtual Learning Environment (VLE) or similar software intended to support teaching and learning (e.g. IT services)

- Support for users of a VLE or similar software, including staff and students (e.g. learning support services, IT services)

- Provision and development of ePortfolio software (e.g. IT services)

- Support for users of ePortfolio software (e.g. learning support services, IT services)

- Creation and management of resource or reading lists for courses or modules (e.g. administrators, library)

As well as internal stakeholders, the wider HE community and suppliers of relevant software or services should also be considered.

A list of stakeholders identified by the Open University is available in Section 6.4.1.

5.2 Functional Requirements

The process of gathering user requirements is covered in other places, such as the JISC Infonet toolkit on system selection[35]. It is important to engage with all the identified stakeholders and use a variety of methods to obtain input, including surveys, interviews and focus groups.

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[35] http://www.jiscinfonet.ac.uk/InfoKits/system-selection/ss-define-1.1

It is worth considering breaking down requirements into a number of areas. For example, the requirements for providing good reference management tools to students may be considerably different from the requirements for enabling tutors or librarians to create lists of references for course material.

It may be helpful to define tasks and workflows that you might expect different stakeholders to be able to carry out. This can help inform functional requirements and ensure that the development is meeting the real need rather than just checking boxes on a list.

The Open University functional requirements and related documentation are described in [Section 6.4](#).

5.3   Linking to online resources

As the amount of material, both scholarly and otherwise, is made available and accessed in electronic format, it is increasingly common to reference online resources. As noted above, one of the key purposes of referencing is to enable the reader to discover a copy of a resource, and often for online material this means providing a link or identifier.

Given a reference to a resource it is desirable to provide a link to the online version of the resource whenever possible. When integrating references into a learning environment consideration should be given to providing links to the resource online.

However, there are three significant problems when giving references to online materials.

Firstly, the volatile nature of web resources means they are subject to both change and deletion[36]. A link to an online resource that works today, may not work, or not link to the same material, by tomorrow.

Secondly, and especially applicable to scholarly resources online, is the "Appropriate Copy Problem"[37]. In brief, this problem arises when a single resource (e.g. a journal article) is available online through multiple providers, but that access to the resource through each provider is only available via subscribing institutions. This means that the copy an author has access to, may not be the same as the one a reader has access to, and so an author provided URL may not work for the reader.

Finally, providing links to online resources, even ones to which the reader has access, may sometimes result in an apparent 'dead end', as the user can be faced with a login screen which leaves them confused as to how to access the resource. The issues of providing a consistent user experience when logging into online resources was the subject of a recent JISC and JISC Collections study[38].

These three areas are discussed in more detail in the following sections.

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[36] http://www.ariadne.ac.uk/issue62/davis/
[37] http://www.dlib.org/dlib/september01/caplan/09caplan.html
[38] http://sites.google.com/site/publisherinterfacestudy/

5.3.1 Persistent Links

When providing links to online resources it is clearly desirable that the links will work over long periods of time. This toolkit does not attempt to cover all aspects of persistent identifiers, which are covered elsewhere; a good starting point is Emma Tonkin's 2008 article on the topic in Ariadne[39].

In 1998 Tim Berners-Lee wrote "Cool URIs don't change"[40]. This document lays out the reasons why those responsible for maintaining URIs should ensure that they are persistent over time. When recording a reference to an online resource, if a 'cool URI' is available, it may well be appropriate to use it. However, judging if a URI is 'cool' or not is not easy. This essentially comes down to the question of how much you trust the provider of the URI will maintain the URI, the content it identifies, and it's ability to do so over a long period of time. This is not simply a question of the intentions of the provider, but also relates to questions such as the long term viability of the provider as an entity (e.g. for commercial providers, what is the likelihood they will become insolvent, and in this case the likelihood of the links being maintained by another party).

Many providers of online scholarly resources now provide so called 'persistent links' which are intended to provide 'cool URIs' for their resources. It is worth noting that the 'persistent link' may not be the one that appears in the browser address bar when you browse to the page, but provided separately with other metadata about the document. Once again, how persistent you believe these links to be is a matter of how far you believe the publisher or provider will maintain the link (and be in a position to do so).

5.3.1.1 PURLs

While the term 'persistent link' has no formal definition, the term 'Persistent URL' (PURL) has a specific meaning. PURLs are:

"Web addresses that act as permanent identifiers in the face of a dynamic and changing Web infrastructure. Instead of resolving directly to Web resources, PURLs provide a level of indirection that allows the underlying Web addresses of resources to change over time without negatively affecting systems that depend on them."[41]

The best known PURL server is managed by OCLC[42], although anyone can use the service to create PURLs, but PURL servers can be implemented by anyone using the PURLZ server software[43] developed by OCLC[44] and Zepheira[45], or using any software that can provide similar functionality.

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[39] http://www.ariadne.ac.uk/issue56/tonkin/
[40] http://www.w3.org/Provider/Style/URI
[41] http://purl.org/docs/index.html
[42] http://purl.oclc.org/docs/index.html
[43] http://www.purlz.org/
[44] http://www.oclc.org/
[45] http://zepheira.com/

As with any 'persistent link' the persistence of a PURL depends on the persistence of the service that resolves the PURL to a web resource. Implementing a local PURL service may increase local control over the service, but institutions should be realistic about their ability to maintain such services over long periods of time and the commitment this requires.

5.3.1.2 DOIs

In addition to persistent links supplied by individual providers, many scholarly resources are now being assigned 'Digital Object Identifiers' (DOIs)[46]. DOIs are intended to be persistent identifiers (rather than persistent links), but can generally be turned into links to the online resource (a process known as 'resolving') by appending the DOI to the address of a resolver – the best known being http://dx.doi.org/.

As an example the DOI "10.1037/0003-066X.59.1.29" identifies the article:

Ray, O. (2004) 'How the Mind Hurts and Heals the Body', American Psychologist, Vol. 59, No. 1. pp.29-40.

Which means that you can link to the online version of the article with the URI http://dx.doi.org/10.1037/0003-066X.59.1.29

References in scholarly works now commonly include a DOI when one is available. In these cases it is possible to create a link to an online version of the resource using a DOI resolver. However, the DOI will usually resolve to a specific version of the resource online, usually the one provided directly by the publisher, and if the reader does not have access to this version, they will be unable to view the resource via this link, even if they have access to the resource through an alternative route. This is the 'appropriate copy' problem in action.

5.3.1.3 OpenURLs

An alternative approach to linking to scholarly resources online is to use 'OpenURLs' (or more formally The OpenURL framework standard ANSI/NISO Z39.88[47]). The OpenURL framework enables the creation of applications that transfer packages of information over a network. The only significant implementation of the standard is to transfer metadata related to bibliographic resources.

OpenURL has seen widespread adoption by University libraries in combination with 'OpenURL resolver' software. Resolver software typically uses the metadata available from an OpenURL (transported over http) to provide a link to the 'appropriate copy' based on the library's subscription information.

As OpenURLs are used to transport metadata, they can include other appropriate identifiers such as DOIs or ISBNs (International Standard Book Numbers) either of which can be used to form links to online versions of the resource – if the resolver is configured to do this.

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[46] http://www.doi.org/
[47] http://www.niso.org/standards/z39-88-2004/

OpenURLs should not be regarded as 'persistent links', as their contents (and therefore the link) can change over time (if the source metadata is updated for example), and the outcome of following an OpenURL link can change depending on the configuration of the resolver software being used. However, they do provide a consistent mechanism for linking to a copy of the resource via a library or institutional subscription. As OpenURLs are constructed from the reference metadata they can be formed 'on-the-fly' from the reference, if this is desired.

5.3.2 Authentication issues

For a detailed look at authentication issues related to scholarly resources, a good starting point is the JISC and JISC Collections commissioned Service Provider Interface Study[48]. In this toolkit the focus will be on authentication as relates to linking to resources from a learning environment, with an assumption that there will be some level of institutional control over the links provided.

"A wide variety of access methods exist to establish a link between a user wishing to access protected content of a publisher and an existing subscription/license agreement that covers that usage."[49]

This 'wide variety of access methods' adds another barrier to a user wishing to access an online version of a resource. The variety of mechanisms are described in Section 2 of the Service Provider Interface Study[50].

Two widely used mechanisms in UK HE are IP authentication and Federated Access Management. IP authentication is often used in conjunction with a URL-rewriting Web Proxy such as EZProxy[51]. The pros and cons of the various approaches are given in the Service Provider Interface Study, and won't be repeated here.

However, in the case of using a Federated Access Management approach, or a URL-rewriting Web Proxy approach, there is a common issue related to the fact that there is an advantage to adding extra information to the link provided to the reader.

As described in the Service Provider Interface Study, a particular challenge for authenticating a reader of online resources is the 'discovery problem'[52]. This is described in detail in the study:

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[48] http://sites.google.com/site/publisherinterfacestudy/home
[49] http://sites.google.com/site/publisherinterfacestudy/home/executive-summary
[50] http://sites.google.com/site/publisherinterfacestudy/full-report-pdf
[51] http://www.oclc.org/ezproxy/
[52] http://sites.google.com/site/publisherinterfacestudy/full-report-pdf

"The typical use-case of a user interacting with a service provider and wishing to gain access to restricted content occurs along the following lines:

1. The user, using their web browser, connects to a service provider and requests to view restricted content.

2. The service provider receives this request. To ascertain whether this person should be granted or denied access, they need to know some information about that person. In the federated world, this means that the user needs to be sent to their home organisation's identity provider, which will "vouch" for that person and pass across information about them to the resource provider.

3. The service provider "discovers" which is the user's home institution

4. The service provider redirects the user to their home institution's identity provider.

5. The user authenticates at their identity provider, which responds to the service provider, letting them know that this user authenticated successfully, and often providing some information about that user.

6. The service provider receives this information, and then either grants or denies access based upon the information it received.

In the logic flow presented above, step 3 is the crux of the discovery problem - how does the service provider figure out which is the home institution/identity provider of the user?"

One 'solution' (more accurately a way to avoid the problem) is called 'IdP-initiated SSO' (Identity Provider inititated Single Sign On). This is where the institution will provide links to online resources in a way that the reader is first directed to the institutions 'identity provider' (i.e. authentication page).

An example of this is the following link to Ovid from the University of Cardiff web pages[53], a service provider for databases and other online content:

https://idp.cf.ac.uk/idp/profile/Shibboleth/SSO?providerId=https%3A%2F%2Fshibboleth.ovid.com/entity&target=cookie&shire=https%3A%2F%2Fshibboleth.ovid.com/Shibboleth.sso/SAML/POST

Rather than direct the reader directly to the Ovid website, it rather directs the user to a local authentication page, but includes within the URL information about the remote resource the reader wishes to access. In this way the user can authenticate in a straightforward manner, and then be redirected (without further intervention on their part) to their desired destination.

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[53] http://www.cardiff.ac.uk/insrv/eresources/databases/index.html#o

A similar approach can be taken with URL-rewriting Web proxies. In this case the reader is directed to a web proxy. At this point they will usually be prompted for an institutional login. An example of this is the following URL from the Open University library[54]:

http://libezproxy.open.ac.uk/login?url=http://www.oxfordartonline.com/subscriber/

As can be seen, once again information about the desired destination is passed within the URL that the reader follows, but in this case rather than be redirected to this URL, instead the Web Proxy (in this case http://libezproxy.open.ac.uk) will act as an intermediary for all further requests for pages from the resource (http://www.oxfordartonline.com/). It will appear to the service provider that the reader is requesting pages from within a registered IP range and so no further authentication is required.

As the Service Provider Interface Study notes, "this approach can be very effective", and where links to online resource are being provided from references within an institutionally controlled environment, some consideration should be given to taking advantage of this.

5.4   Workflows

Understanding and planning workflows for both staff and students is key to a successful integration of references into a learning environment. The "Citation Management Service Usage Model (SUM)"[55] (in draft at time of writing) describes the typical tasks and workflows that are required, so to avoid duplication these will only be summarized here.

5.4.1 Course creation

During course creation, lists of resources (and therefore references to those resources) will be collected. This may be by a wide variety of staff involved in the creation of courses, and there is likely to be a variety of practice across courses even within a single institution.

The basic tasks are as follows:
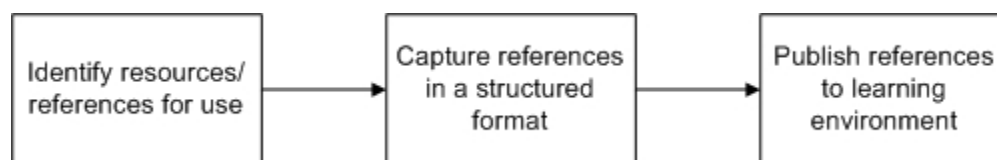
This is clearly a process that is part of the overall course planning and writing process. As well as happening during the creation/setup stage of a course, it is likely to be a continual process while the course is running, delivering a set of constantly updated resources to students.

This is the type of workflow that lies behind the Business Process called 'Add References' in the Citation Management SUM[56].

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[54] http://library.open.ac.uk/find/databases/index.cfm#O
[55] http://wikis.e-framework.org/community/wiki/CitationManagement
[56] http://wikis.e-framework.org/community/wiki/CitationManagement

5.4.2 Student

The possible student workflows are more varied and complex, as each student will have preferences as to how they manage their references. Based on the Citation Management SUM a number of common tasks will be:

- Students select the references they wish to keep
- Students import references to resources from external sources
- Students aggregate references from all sources available to them
- Students organise, comment on and share references
- Students create and store assignment-specific bibliographies in correct referencing style

A simple workflow might look like this:
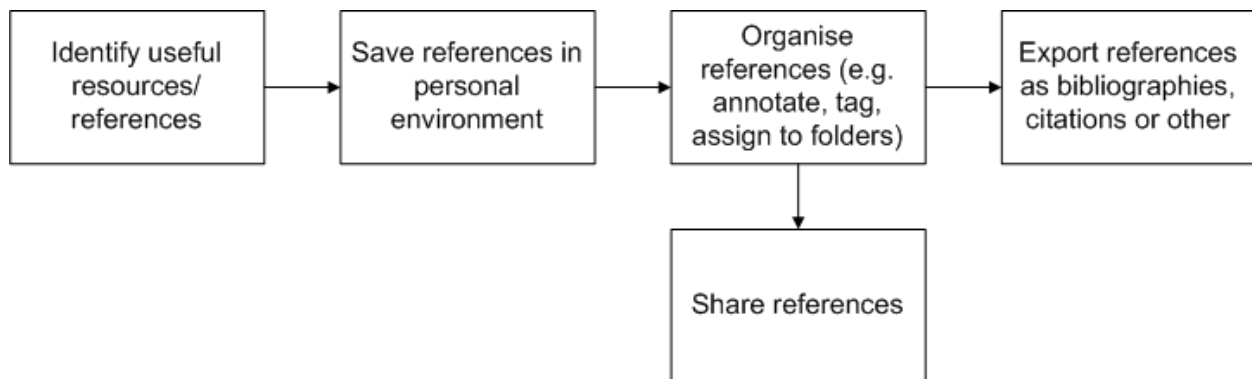
In practice any of these tasks might be repeated many times while the student was studying at an institution.

This is the type of workflow that lies behind the following Business Processes in the Citation Management SUM:

- Aggregate References
- Import/export References
- Create bibliography
- Manage bibliography
- Recommend resources

6 The Open University approach

6.1 Background

Adapted from the TELSTAR Project plan[57]:

> The Open University (OU) is the largest university in the UK, teaching around 178,000 people in 2006/07. The effective delivery of online activities at distance and at scale requires an institution wide and systematic solution.
>
> A key element of the OU e-Learning Strategy is the university-wide implementation of a suite of tools that form a technology enhanced learning (TEL) environment to be rolled out for use by all students, based on the Moodle open source platform. The TEL environment is known to students as their "course website".
>
> In terms of access to Library services, all students and staff may access a large number of online resources from a variety of collections made available through the library website and digital library service and/or via a reference to a library subscribed resource embedded in course materials and links in course websites.

6.2 Existing systems and processes

There are currently a number of different ways in which references are managed across the Open University's learning environment.

6.2.1 Course Production

The process of course production at the Open University is extremely complex, and involves a wide range of staff from across the institution. The course production process runs from assessing the market for types of course and planning the curriculum, through the writing and publication of course materials to the eventual 'presentation' (delivery) of the course to students.

Any course will be produced by a 'course team':

> "Each course is produced and supported by a team that includes a course team chair and a course manager (who leads on organisational, budgetary and support issues). Apart from the course content, they also produce the assessment material for each presentation and form the examination board."[58]

The course team will consist of academic and administrative staff, and may include some level of clerical support in the form of 'course team assistants'. The course teams work closely with staff from Learning and Teaching Solutions (LTS) the unit responsible for the production and delivery of Open University course material regardless of format. LTS is a large unit, supporting a wide range of activities with a wide

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[57] http://www.jisc.ac.uk/media/documents/programmes/institutionalinnovation/telstarprojectplan.doc
[58] http://www.open.ac.uk/tutors/induction/whos-who/course-team.php

variety of staff, including project managers, media developers and editors. LTS is also responsible for the Open University's VLE (Moodle) and other IT systems which support teaching and learning.

Library staff will also work with course teams to understand the requirements of the course, and to promote the relevant services that the library can supply to the course, both during production and presentation.

The Open University is perhaps unique as a UK HE institution in that the vast majority of its course materials are formally 'published', and go through formal 'publication' related workflows.

6.2.2 Structured Content

"Structured content is a customised Word authoring tool that enables OU academics and LTS to produce course materials for multiple outputs (web and print)."[59]

Essentially the Structured Content tool authors course content as XML, which can then be published in a variety of different formats including print and electronic. There are a variety of approaches to using the tool to author course material. Three examples are:

- academic staff use simple Word templates to author course material. These documents are then passed to staff in "Learning and Teaching Solutions" (LTS). LTS staff take the content of these Word documents and put them into Structured content
- academic staff are trained to use the structured content tool and use this to author material directly into structured content.
- academic staff use Word to author course material. Administrative staff in academic departments are trained to use the structured content tool and transfer content from simple Word documents into the structured content format. This is then passed to LTS for further amendment or corrections.

The structured content tool divides course material into sections, and each section can have 'References' and 'Further Reading' components. It is also common to insert 'in-text' citations in the text, and also to insert full references into some parts of the text, for example if there is a piece of reading a student is expected to carry out as part of a course activity.

6.2.3 Course website 'Resource page'

Each course website can have one or more 'Resource page'. The Resource page is a module for the Moodle VLE developed by the Open University[60]. The Resource page course enables the addition of links, files or text and can be used to list references or links to resources.

It is also possible to display the contents of an RSS feed in a Resource page.

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[59] http://intranet.open.ac.uk/lts/production/structured-content.shtml (not available outside the OU)
[60] http://moodle.org/mod/data/view.php?d=13&rid=1012&filter=1

Typically one or more Resource pages will be setup and populated by the course team when the course website is setup.

6.2.4 MyStuff

MyStuff is an e-portfolio system developed at the Open University, based on the Moodle VLE. MyStuff enables students to create, store, organise and share resources. MyStuff supports a number of different 'item' types including the following items which are related to references:

- Book (whole, printed)
- Book (electronic)
- Journal article (print)
- Journal article (electronic)
- Web page
- OU course material (generic printed)

Not all courses promote MyStuff to their students, although it is linked from the 'Student Home', a set of web pages aimed at all students which brings together a variety of information for students.

MyStuff is not under active development.

6.2.5 MyOpenLibrary

"MyOpenLibrary is a personal library page, which knows who you are, what you are studying and presents the relevant electronic library resources. These electronic library resources are selected from Open Library and include: e-journals, e-books, databases, reference materials and ROUTES links."[61]

MyOpenLibrary is based on the MyLibrary software developed at the University of Notre Dame[62]. MyOpenLibrary is used by approximately 80 courses at the Open University, who use it as a mechanism to deliver sets of resources to students including:

- Databases
- E-Books
- Websites
- E-journals
- Articles

MyOpenLibrary offers some personalisation functions to students including the ability to add 'personal links' and customise the layout and appearance of the page.

The possibility of setting up a MyOpenLibrary for a course is discussed by library staff and the course team while the course is being setup.

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[61] http://myopenlibrary.open.ac.uk/
[62] http://www.ala.org/ala/mgrps/divs/lita/ital/272008/2703sep/morgan_html.cfm

6.2.6 ROUTES

"ROUTES is a Library service providing access to selected quality-assessed Internet resources for Open University courses. Resources are selected by course teams and the Library's Information Specialists."[63]

ROUTES is used for four main purposes:

- Provide a catalogue of (freely available) websites used in Open University courses
- Indicate which websites are used in specific courses
- Provide 'persistent' links to websites which can be used in Open University course materials
- Provide a 'link checking' service to identify URLs that are temporarily or permanently broken

ROUTES is an implementation of the Index+ software from System Simulation[64]

In general students are not encouraged to access the ROUTES interface directly, but rather ROUTES is used as a source of links that can be accessed from a Course Website or MyOpenLibrary.

The possibility of using ROUTES for a course is discussed by library staff and the course team while the course is being setup.

6.2.7 RSS Tool

The RSS Tool is software developed at the Open University Library that enables the aggregation of resources from a variety of sources including:

- The library catalogue (Voyager)
- ROUTES
- MyOpenLibrary
- Any RSS feed

It is also possible to enter items manually including a title, description and link.

When you create an aggregation of resources with the RSS Tool, you can assign it to a course, or a section of a course, and this can then be used to populate a 'resource page' in the Course website.

The possibility of using the RSS Tool for a course is discussed by library staff and the course team while the course is being setup.

6.2.8 Use of 'references' in the OU Learning Environment

The overall picture is complex. This diagram shows how the various systems described above fit together in the current Open University environment. Much of the activity will be triggered by Course teams identifying a resource as necessary or useful for a course or module.

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[63] http://routes.open.ac.uk/
[64] http://www.ssl.co.uk/ixbin/indexplus?record=COM174

Note that not all systems or processes will be used within a single course or module.
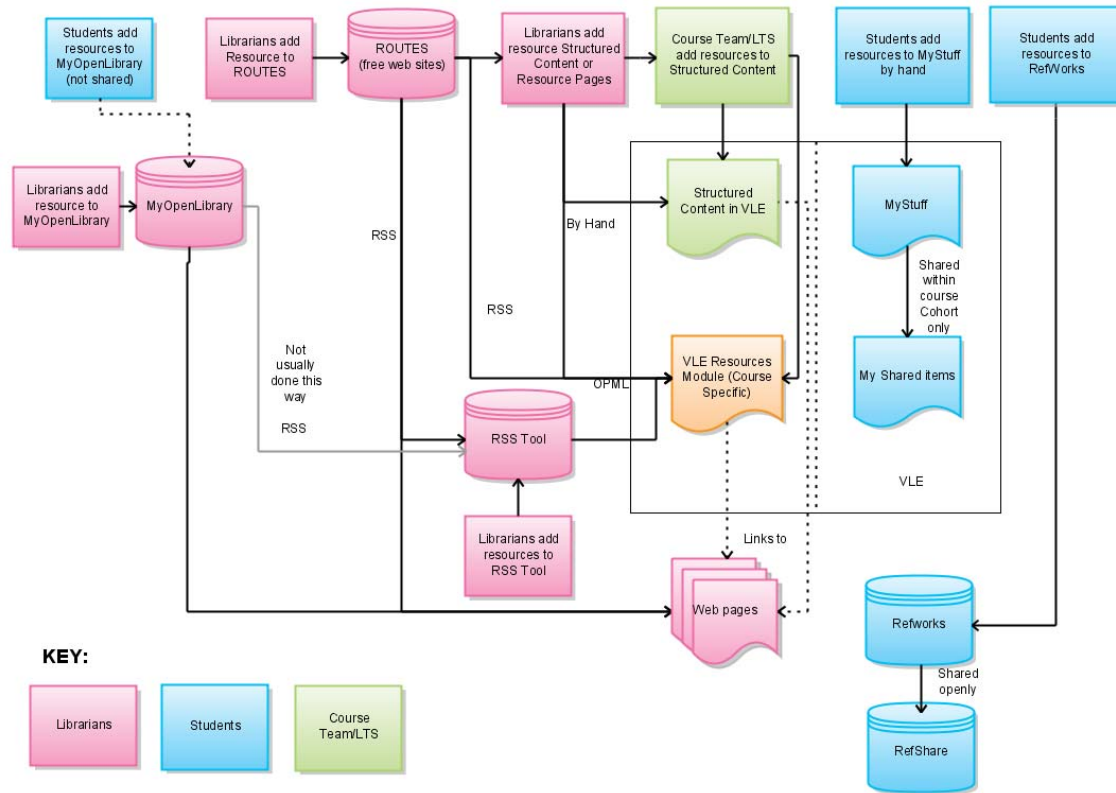
6.3   OU Business Case

A full business case was developed for a project to integrate Reference Management tools into the Open University's learning environment. Some key parts of the business case are shown here to illustrate the reasons for going ahead with the project.

The OU Business case was built around many of the issues outlined in Section 3 and Section 4 of the toolkit. It started by stating:

"There is a real need for students, course and programme teams to be able to create, manipulate, manage, organise and store a range of citations and bibliographic references in required discipline specific styles and formats within our current OUVLE tools. It is particularly important to support increasing numbers of students who are studying on courses requiring production of larger assignments and projects, including work-based learners."

Further extracts from the OU Business Case are available in Appendix A.

6.4 OU Stakeholders and Requirements

6.4.1 Stakeholders

The Stakeholders for these user requirements are:

- Course teams (authors, administrators and clerical staff)

- Editorial staff

- Librarians

- Students

6.4.2 Common tasks

Course teams:

- Add a new reference to a piece of structured content

- Add new references to a Resource page on the Course website

- Create an RSS feed of references and add this to a Resource page on the Course website

- Add a new reference to an existing RSS feed of references

- Request 'persistent' URLs for resources from the library

Editors:

- Manually adjust the display format of a reference in structured content

- Check that links from References to online resources work

- Request 'persistent' URLs for resources from the library

- Correct incorrect links from References to online resources

Librarians:

- Add a new reference to a Resource page on the Course website

- Create an RSS feed of references and add this to a Resource page on the Course website

- Add a new reference to an existing RSS feed of references

- Check links from References to online resources work

- Correct incorrect links from References to online resources

- Supply 'persistent' URLs for resources to Course teams and Editors

Students:

- Follow a link from a reference on the Course Website to a resource

- Add reference to their personal environment, from the Course Website and other sources

- Organize references by a variety of criteria

- Bookmark useful resources found online (via the Course Website or through other routes)

- Add references or citations to assessed pieces of work

- Create a bibliography for assessed pieces of work

6.4.3 Methodology

The requirements listed here were compiled through a number of routes:

- Interviews with individual stakeholders

- Focus groups with stakeholders, specifically library staff and students

- Usage statistics from existing systems that provide relevant functionality

- Anecdotal feedback provided to the library over time

6.4.4 Functional Requirements

1. References within Structured Content

Number	Requirement	Mandatory (M)/Desirable (D)/Future Enhancement (E)
1.1	It should be possible to enter new reference details via a simple form	M
1.2	It should be possible to capture new reference details by supplying minimal metadata such as a DOI or ISBN	D
1.3	It should be possible to format the references within SC (Structured Content) to follow the OU Style Guide specification for references	M
1.4	It should be possible to format the references within SC (Structured Content) in a variety of other citation/referencing styles	D

1.5	It should be possible to manually adjust the reference text as displayed (i.e. the style) while maintaining the link to structured reference data	M
1.6	It should be possible to indicate if reading/viewing a resource is required or optional	D
1.7	Links to online versions of printed references should be created automatically where possible	M
1.8	It should be possible to manually insert a link into a reference and use this in preference to the automatically created link	M
1.9	It should be possible to suppress the display of a link from a reference to an online resource	D
1.10	Any links to online versions of resources should be persistent over time	M
1.11	Any links to online versions of resources should be accompanied by a full reference to the resource (in the style agreed for the course)	M
1.12	Students should be able to export all references, or a subset of references, to their ePortfolio	M
1.13	Students should be able to export all references, or a subset of references, to other formats of their choice	D
1.14	It should be possible to check all links to online resources from structured content are valid, preferably by some automated process	M

2. References to Resources on Course Websites (excluding structured content)

Number	Requirement	Mandatory/Desirable
2.1	It should be possible to enter new reference details via a simple form	M
2.2	It should be possible to capture new reference details by supplying minimal metadata such as a DOI or ISBN	D
2.3	Links to online versions of printed references should be created	M

	automatically where possible	
2.4	It should be possible to manually insert a link into a reference and use this in preference to the automatically created link	M
2.5	It should be possible to suppress the display of a link from a reference to an online resource	D
2.6	Any links to online versions of resources should be persistent over time	M
2.7	Any links to online versions of resources should be accompanied by a full reference to the resource (in the style agreed for the course)	M
2.8	It should be possible to link references to the relevant courses	M
2.9	It should be possible to display all the references linked to a specific course, within the relevant course context	M
2.10	It should be possible set the order in which references appear when displayed within a course context	M
2.11	It should be possible to group references under different headings when displayed within a course context	M
2.12	It should be possible for a student to export a subset of, or all, references to their ePortfolio	M
2.13	Students should be able to export all references, or a subset of references, to their ePortfolio	M
2.14	Students should be able to export all references, or a subset of references, to other formats of their choice	D
2.15	It should be possible to manually adjust the reference text as displayed (i.e. the style) while maintaining the link to structured reference data	M
2.16	It should be possible to check all links to online resources from resource pages are valid, preferably by some automated process	M

3. References in ePortfolios

Number	Requirement	Mandatory/Desirable
3.1	It should be possible to enter new reference details via a simple form	M
3.2	It should be possible to capture new reference details by supplying minimal metadata such as a DOI or ISBN	D
3.3	It should be possible to capture reference details from Resource pages on Course Websites	M
3.4	It should be possible to capture reference details from Structured Content on Course Websites	M
3.5	It should be possible to edit references previously added to the ePortfolio	M
3.6	It should be possible to organize references into groups (e.g. by tagging or organization into folders)	M
3.7	It should be possible to add references to existing organizational groups	M
3.8	It should be possible to remove references from existing organizational groups	M
3.9	Where a link is automatically generated to an online version of the resources that is not available to the student, they should be directed to a page explaining the problem and offering further support.	D
3.10	It should be possible to create a list of references from the ePortfolio in a variety of citation/referencing styles	M
3.11	It should be possible to export a set of references from an ePortfolio to an appropriately styled bibliography in a Word compatible file format	D
3.12	It should be possible to export a set of references from an ePortfolio to a file that could be imported into other bibliographic management systems	M
3.13	It should be possible add comments to a reference within an ePortfolio	M

3.14	It should be possible to share a reference from an ePortfolio with other students	M
3.15	It should be possible to add comments to shared references	D
3.16	It should be possible to automatically import references relevant to the student's current course registrations	E
3.17	It should be possible to add files as attachments (e.g. PDFs) to references	E
3.18	It should be possible to see local library service options for references that are not available online. E.g. Option to see if a local public or University library has a copy of the resource	E

6.5 RefWorks

The Open University formally supports two referencing tools for its staff and students, EndNote and RefWorks.

A decision was taken early in the OU integration project to work with RefWorks-COS to use the RefWorks software to deliver the desired Reference Management tools into the OU Learning environment. The key reasons for choosing to work with RefWorks were:

- It is web-based software
- It is the Reference Management tool promoted to Open University students

Initially there was no API available to the RefWorks software, which limited some of the early choices made in terms of the integration. However, at later stages of the project, an API was made available which allowed different approaches to the integration in some areas.

The three areas of integration identified through the user requirements (integration with Structured Content, integration with course resource pages, integration with ePortfolios) were considered separately.

6.5.1 Scalability of RefWorks

RefWorks-COS provided the following information relating to scalability of their services:

Number of references currently hosted: c. 110 million

Number of attachments currently hosted: >250,000

Monthly user sessions: between 350,000 and 900,000

The average individual user accounts over the top 20 universities using RefWorks is more than 16,000

RefWorks is setup in such a way that it is a relatively easy process to add servers to handle the required level of usage.

Further confidential information was provided to the Open University by RefWorks.

Based on this information it was agreed that RefWorks would scale to meet the needs of the Open University integration project.

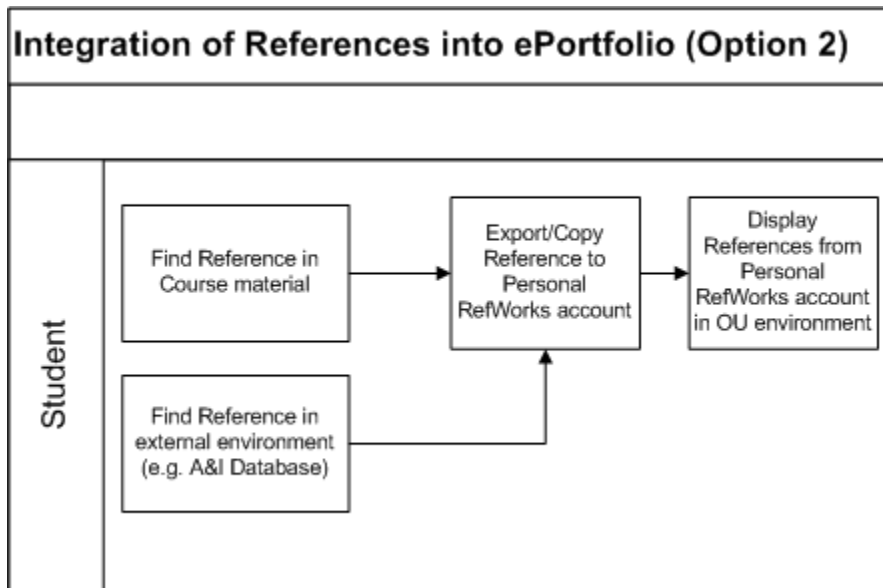## 6.6 Integration of References into the student ePortfolio environment

6.6.1 Options

Three options for integrating references into the Course Website were considered. The decision as to which option to select was greatly influenced by the decision by the Open University to cease development of the MyStuff ePortfolio environment.

Option 1
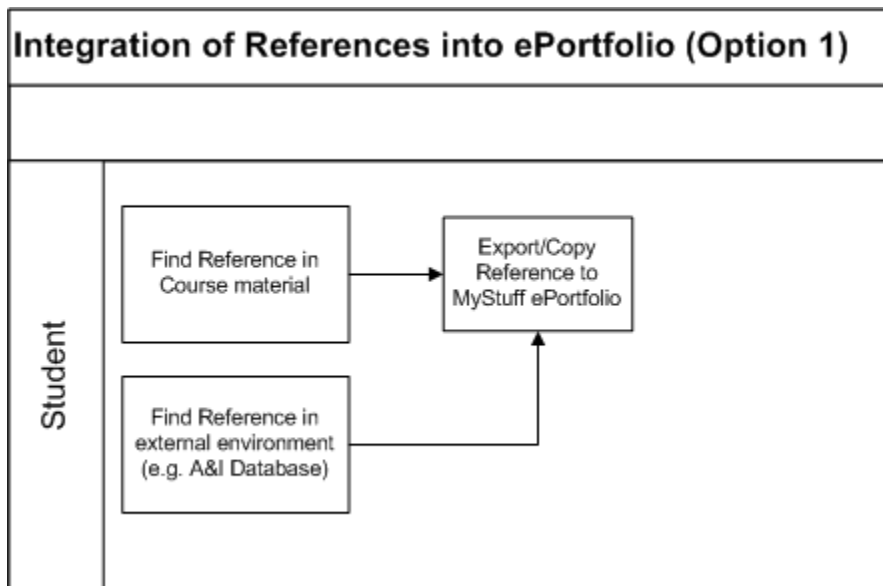
This option makes use of the existing MyStuff ePortfolio solution in use at the Open University. MyStuff already has limited support for storing resource metadata, and includes functions such as annotation and sharing. A large number of students are already using the MyStuff ePortfolio solution.

Option 2

Integration of References into ePortfolio (Option 2)

Student	Find Reference in Course material → Export/Copy Reference to Personal RefWorks account → Display References from Personal RefWorks account in OU environment
	Find Reference in external environment (e.g. A&I Database) →

This option envisages using a student's existing RefWorks account (available to all students studying with the Open University) to store references, but developing additional tools to enable this account to be viewed from within the OU online environment. This would require an API for RefWorks to be available.

Option 3

Integration of References into ePortfolio (Option 3)

Student	Find Reference in Course material → Export/Copy Reference to Personal RefWorks account → Display References from Personal RefWorks account via a 'Widget'
	Find Reference in external environment (e.g. A&I Database) →
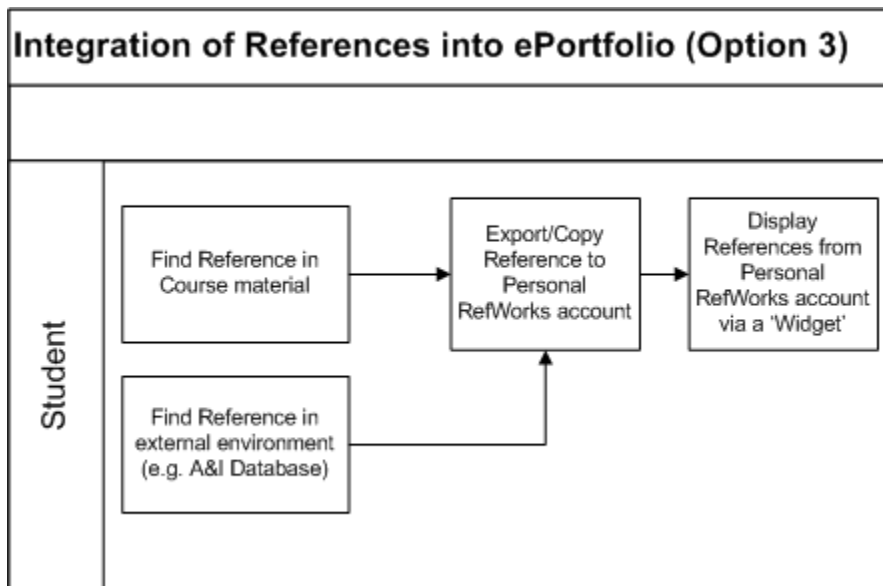
As with option 2, this option also envisages using a student's existing RefWorks account to store references, but rather than integrating this directly with the OU online environment, it uses a 'Widget' approach to enable interaction with references in the RefWorks account in any Widget compatible environment. This would require an API for RefWorks to be available.

6.6.2 Decision

Initially Option 1 was seen as the most favourable option, delivering new functionality to students in a familiar environment and making use of existing ePortfolio functionality already available in MyStuff. However during the project, a decision was made by the OU to cease development of the MyStuff ePortfolio product. Fortunately this decision was in plenty of time to enable a reappraisal of the available options.

As Option 3 does not integrate references directly into a Course Website, but rather in an independent 'Widget' (using the W3C terminology[65]) this opens up the possibility of embedding the Widget in a variety of environments. However, running a Widget would require an investment in other infrastructure, such as the Apache Wookie Widget engine, which was not possible within the timescales of the project. Using the Widget approach also raises questions about how to display the appropriate references within a specific course context.

This left **Option 2** as the only viable option, and the one implemented within the project. Option 2 has the advantage of integrating with existing RefWorks functionality, and the adoption of Option 2 does not militate against further work on Option 3 in the future should this become desirable. Option 2 requires an API for RefWorks to be available.

6.6.3 Solution

The solution developed to integrate references into the student ePortfolio environment was an interface to RefWorks from within the course website environment. In this way, the reference management tools and stored references sit alongside both the course material, and the students' ePortfolio.

The solution took the form of a new Moodle module called 'MyReferences'. This used the RefWorks API to provide the basic functionality required by students including:

- Creating and Importing references (including automatic reference creation based on DOIs (Digital Object Identifiers) and ISBNs)

- Organising references into folders

- Exporting references

- Creating bibliographies

MyReferences was deliberately designed to provide only a subset of the full RefWorks functionality, but because MyReferences uses an individual's personal RefWorks account to store and organize references, students can switch to using RefWorks directly if they want to use the more advanced functionality provided by that software. Once within RefWorks they will have access to exactly the same references and folders.

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[65] http://www.w3.org/TR/widgets/

As well as providing cut-down functionality, MyReferences also delivers only a very few referencing styles when creating a bibliography. These are the most commonly used styles required for use in student work across the institution, including a style based on the Open University in-house 'Harvard' style. The 'Create Bibliography' function allows the student to select references (or folders of references) and shows both the in-text citation styles for each reference, and a bibliography containing all the references in the requested style.

Within MyReferences, whenever possible links are added to references to automatically link to online versions of the resource being referenced. The mechanism used to create these links is described in more detail in [Section 6.8.3](#).

As well as offering Export options to both RefWorksXML[66] and RIS[67] file formats, MyReferences also offers the ability to export to a Moodle 'Collaborative Activity'. Rather than creating a file to download, the 'Collaborative Activity' export displays the references in an encoded XML format which can be cut and pasted into a collaborative activity within Moodle, e.g. a blog post, a wiki page or a forum contribution. When the collaborative activity is read by another student, a newly developed Moodle 'filter'[68] will recognize the presence of a reference in this format, display the reference information in an orderly way, and add export options and links to the reference to allow readers to take a copy of the reference or link to the online resource (where possible).

The MyReferences interface is illustrated here:

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[66] A RefWorks specific XML format
[67] http://en.wikipedia.org/wiki/RIS_(file_format)
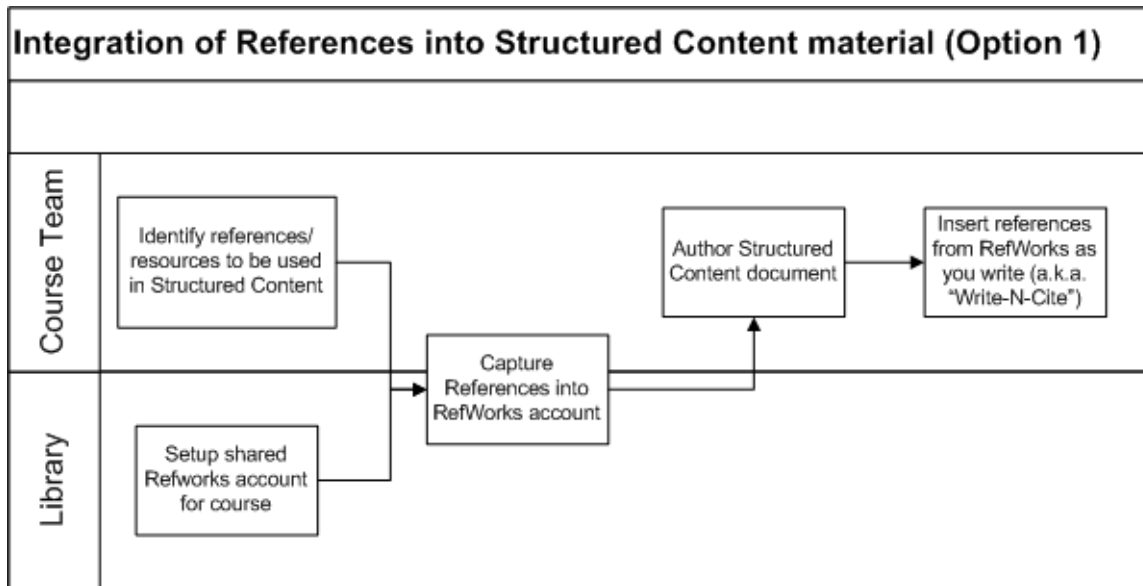[68] http://docs.moodle.org/en/Filters

6.7 Integration of References into Course material

6.7.1 Integration of References into Structured Content material

6.7.1.1 Options

Three options for integrating references into the Structured Content tool and work process were considered.

Option 1

Integration of References into Structured Content material (Option 1)

This option envisages that while writing course material an author could insert a citation or reference at any point using any reference already stored in their RefWorks account. This is essentially the model for the RefWorks Write-N-Cite functionality[69].

Option 2

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[69] http://www.refworks.com/refworks/help/Using_Write-N-Cite.htm
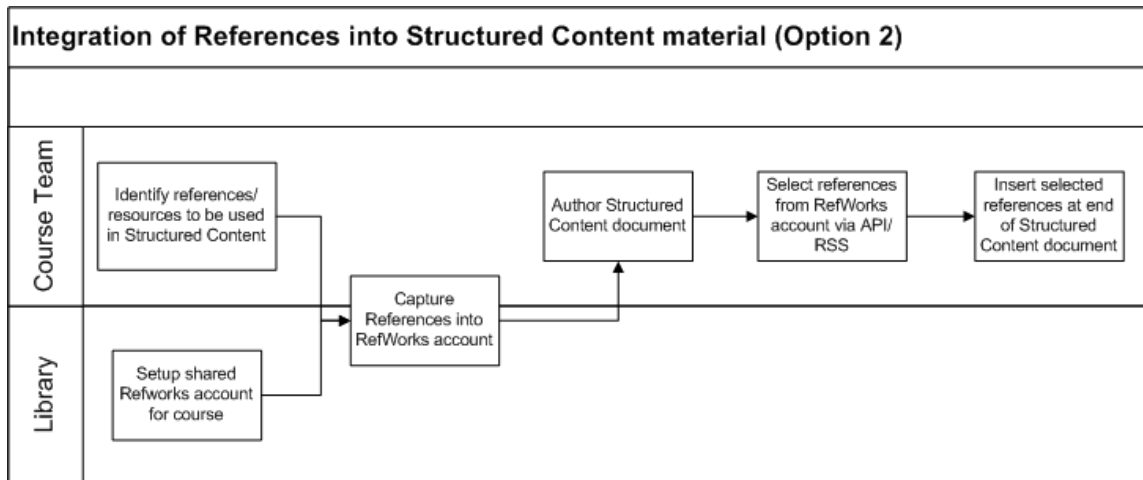
This option envisages that references could be selected directly from a RefWorks account, either using an API, RSS feed or similar. The selected references would be inserted as a block at the end of a structured content document in the form of a bibliography.

Option 3
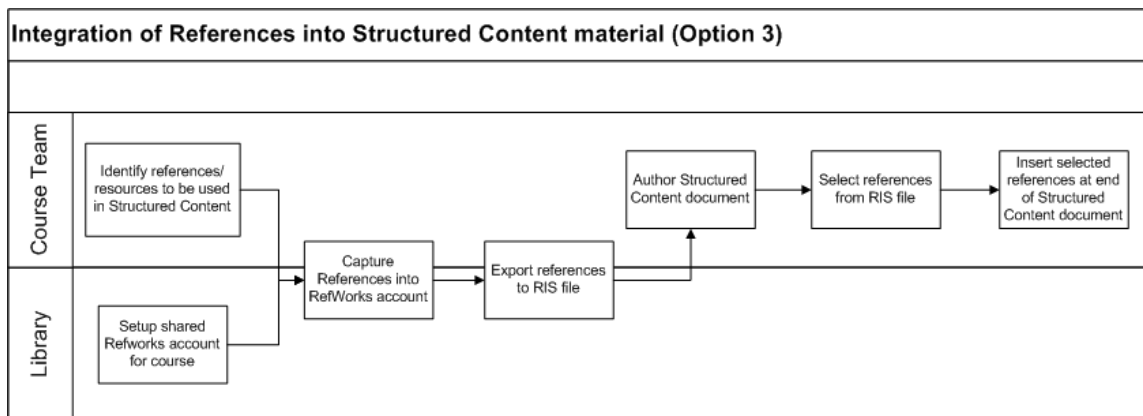
This option envisages that references could be selected directly from a RIS file[70], which would have been created using the Export option[71]. The selected references would be inserted as a block at the end of a structured content document in the form of a bibliography.

6.7.1.2 Discussion

Option 1 would provide the most seamless integration, and allow for the correct styling of in-text citations as well as references. It would also reflect the existing "Write-N-Cite" functionality provided by

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[70] http://en.wikipedia.org/wiki/RIS_(file_format)
[71] http://www.refworks.com/RWSingle/help/Exporting_or_Backing_Up_a_Database.htm

RefWorks. However, investigation of the Write-N-Cite tool showed that this didn't write enough data into the document (id, etc). RefWorks also recommended against using it in conjunction with xml based Word documents which are used by the Open University in the creation of course material.

The amount of development required to create an equivalent tool that would integrate into the Open University authoring environment was seen as too great to be possible within the resource and timescale of the project.

Option 2 and Option 3 are quite similar. Option 2 eliminates the need for the additional step of exporting a set of references from RefWorks into a RIS file.

Option 3 provides a static set of references which can transported alongside the course content document throughout the production process, and can be archived with the course if necessary. Option 3 most closely reflects the current process for inserting external content into Structured Content material (e.g. pictures)

Option 3 also ensures that once course material has been quality assured by the editorial process there are no further changes.
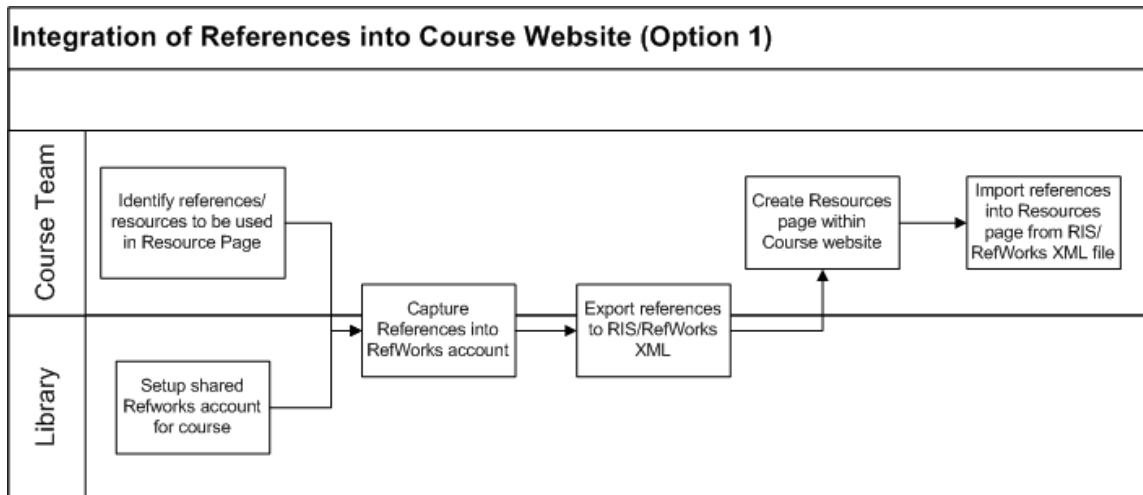
6.7.1.3 Decision

Following the recommendation of the Structured Content team at the Open University, **Option 3** was chosen as the workflow to be implemented by the project.

6.7.2 Integration of References into Course Websites

6.7.2.1 Options

Three options for integrating references into the Course Website were considered.
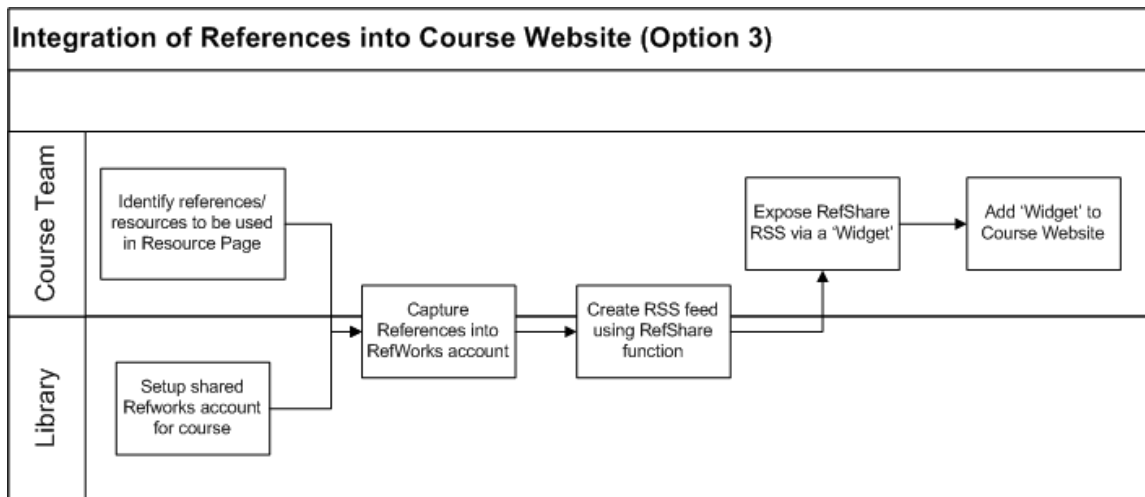
Option 1

Integration of References into Course Website (Option 1)

Course Team:
- Identify references/ resources to be used in Resource Page
- Create Resources page within Course website
- Import references into Resources page from RIS/ RefWorks XML file

Library:
- Setup shared Refworks account for course
- Capture References into RefWorks account
- Export references to RIS/RefWorks XML

This option uses an export file created from a RefWorks account. The references from this file are imported into a Resource page within a Course Website using the Resource Page Moodle Module developed at the Open University.

Option 2
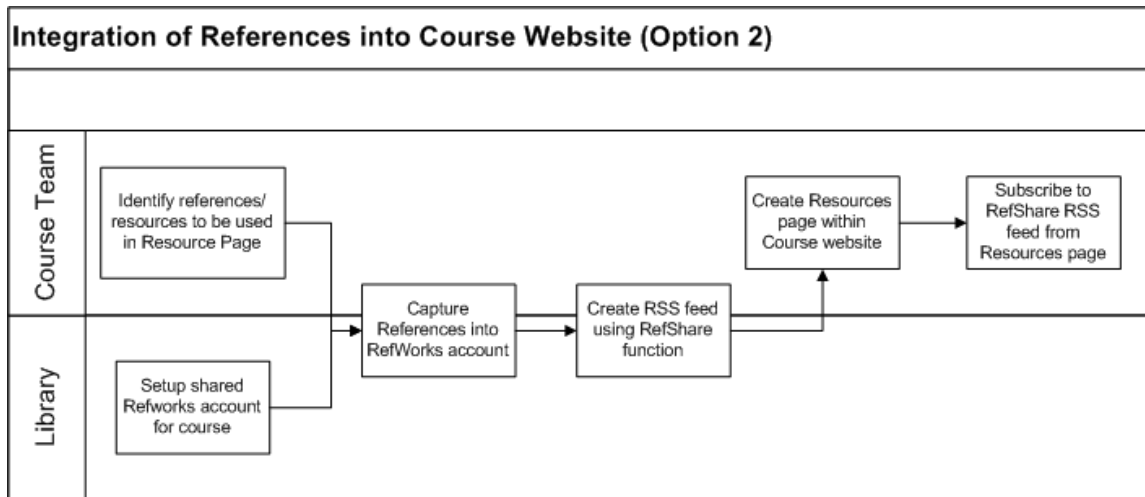
This option allows references to be dynamically displayed in a Course Website Resource page by using RefShare RSS feeds (RefShare is a piece of RefWorks functionality that enables the public sharing of a folder within a RefWorks account).

Option 3

This option makes use of the RefShare RSS feeds, but rather than feeding the contents of the RSS feed directly into the Course Website, the RSS feeds are consumed by an independent 'widget', which is then embedded into the Course Website.

6.7.2.2 Discussion

As Option 3 does not integrate references directly into a Course Website, but rather in an independent 'Widget' (using the W3C terminology[72]) this opens up the possibility of embedding the Widget in a

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[72] http://www.w3.org/TR/widgets/

variety of environments. However, running a Widget would require an investment in other infrastructure, such as the Apache Wookie Widget engine. Using the Widget approach also raises questions about how to display the appropriate references within a specific course context.

Option 1 and Option 2 are very similar in terms of functionality for students using a course website. However they do have different strengths in terms of course authoring. Option 1 provides a stable set of references which are not subject to external change once they have been imported into the course website. As each reference is imported as a separate 'resource' within a resource page it also means that once imported a course author or editor can reorder the references as they like.

Option 2 gives a more dynamic set of references, which can be updated as necessary (adding, removing or editing references) by updating the list of references in the RefWorks account. While this dynamic element may often be welcome, it also leads to questions on how to Quality Assure all changes that are made to the material while students are taking the course. The way that the Course Website Resources pages handle RSS feeds also means that the feed is treated as a single resource entry – meaning that references cannot be reordered manually (by default they are sorted alphabetically by title).

6.7.2.3 Decision

In order to support different approaches to the use of Course Resource pages, both **Option 1** and **Option 2** will be implemented as workflows by the project team.

6.7.3 RefWorks Account structure

6.7.3.1 Assumptions

- There is a requirement for multiple users to manage course related references for a single course
- References will be exported to a RIS file before being incorporated into structured content.
- References will also be exposed via RefShare to allow updates and additions to references during the presentation of a course within the course 'Resources' page within the VLE
- References can also be imported into the course from RIS or RefWorks XML files, but for simplicity this route is omitted from the models
- There will be an overlap between those references incorporated in structured content and those included in the Resources page, and that it is desirable for these to be managed in a similar way

6.7.3.2 Limitations

RefWorks does not support any graduated security model. There is a single username/password for an account, and anyone with this username/password has full permissions within the account. In order to have multiple users contributing to and managing references within the account, they have to share this single username/password.

6.7.3.3Model 1 – Single RefWorks database, multiple users
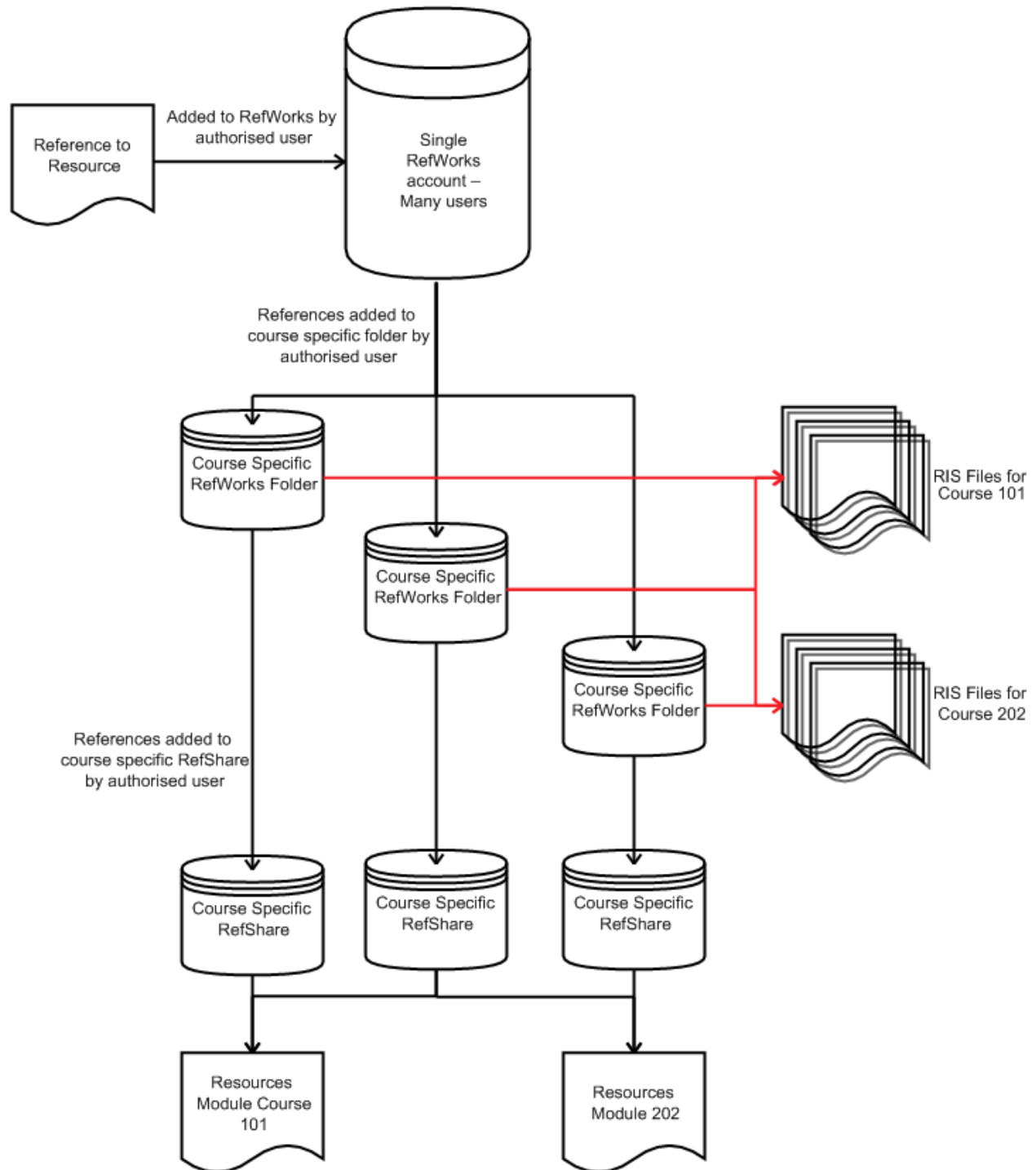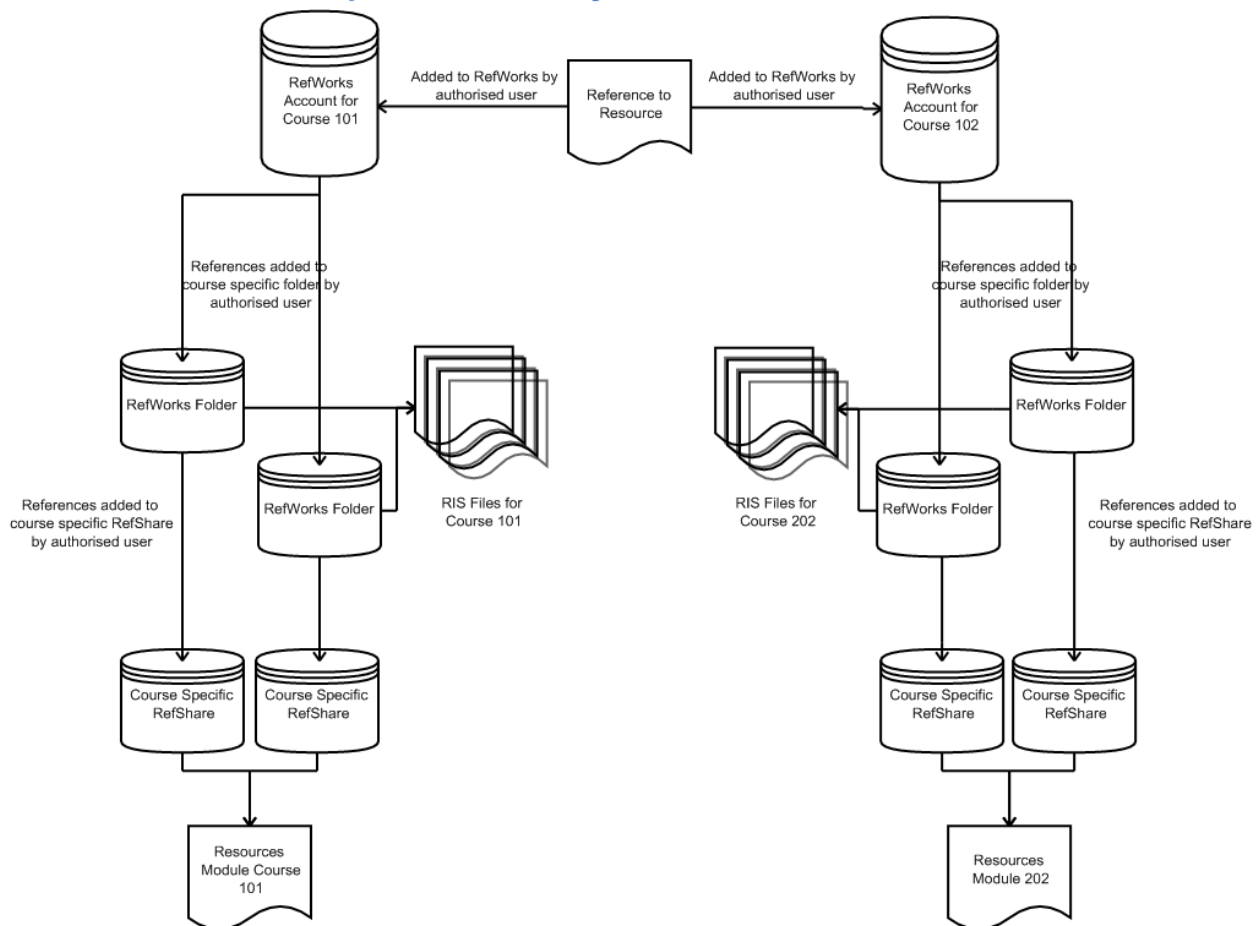

Advantages

- A single Reference record can be used across multiple courses, and when details of the Reference need amending, this could be done in a single place
- Single RefWorks account to create and administer

Issues

- If access to the single RefWorks database were to be given to all possible contributors (i.e. every member of each course team) then potentially hundreds (thousands?) of users sharing a single username and password and the ability to update all records (whether used in their course or not), and the risk of errors being made is large.
- If access to the single RefWorks database is restricted to a smaller, core, team (e.g. Learning and Teaching Librarians) the work required to keep this up to date falls on a small number of people, and course teams do not have direct access

6.7.3.4 Model 2 – One RefWorks database per course
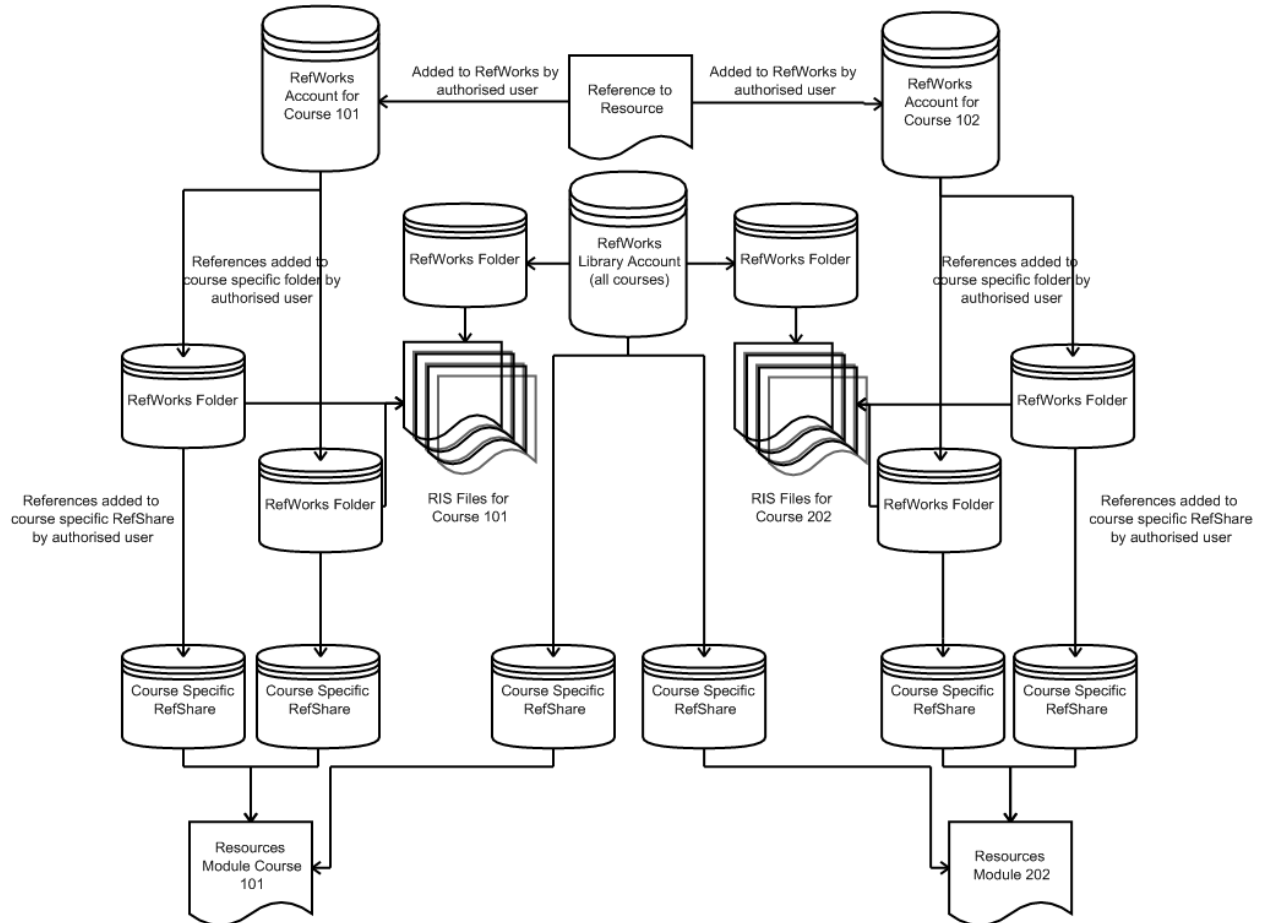

Advantages

- Only small numbers of people need access to any particular RefWorks database
- Course teams could have direct access

Disadvantages

- Multiple copies of each Reference need to be maintained. For References used on many courses this could lead to a very large overhead (if the details of the reference were to change)

- Hundreds of RefWorks databases to manage (account creation and of user names and passwords, account deletion)

6.7.3.5 Model 3 – One RefWorks database per course plus a Library database for common resources

Advantages

- Resources common across multiple courses are managed in a single place (the RefWorks Library Account)
- Only small numbers of people need access to any particular RefWorks database
- Course teams could have direct access

Disadvantages

- Hundreds of RefWorks databases to manage (account creation and of user names and passwords, account deletion)
- Library Resources continue to be seen as separate to Course specific resources
- Still potential for References to be duplicated across courses, and so lack of central management – except for those in the RefWorks Library account

6.7.3.6 Other Models

While models 2 and 3 assume one RefWorks database for each course, it would be possible to group courses together and so reduce the number of RefWorks databases that need managing (e.g. have a RefWorks database that manages references a small group of courses, or all courses within a specific subject area). Taking this approach could mean striking a balance between the advantages and disadvantages of the models outlined above. An example could be that a single RefWorks could be used for all courses across a faculty, and this central account could be managed on behalf of the faculty by the library.

6.7.3.7 Discussion

Essentially the lack of a granular permissions model in RefWorks forces a choice between the ability to distribute responsibility for building course reference lists and the ease with which the references can be managed.

Model 1 would only work if you assigned a small team to the job of managing the database, Quality Assuring the references, and building reference lists for courses (although obviously what went on those lists would be informed by the Course Teams).

Model 2 is more practical, as working at a course level would mean only a small number of people working in the same RefWorks at any time. Model 2 does not have the benefit of sharing common references across multiple courses, however interviews with course authors and library staff suggest that the majority of resources are not repeated over multiple courses, except perhaps very general resources.

Model 3 is a variation on Model 2 to allow for those resources which are repeated over multiple courses to be managed more efficiently. However, it creates a split between the 'Library' references, and the 'Course' references which is not necessarily desirable.

It should be noted that there are further variations around these models that could be adopted where seen as practical. For example a RefWorks account for a programme or faculty; or having multiple accounts per course.

6.7.3.8 Recommendations

1. Courses should adopt a model that best fits their requirements.
2. The best compromise that will suit the majority of courses is Model 2 with a RefWorks account dedicated to a course.
3. Variations on Model 2 which user a single RefWorks database for a faculty or programme may be appropriate where a small central team can be identified to manage all the references (e.g. library staff)
4. Central lists of resources could be created by the library that could be easily added to a course specific account.
5. Future work should investigate the possibility of enabling Model 1 by enabling a more sophisticated security model over RefWorks or alternative central databases.

6.7.4 RefWorks folder structure prototype

RefWorks supports 'folders' to help organise sets of references. One reference can belong to more than one folder. Folders in RefWorks are not hierarchical, so in this sense the concept of a 'folder' in RefWorks is similar to a 'tag' in other systems such as the online bookmarking service Delicious[73].

You can create RefShare RSS feeds and export references on a folder-by-folder basis.

6.7.4.1 Prototype folder structure for A815

A815 is the MA English course.

A815 study materials are divided into seven 'blocks'. Each block (with a single exception) has a 'Reading Guide' and accompanying set of readings. Some blocks have some additional readings as well. To make it easy to manage these references, the following folder structure in RefWorks was created:

Once the relevant references had been added to the RefWorks account and allocated to the appropriate folders, an export file in RefWorksXML format was created from each folder.

Within the course website (Moodle) a number of Resource pages were created, and the references were imported from the RefWorksXML files.

The resulting resource pages looked as follows:

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[73] http://delicious.com

Brathwaite, K. "A Post-Cautionary Tale of the Helen of Our Wars ", *Wasafiri*, vol. 11, no. 22, pp. 69. ☐

in *Wasafiri* No. 22 (1995), pp. 69-78. Click on the 'View Article (PDF)' link to read the full text.

Hulme, P. "The Place of Wide Sargasso Sea ", *Wasafiri*, , no. 20, pp. 5. ☐

in *Wasafiri* No. 20 (1994), pp. 5-11. Click on the 'View Article (PDF)' link to read the full text.

Hulme, P. "A Response to Kamau Brathwaite ", *Wasafiri*, vol. 11, no. 23, pp. 49. ☐

in *Wasafiri* No. 23 (1996), pp. 49-50. Click on the 'View Article (PDF)' link to read the full text.

Meyer, S.L. 1990, "Colonialism and the figurative strategy of Jane Eyre ", *Victorian Studies*, vol. 33, no. 2, pp. 247. ☐

Savory, E. "The Helen of our wars: cultural politics and Jean Rhys criticism " in *Jean Rhys* , pp. 196-225. ☐

To find this chapter type the start page number (196) in the 'Go to page' search box in the navigation bar across the top of the ebook page, and press the Enter/Return key on your keyboard.

Spivak, G. "Three Women's Texts and a Critique of Imperialism ", *Critical Injury*, vol. 12, no. 1, pp. 243-261. ☐

Click on the 'PDF' link to read the full text or scroll down and use the arrows to navigate through this article.

Cambridge Collections Online : Welcome [online], http://cco.cambridge.org.libezproxy.open.ac.uk/uid=1060/private_home [29 September 2009]. ☐

Subscribed web resource (webpage)

References: [Select all] [De-select all] [Export selected]

6.7.4.2 Recommendations

1. Each course is different, there is no single way of organising references that will suit every course.
2. Courses should use a folder structure that reflects the structure of the course material to allow sets of references to be exported or shared for a particular block or unit.

6.7.5 Solution

The solution developed to integrate references into course material was to provide a variety of mechanisms to carry out the tasks as described in the basic workflow for including references in course material (in Section 6.4.2 of the Toolkit). This workflow is:
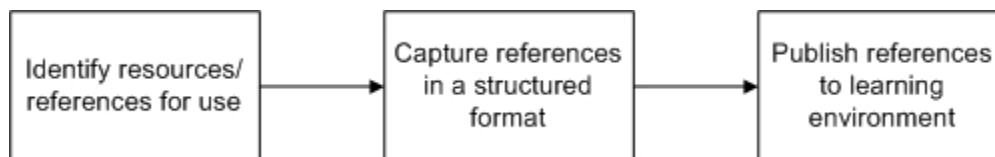
To support a flexible approach to this, the project developed a series of tools to enable staff to carry out these tasks.

Having developed the MyReferences module for students to manage references, this seemed the obvious place for staff to capture references in a structured format. However, two additional functions were required to make MyReferences suitable for use in collecting and publishing references:

- Ability to create shared RefWorks accounts, and give permission to other users to access them to add and edit references

- Ability to publish folders 'publicly' as an RSS feed (using the RefShare functionality provided by RefWorks)

Given these tools course teams or other staff can create a 'shared account' which can be used by all members of the team to collect references and organize them into folders.

References can be entered by hand, imported from other sources, or added using the ability to automatically create references from DOIs (Digital Object Identifiers) or ISBNs.

Once references have been collected and organized into folders, they can either be published as an RSS feed, or exported in either RefWorksXML[74] or RIS file format[75].

There are then three options available for including the references in a course website:

- In a Structured Content (SC) document a new function has been added to allow an author to browse for a RefWorksXML (or RIS) file, and select references to insert into the SC document with the appropriate referencing style applied. The SC document, including references, can then be published to the course website

- Import a RefWorksXML (or RIS) file into a course 'resources page'. The Moodle Resource Page module has been developed to display the reference using an appropriate referencing style

- Add a published RefShare RSS feed to a course 'resources page'. The Moodle Resource Page module has been developed to recognize RefShare RSS feeds and display the references in the feed using an appropriate referencing style

Whichever route is used to include the references in the course website, a number of functions are added to the references when they are displayed in the course website. These are:

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[74] A RefWorks specific XML format
[75] http://en.wikipedia.org/wiki/RIS_(file_format)

- Export options (directly to a MyReferences account, in a variety of file formats, or for inclusion in a 'Collaborative Activity' as described in Section 6.6.3)

- Automatic creation of links to an electronic copy of the resource being referenced whenever possible. This is described in more detail in Section 6.8.3. These links are checked before the course is made public to ensure they link successfully to the appropriate resource

- From the MyReferences tool staff (not students) can run a 'Check Links' report, which works specifically with the SFX OpenURL resolver. This checks that each link created resolves successfully – i.e. to a working webpage. N.B. it does not guarantee the content on the webpage is the correct content

- From the MyReferences tool staff (not students) can preview how references will look when published via the different routes outlined above

A basic workflow, mapped to the generic workflow above is:
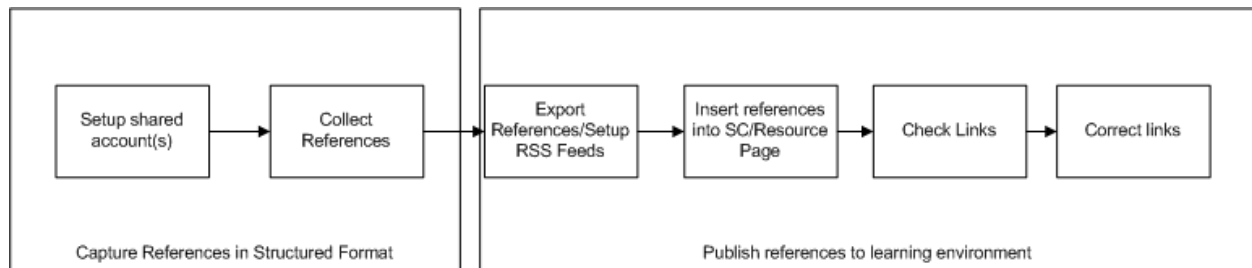
6.8   Providing Links to Resources from References

6.8.1 A note on Referencing vs. Accessing

It is important to differentiate between Reference and Access (although sometimes these overlap). To Reference something is not always to provide a route of Access, but in many cases it is desirable (or necessary) to do both. This particularly applies to referencing Web pages, where it would be normal practice to include a URL for the web page within the reference.

This is particularly important as references are moved between different environments – the link that the OU provides with a reference within the VLE is likely to be a route of access, as opposed to the authoritative link for the reference. As an example if referencing the BBC homepage you would expect a reference to be something like:

BBC (14th August 2009) *BBC*, Available from http://www.bbc.co.uk/ (Accessed August 2009)

However, current good practice would lead the course team to request a persistent URL for the resource from the library. Using ROUTES to provide a persistent link would result in the reference being transformed to:

BBC (14th August 2009) *BBC*, Available from
http://routes.open.ac.uk/ixbin/hixclient.exe?_IXDB_=routes&_IXSPFX_=g&submit-button=summary&%24+with+res_id+is+res9377 (Accessed August 2009)

This latter reference only makes sense within the context of the OU, and even then the former is the preferable form for a reference.

6.8.2 Current Linking strategy at the Open University

The approach taken to linking varies depending on the type of resource being linked to. Links are provided to 'full-text' resources only - that is, links to the full content of the resource, not to surrogates (e.g. a record for the resource in a library system) or summaries (e.g. abstracts, tables of contents)

The descriptions below all assume the OU have access to the required resource. If this was not the case, this would be fed back to the course team, either to identify alternative access options (e.g. licence the content for use and digitize) or identify alternative resources.

6.8.2.1A Note on Browser redirection

It is sometimes desirable to allow a URL displayed to a user to actually return the content located at an alternate URL. The example given above using a ROUTES URL to provide a persistent link to a resource works in this way.

A course wishes students to access the BBC home page at http://www.bbc.co.uk, but the Open University library recommends the use of the ROUTES URL
http://routes.open.ac.uk/ixbin/hixclient.exe?_IXDB_=routes&_IXSPFX_=g&submit-button=summary&%24+with+res_id+is+res9377

When the student clicks on the ROUTES URL, they are immediately 'redirected' to the BBC homepage. The student may well not be aware any redirection has taken place.

There are different methods of achieving a redirect, the main ones being:

- Use of HTTP redirects by returning a 301, 302 or 307 HTTP Status Response code with the URL target of the redirect
- Use of the 'Refresh' meta-tag within an HTML document stored at the requested URL
- Use of a script stored at the requested URL (typically JavaScript called from within an HTML document)

The W3C recommend the use of HTTP redirects[76]. The use of HTTP redirects has a number of benefits:

- It does not require a document to be loaded or script to be run in the User Agent (browser) making the request
- It allows richer information about the nature of the redirect (see http://www.w3.org/Protocols/rfc2616/rfc2616-sec10.html for further information on HTTP

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[76] http://www.w3.org/QA/Tips/reback

- HTTP redirects do not break the 'back' button function in browsers, which other methods of redirect do on occasion

Redirection in the OU VLE

When links to resources are included in either Structured Content, or in a course Resources area, some further adjustments are sometimes made automatically by the VLE.

The scripts applied to links in Structured Content and Resources are the same, but there is an important difference between the two scenarios. For links in Structured Content, these changes are made as the content is published into the VLE, and so the links stored in the content are those adjusted by the VLE. For links in Resources, these changes are made as the page is loaded in the browser (i.e. the original link is still stored in the Moodle database tables).

The reason for making changes to the links is to preserve the function of the 'back' button in the browser. Specifically in IE6, IE7and IE8.

There are two forms of link that are targeted:

- Links directed via ROUTES
- Links directed via EZProxy

ROUTES URLs

ROUTES URLs are identified by the existence of the following string at the start of the URL:

http://routes.open.ac.uk/ixbin/hixclient.exe?

URLs containing this pattern are modified as follows:

- Remove the string http://routes.open.ac.uk/ixbin/hixclient.exe? from the start of the URL
- URL encode the remaining part of the ROUTES URL
- Prepend http://learn.open.ac.uk/local/routeslink.php?q= to the URL encoded string

For example, the URL

http://routes.open.ac.uk/ixbin/hixclient.exe?_IXDB_=routes&_IXSPFX_=g&submit-button=summary&$+with+res_id+is+res9377

becomes

http://learn.open.ac.uk/local/routeslink.php?q=_IXDB_%3Droutes%26_IXSPFX_%3Dg%26submit-button%3Dsummary%26%24%2Bwith%2Bres_id%2Bis%2Bres9377+

The script requests the relevant ROUTES page from the specified URL, finds the redirection information which is stored in a HTML Meta tag as a Refresh value, and then redirects the user to this destination URL (using a 302 HTTP Status Response Code) to preserve the functioning of the browser 'back' button in IE6, IE7 and IE8)

EZProxy URLs

EZProxy URLs are identified by the existence of the following string at the start of the URL:

http://libezproxy.open.ac.uk/login?url=

URLs containing this pattern are modified as follows:

- Remove the string http://libezproxy.open.ac.uk/login?url= from the start of the URL
- URL encode the remaining part of the EZProxy URL
- Prepend http://learn.open.ac.uk/local/libezproxylink.php?url= to the URL encoded string

For example the URL

http://libezproxy.open.ac.uk/login?url=http://dx.doi.org/10.1109/MS.2004.1259221

becomes

http://learn.open.ac.uk/local/libezproxylink.php?url=http%3A%2F%2Fdx.doi.org%2F10.1109%2FMS.2004.1259221

This script is slightly more complex than the routeslinks.php script. The script recursively follows redirects and also collects any cookies that would be set in the user's browser during the redirects. Once the script has followed all the relevant redirects (there are a number of possible conditions for termination of the recursion), it will redirect the user's browser to the ultimate target of the redirects, while at the same time writing all the relevant cookies to the browser.

Testing has shown that the EZProxy software itself handles redirects with HTTP Status Response Codes (302s). In reality the problem this script deals with is that there maybe other systems (outside the control of the OU) that use other forms of redirection. An example is the SwetsWise ejournal service, which uses a HTML Meta tag with a Refresh value to redirect the user to journal articles in PDF format.

Because this script is applied to all links directed via http://libezproxy.open.ac.uk/login, in many cases this script maybe redundant. However, using this script means that any situations where redirects are achieved by means other than a HTTP Status Response Code do not break the 'back' function in the browser.

It might be advisable to identify the specific services which the script needs to be applied to, however this could take significant initial and ongoing resource to keep a list of affected services and to keep the script up to date.

6.8.2.2 Freely available web resources (available via a dedicated URL)

- Check if the URL is in ROUTES, if so, add details of the new course context (course, module, block or other granular unit of a course) in which it is being used.
- If URL not currently in ROUTES, add to ROUTES, with appropriate metadata, including the course context.
- In either case, if an appropriate course context does not exist in ROUTES, create it.
- Supply links back to course, either individually, or as a feed for the course

6.8.2.3 Subscribed resources – Databases

Look up the database in the A-Z list on the library web pages (http://library.open.ac.uk/find/databases/index.cfm), copy and paste URL and supply to course team, or add to the RSS Feed Tool for the course/block/module.

N.B. The URLs from the A-Z list are generated from the library catalogue, and use the library catalogue 'bibId' as an 'id'. The URLs in the library catalogue will direct via an authentication mechanism where appropriate – i.e. EZProxy[77] or OpenAthens LA 2.0[78]. For example:

- A-Z List URL: http://library.open.ac.uk/find/databases/linking.cfm?id=208370
- URL in Library Catalogue record: http://msds.open.ac.uk/sams/athensda/athensda01.asp?service=ATHENSDA58
- Actual URL: http://www.sciencedirect.com

- A-Z List URL: http://library.open.ac.uk/find/databases/linking.cfm?id=257166
- URL in Library Catalogue record: http://libezproxy.open.ac.uk/login?url=http://isiknowledge.com/wos/
- Actual URL: http://isiknowledge.com/wos/

6.8.2.4 Subscribed resources – Electronic Journals

Look up the journal in the library catalogue (http://voyager.open.ac.uk/)

Copy and paste URL and supply to course team, or add to RSS Tool feed for the course/block/module.

The URLs in the library catalogue will direct via an authentication mechanism where appropriate – i.e. EZProxy or OpenAthens LA 2.0

6.8.2.5 Subscribed resources – Electronic Books

Look up the book in the library catalogue (http://voyager.open.ac.uk/)

Copy and paste URL and supply to course team, or add to RSS Tool feed for the course/block/module.

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[77] http://www.oclc.org/ezproxy/
[78] http://www.athensams.net/products-services/managing-identity/openathensla.aspx

The URLs in the library catalogue will direct via an authentication mechanism where appropriate – i.e. EZProxy or OpenAthens LA 2.0

6.8.2.6 Subscribed resources – Journal Articles

Journal articles are probably the most complex set of resources to link to, and it seems likely that links to journal articles also make up the largest set of links to resources across the OU course material.

The full recommendations are documented internally at http://intranet4.open.ac.uk/wikis/LibraryWiki/Linking_to_resources#Article_linking (not available outside the OU).

The workflow includes the following steps, although the order may not be as described here:

- Check if we have access to the article, and note what routes of access are available
    - If the only route of access is via EBSCO, get a persistent link from EBSCO. This is available via EBSCO, and will be of the form http://libezproxy.open.ac.uk/login?url=http://search.ebscohost.com.libezproxy.open.ac.uk/login.aspx?direct=true&db=bth&AN=35713595&site=ehost-live&scope=site
    - Identify a DOI if possible (and not already supplied). Provide a link of the form http://libezproxy.open.ac.uk/login?url=http://dx.doi.org/1038/35057062
    - If a DOI is not available, or for some reason is not appropriate, obtain a persistent link from the appropriate supplier
- An alternative to all of the above is to provide an OpenURL (i.e. SFX link), but this tends to be non-preferred because:
    - Complexity of OpenURLs
    - Article level linking is not guaranteed
    - Seemingly inconsistent behaviour from SFX

6.8.3 TELSTAR approach

6.8.3.1 Underlying principles

When considering future options for linking to resources that are referenced within OU courses TELSTAR established the following principles through conversations with stakeholders:

- *Simplification* – Currently too many options and systems

- *Automation* – Avoid manual creation of links whenever possible **without having a negative impact on the student experience**

- *Management* – know what resources and links are being used and where

- *Transferability* – when moving references between different environments, the links provided with the reference should continue to make sense. (see Section 6.8.1 for a fuller explanation)

6.8.3.2Solution

The solution implemented by TELSTAR has OpenURL at its core. Using OpenURL as a transport mechanism, all links are routed via the SFX OpenURL resolution service. The action taken by the SFX server will depend on the information transported in the OpenURL and the configuration of SFX.

Key to the use of the OpenURL is that the metadata transported in the OpenURL can include identifiers. The two key identifiers for the purposes of references appearing in OU course materials are http URIs (i.e. URLs) and DOIs. Since these are both types of URI, they can be transmitted in the rft_id entity within the OpenURL[79].

The reasoning used in SFX when resolving an OpenURL is as follows:

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[79] The fields available for use in OpenURL are defined in the ANSI/NISO Z39.88 standard
http://www.niso.org/standards/z39-88-2004/
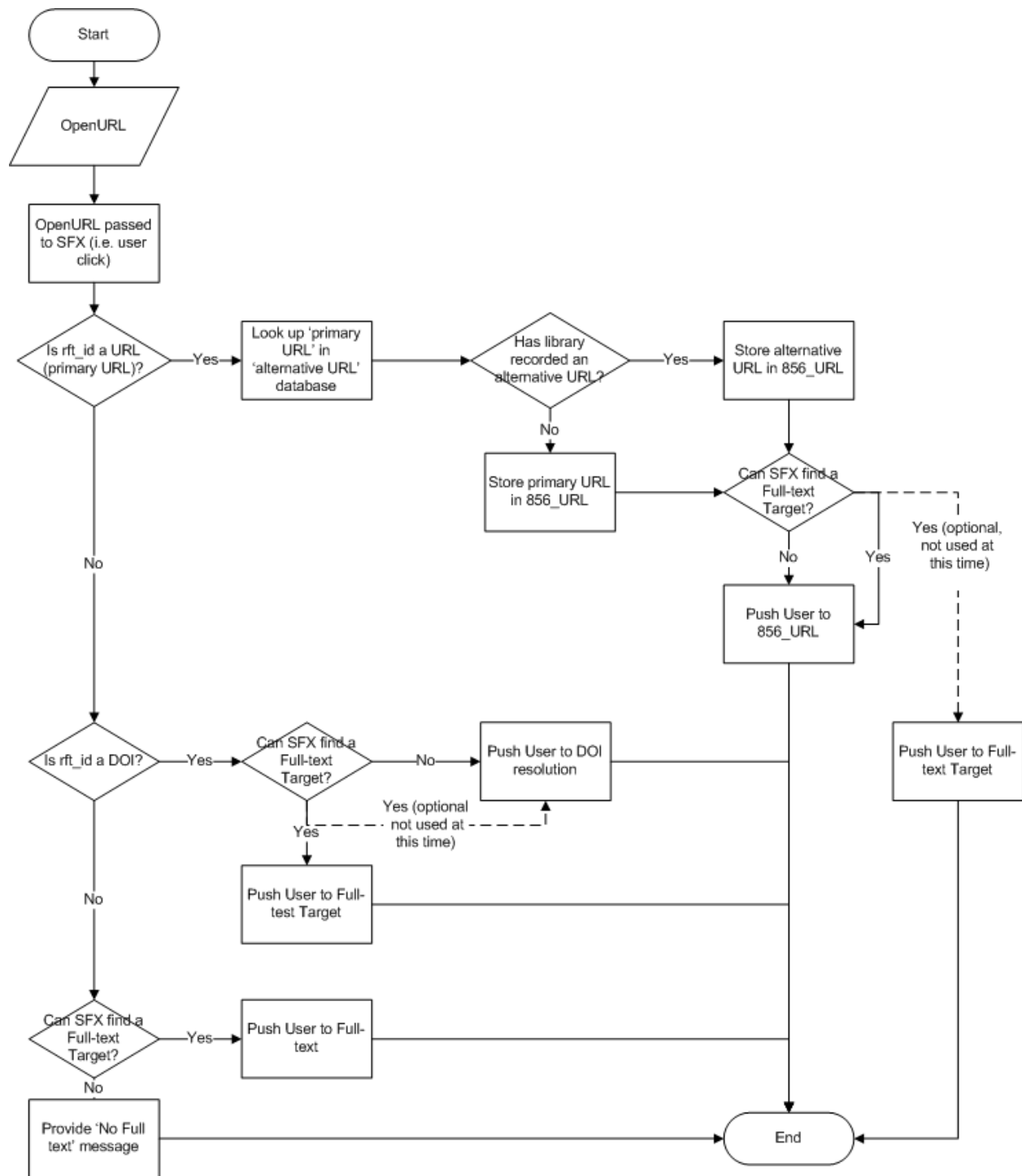
As can be seen from this diagram, it is possible to use the 'primary URL' (i.e. the URL provided in the original reference), or a DOI, to form a link to the online resource. However, where SFX can form a link to the 'appropriate copy' of a resource via its built-in linking mechanisms, we are able to take advantage of this.

In order to enable SFX to use a URI contained in the rft_id entity as a link, a new SFX 'Source parser' was written. A Source Parser is a piece of code in SFX that interprets the content of an OpenURL from a specific 'source' (the 'Referrer' entity in the OpenURL framework[80]).

The diagram above introduces the concept of an 'alternative URL' database. This database is a newly developed resource at the Open University Library. When the library becomes aware of a change to a URL which is being used in current course material, an entry can be added to the database recording both the old URL and the new URL. The old URL is then used as a key so SFX can pass any URL to the database to find out if the library is currently maintaining an alternative location for the resource, and the requester will be redirected to the new location.

This mechanism allows immediate action to be taken in the case of resources that move without having to re-edit all occurrences of the resource across all OU course material. However, unlike the current mechanisms, where a resource has not changed URL, no record need be maintained. It also enables the correct 'primary' URL for the resource to be recorded with the original reference.

Looking at how this linking mechanism is expected to work for different common material types may help clarify:

Subscribed resources – Journal Articles

In general Journal Articles should be linked to using an OpenURL. This can be generated from the reference metadata.

Where a DOI is available, this should be included in the OpenURL, e.g.:

> http://openurl.open.ac.uk/sfxlcl3?ctx_enc=info:ofi/enc:UTF-8&ctx_id=10_1&ctx_tim=2009-08-12T15:18:1BST&ctx_ver=Z39.88-2004&rfr_id=info:sid/sfxit.com:citation&rft.genre=article&rft_id=info:doi/10.1103/PhysRevE.62.1457&rft_val_fmt=info:ofi/fmt:kev:mtx:article&sfx.title_search=contains&url_ctx_fmt=info:ofi/fmt:kev:mtx:ctx&url_ver=Z39.88-2004

SFX can then be configured to either resolve the link directly, or pass the user onto the DOI resolution service (e.g. http://dx.doi.org/10.1103/PhysRevE.62.1457) depending on what the library sees as preferable.

Subscribed resources – Electronic Journals

In general Electronic Journals should be linked to using an OpenURL. This can be generated from the reference metadata. If a DOI is available this should be included in the reference metadata.

Subscribed resources – Electronic Books

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[80] http://www.niso.org/standards/z39-88-2004/

In theory electronic books can be linked to with an OpenURL, which could be generated from the reference metadata. However, in practice the SFX KnowledgeBase does not contain extensive enough information on e-books and their providers. If a DOI is available this should be included in the reference metadata, and can be used to form a link as with Journal articles.

Subscribed resources – Databases

As these resources have a dedicated URL, it is not possible to meaningfully reference them without including the URL. However, the preferred URL may not be the 'natural' URL for the service.

Construct an OpenURL using the supplied URL as an ID (in rft_id in the OpenURL), and then 'resolve' it by directing via an appropriate route (e.g. via EZProxy). It might be possible to combine this with information in Voyager (e.g. lookup a URL and get the correct 'managed' URL).

Freely available web resources (available via a dedicated URL)

As these resources have a dedicated URL, it is not possible to meaningfully reference them without including the URL.

Construct an OpenURL using the supplied URL as an ID (in rft_id in the OpenURL), and then 'resolve' it by directing via an appropriate route (e.g. via EZProxy). It might be possible to combine this with information in Voyager (e.g. lookup a URL and get the correct 'managed' URL)

6.9   Authentication and Authorization mechanisms for OU library resources

6.9.1 Current Authentication and Authorization mechanisms

The Open University uses two main authentication and authorization mechanisms to provide access to library resources such as ejournals, ebooks and online databases. These are:

- IP Authentication via EZProxy[81]
- OpenAthens LA[82]

There are also a few resources (approximately 45 as of 23/2/2010) which have resource specific usernames and passwords. The details of these are made available through a web page that is only accessible by members of the Open University.

When providing links to users, the library generally provides links that work equally well for on- and off-campus users. This usually means directing links via EZProxy.

As an example, the URL for the resource "19th Century British Newspapers" (provided by Gale Cengage Learning) is:

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[81] http://www.oclc.org/ezproxy/
[82] http://www.athensams.net/products-services/managing-identity/openathensla.aspx

http://find.galegroup.com/bncn

This would work for an on-campus user, as the product would recognize the IP address of the requester as being a valid Open University IP address. However, this would not work effectively from off-campus. For this reason the link provided by the library would be:

http://libezproxy.open.ac.uk/login?url=http://find.galegrou.com/bncn

Following this link will prompt the user to login to the Open University's EZProxy service using their 'SAMS' (Standard Access Management System) username and password. This is the same username and password used to sign-in to many Open University services, including the course website (Moodle).

If the user has already signed in to the EZProxy service during the same browser session, they will not be prompted again, so after the first login, access for the user will be seamless.

As login via EZProxy does not include any personal details of the user, it is not appropriate for resources which require some level of 'personal' account. Many of these resources support Open Athens authentication, and the Open University uses Open Athens LA (Local Authentication) for this type of resource where possible. Open Athens LA allows users to access Athens authenticated resources while using an institutional username and password. At the Open University the login required is once again the SAMS username and password, and the login screen is the same as is presented when logging into the EZProxy service.

An example of a resource generally accessed via Open Athens LA is RefWorks, where it is necessary for the user to access a personal account. As with resources accessed using EZProxy, the library provided link is designed to take the user directly to the login page, before passing the user onto the resource, once authentication has taken place.

The other situation that might result in the use of Open Athens LA to sign-in to an online resource is where an off-campus user uses the resource using a link not provided by the library. For example, if the user were to find the RefWorks login page via the RefWorks homepage[83], rather than via a library provided link. In this case the user would see a number of login options, and would need to navigate to the 'Athens' login option to successfully authenticate. This can be a convoluted process, varies between resources, and often leads to confusion on the part of the user.

6.9.2 Impact of TELSTAR on Authentication and Authorization

TELSTAR does not introduce new mechanisms for Authentication or Authorization, and as such there is an ongoing need to support EZProxy and Open Athens LA.

However, as described in Section 6.8.3, TELSTAR proposes an alternative way of providing links to resources, at least from within Course websites. This alternative approach means that the link stored with the reference to a resource is the 'original link', which creates a question of how to enable a

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[83] http://www.refworks.com

seamless authentication and authorization process for the students, as is currently achieved by providing modified URLs to link to the resource.

As described above, all links created via TELSTAR functionality are routed via the SFX Link Resolver using the OpenURL framework. This enables the library to add the appropriate authentication mechanism at the link resolver.

The SFX Link resolver is currently integrated with EZProxy. For each online resource SFX is aware of, it is possible to indicate that links to the resource should be directed via the Open University EZProxy service. This means that the student experience of authentication as they link to resources will be unchanged for those resources SFX is aware of.

For Athens authenticated resources, or resources that SFX is not aware of, there are two possible mechanisms to ensure the user is directed via an appropriate authentication route under the TELSTAR model of linking:

- Use existing mechanisms (as described in Section 6.8.2.3 and Section 6.8.2.5) to produce a persistent link for the resource which directs the user via the appropriate authentication route, and make this the link included in the reference

- Use the concept of that 'alternative URL' to allow the 'primary URL' for the resource to be stored in the reference, while the 'alternative URL' directs the user via the authenticated route.

The latter mechanism is preferred as this means the primary URL can be stored with the reference. However, more investigation into the associated overheads of managing URLs in this way is needed.

6.9.3 Future of Authentication and Authorization for library resources

In the UK HE sector there is a clear move towards using 'Federated Access Management' for authentication and authorization to library resources. Many institutions have now implemented 'Shibboleth' to enable the use of Federated Access Management. The Open University library plans to move to this approach in the future.

Achieving a similar experience to the current 'seamless' authentication process described in Section 6.9.1 when using Federated Access Management requires the use of IdP-initiated SSO (described in Section 5.3.2), also known as 'WAYFless URLs'.

Ex Libris, the suppliers of the SFX Link Resolver software, are currently working on integrating IdP-initiated SSO into the SFX software.

It is recommended that the Open University engage with Ex Libris and the SFX user community to ensure that future developments in this area meet the needs of the Open University.

6.10   Potential impact on existing Library systems

It should be noted that no decision has yet been made to roll out TELSTAR functionality across the Open University. This section only describes the potential impact, although any implementation project would need to consider these issues.

6.10.1 MyOpenLibrary

MyOpenLibrary functionality would be entirely replaced by new functionality introduced by TELSTAR. Course specific resources delivered via MyOpenLibrary would instead be delivered via 'resource pages' on the course website.

The ability to add 'personal links' in MyOpenLibrary would instead be delivered via MyReferences, where students can add links and other references as necessary.

Potential Impact: if a decision is made to roll out TELSTAR functionality across the institution, all courses using MyOpenLibrary could be migrated to using TELSTAR functionality in its place.

N.B. The MyLibrary software is also used to provide resources to Business School Alumni via a service called 'MyPAL'. If the use of MyLibrary software is to be phased out completely, an alternative approach to supplying this service would be required.

6.10.2 ROUTES

ROUTES functionality would generally be replaced by new functionality introduced by TELSTAR. However, current ROUTES functionality does not map exactly to new TELSTAR functionality.

As noted in , ROUTES provided four main functions. These are listed here, with a description of the extent to which TELSTAR replaces these functions:

ROUTES function	TELSTAR equivalent
Provide a catalogue of (freely available) websites used in Open University courses	Under the TELSTAR model there is no central catalogue of websites or resources used in Open University courses.
Indicate which websites are used in specific courses	Because TELSTAR uses course websites as the mechanism to associate resources with courses, there only way to check which websites are being used in specific courses would be to look at the course website. However, if the course team has elected to collect all resources for a course in a shared RefWorks account, this account would provide an immediate overview of all the resources used on that course.

Provide 'persistent' links to websites which can be used in Open University course materials	The TELSTAR model dispenses with the use of 'persistent' links, so this function is no longer required. Instead TELSTAR enables the library to redirect users to the appropriate URL when they click on a link in the course website.
Provide a 'link checking' service to identify URLs that are temporarily or permanently broken	The TELSTAR model generally supports 'just in time' link checking instead of the 'just in case' model supported by ROUTES. A 'just in time' model is more efficient in that it only deals with actual problems rather than potential problems. In July 2010, TELSTAR will introduce a variety of reports that can be run on shared RefWorks accounts, including link checking, to enable a more proactive approach to link checking if required.

Potential Impact: if a decision is made to roll out TELSTAR functionality across the institution, ROUTES could be phased out as part of that roll out.

N.B. ROUTES is being used by the Arab OU. If ROUTES is to be phased out completely an alternative approach to supplying this service to the Arab OU would be required.

6.10.3 RSS Tool

The RSS Tool enables groups of resources to be aggregated and delivered into course websites via RSS or OPML.

In general this functionality is replaced by TELSTAR. Resources can be aggregated into shared RefWorks accounts, and be delivered into course websites via RSS or direct import. There are some aspects of the RSS Tool functionality that are not supported by TELSTAR, perhaps most notably the ability to reorder the items in the RSS Tool to enable the display of items in a specific order within the course website.

Potential Impact: if a decision is made to roll out TELSTAR functionality across the institution, the RSS Tool could be phased out as part of that roll out.

6.10.4 SFX

Under the TELSTAR model, all links from course websites are directed via the SFX OpenURL resolver. This increases the reliance on this system, making it a more critical system.

Although this has no immediate impact, the increased dependence should be considered when looking at aspects of resilience and disaster planning.

If the Open University should decide to move to alternative link resolver it will need to ensure that alternative products can support the necessary functionality to support the linking mechanisms TELSTAR has introduced.

It is recommended that the Open University takes an active role in the SFX user community to ensure that the product continues to meet their requirements, and wherever possible innovations introduced by the Open University become part of the supported product.

6.10.5 EZProxy

As noted, there is an ongoing need to support EZProxy. This is not affected by TELSTAR functionality. It may be that the introduction of Federated Access Management will decrease or eliminate the use of EZProxy at the Open University, but this is not affected in any way by TELSTAR functionality beyond those issues noted above.

6.10.6 Other Systems

There is no anticipated impact of TELSTAR on other library systems.

7 Appendix A: Extracts from the OU Business Case

The following text is all reproduced from the business case built at the Open University for work on integrating reference management tools into the OU learning environment.

There is a real need for students, course and programme teams to be able to create, manipulate, manage, organise and store a range of citations and bibliographic references in required discipline specific styles and formats within our current OUVLE tools. It is particularly important to support increasing numbers of students who are studying on courses requiring production of larger assignments and projects, including work-based learners.

This business case aims to deliver solutions which

- investigate and provide recommendations for delivering more robust and scalable solutions for integrating course, programme based and library specific citations and bibliographic references in courseware and web learning spaces.
- ensure the organisation makes more effective use of its current subscription based bibliographic management tools (Refworks and also potentially Endnote) and integrates them within our current OUVLE tools and structured authoring solutions.
- build capacity to support more effective resource management for course and programme teams which can ensure efficient, timely and more flexible distribution of our freely available and subscription based resources to learners in line with their requirements.
- seek to test the scalability and performance of incorporating other tools within the broader bibliographic management solution, such as the library's SFX direct resource linking tool.

Integrating bibliographic management services with OUVLE tools.

Why would we wish to do this?

EndNote and RefWorks are bibliographic software packages which will enable you to:

- organise, store and manage references
- create bibliographies for activities and assignments
- insert citations in the text of your document in the chosen style using Microsoft Word.
- output bibliographies in the chosen style e.g. Harvard, numbered, MLA.
- instantly edit hundreds of different, ready-made styles to suit your needs, or to create new ones
- store reference information for over 30 reference types, e.g. web page, electronic journal article
- assign keywords to references in order to sort by subject etc.
- insert information simultaneously into a particular field in a number of references (e.g. if you wanted to add a keyword to several references)

What impact will there be for students, course and programme teams in not doing this?

- Complexity and fragmentation of experience for the student with the Library as another parallel system with different interfaces
- Students will view the library as a separate entity from their learning experience rather than an integral part of it
- Students will make less use of the quality assured resources available in the library for their studies
- Less convenience for the Student – not able to store and use references and citations to Library and other resources in the places they choose
- In response to ELQ, course and programme teams will be less likely to naturally embed library materials within course content and activities as part of the authoring process
- Less integrated approach to supporting student scholarship skills development, in terms of helping them with managing references, creating bibliographies and avoiding plagiarism
- Losing the opportunity to help the move to less content in courses by giving students a system for building their own learning materials (and storing them in such a way that they can feed future presentations)
- There are significant sustainability issues in relation to the MyOpenLibrary product and we need to develop services based on current technologies

The project's objectives are to deliver solutions which enable students to

- save a citation index of all their course/programme materials and embedded library references into MyStuff
- create their own simple bibliographies for course related activities and assignments in MyStuff and publish them to the eTMA system and other webspaces

Benefits to students:

provides

- flexible and simple solutions to storing and managing course related references in one place
- an integrated tool to build citation libraries and publish bibliographies in a range of citation styles and formats as required by the programme or course team discipline
- enable course and programme teams to
- produce consistent, standardised, high quality production of citation and reference management within OU learning materials which can be flexibly delivered to a range of distributed networked environments as well as print materials

Benefits for students, programme and course teams:

- more effective manipulation and management of citations and bibliographic references embedded within print based and online materials i.e.XML schema to be extended to associate/ nest with Refworks XML
- ability to render citations and bibliographic references within course materials and online resources consistently and systematically in appropriate formats and styles (increase value and quality assurance

Develop a more integrated technical solution through testing the ability, usability and scalability of using our current subscription based tools to create course/programme elearning libraries

Benefits for students, programme and course teams:

- easy export of course or programme based libraries to relevant websites (via Refworks XML) in a range of required citation and bibliographic formatted styles
- more scalable support for building elearning focussed libraries
- consistency of approach to ensure quality assurance
- support the development of student scholarship and student centric course/programme pedagogies
- local copies can be created so risks around using commercial third party solutions can be mitigated

Customers

Expected impact on the University's customers:

Customer group	Impact
Existing students	Enhanced student experience; better access for more users to high-quality, trusted expert collections subscribed to by the Library sources used are at the appropriate level for the course therefore quality of assessed work is improved; improved information literacy skills (transferable);
Library staff	To build relationships with OU customers encouraging constant and purposeful change by inviting user participation in the creation of the virtual services**,** supported by consistently evaluating services. Reduced number of pages to be maintained in websites Less time spent on updates and maintenance; Reduced time spent on minor helpdesk enquiries, allowing more time to be spent on value-added services
The institution	New business opportunities opened up Opens up partnership opportunities

Partners

Partners will benefit by receiving customised libraries that meet expectations and which comply to licensing arrangements, whilst also being provided with tools which support personalisation, should they wish to use them.

OU effectiveness and efficiency

The proof of concepts will aim to capture wherever possible quantifiable benefits in order to inform strategic direction and development for future service and systems integration. In particular attempts will be made to process cost the following elements on a course basis:

Efficiency savings
- reduced cost in find and retrieval time for customers;
- ease of use results in improved take up of Library Services resources by course teams;
- reuse of existing OU system leads to reduced development time;
- reduced staffing costs – helpdesk queries, maintenance of sites, staff training;
- use of database and dynamic content makes editing processes more efficient.