



Digital Rights Management

Final Report

Study carried out by Intrallect Ltd on behalf of JISC

Charles Duncan, C.Duncan@intrallect.com
Ed Barker, E.Barker@intrallect.com
Peter Douglas, P.Douglas@intrallect.com
Martin Morrey, M.Morrey@intrallect.com
Charlotte Waelde, Charlotte.Waelde@ed.ac.uk

Intrallect Ltd
Braehead Business Park
Braehead Road
Linlithgow EH49 6EP
U.K.

T: +44 (0)870 234 3933
W: www.intrallect.com

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¹ All acronyms used are listed in Appendix A.

2 Executive Summary

This report delivers the outcomes of a study to make recommendations on the best approach for JISC and the UK education and research communities to adopt in relation to Digital Rights Management (DRM). The study was carried out between February and August 2004.

The study addresses many different aspects of DRM, in particular, issues related to sharing teaching and learning resources, publication and digital library management, providing access to research data, and using resources from 3rd party sources

A very broad view of digital rights management was taken. Different aspects of DRM were categorised as either: “definition of DRM policy” through which an organisation recognises rights and obtains clearance to use any 3rd party material, asserts its rights to govern the use of resources when they are made widely available, determines licence conditions and expresses licences in both written and digital form; or “projection of DRM policy” through which an organisation ensures that those who use its resources are aware of the conditions of use, and understand those conditions, as well as the ability to prevent and monitor unauthorised access.

A literature survey was carried out throughout this study as DRM is a rapidly developing subject.

In order to make recommendations it was necessary to establish the requirements of the various stakeholders in the UK HE and FE research, teaching, and library communities. This was done through a series of workshops and interviews. A “use case” approach was adopted through which 32 detailed cases and a further 93 summary cases were developed. These cases were analysed to extract requirements, many of which were common to several cases. These cases and requirements were developed with no regard to the processes or technology which might meet the requirements. This was done to preserve the distinction between what people need to do and the way they achieve that purpose. It is likely that the requirements will persist over several generations of technological solutions.

The requirements were grouped depending on their stage in the DRM process and detailed recommendations are made concerning the various options available to meet each set of requirements. A cost-benefit-risk analysis of the options is also included.

While some aspects of DRM are well understood and good practice is already established, other areas need further work. It is suggested that good practice guides, common licences and practical examples of DRM technology would improve the widespread adoption of DRM. There is currently a high degree of interest in DRM shown by the fact that the project Interim Report was downloaded 3000 times in its first five weeks of publication.

3 Introduction

3.1 Objective

The objective of this study was

to make recommendations on the best approach for JISC and the UK education and research communities to adopt in relation to Digital Rights Management (DRM).

The management of intellectual property rights (IPR) over the outputs of research, teaching, learning, publication, and the other diverse activities of the HE and FE communities is a complex and ongoing issue. In teaching and learning communities, management of digital rights is seen as a potential barrier to the development of a learning object economy through which sharing and reuse of resources will thrive (Campbell (2003), Campbell et al (2001)). DRM is also recognised as key to the rapidly developing practice of self-archiving of research publications (Gadd et al (2003a, 2003b)) and it is at the heart of the ever-changing licence agreements between commercial publishers and libraries (Jones (2003), Hill Slowinski (2003)).

3.2 Structure

This report is based on the findings of a study carried out between February and August 2004².

The work of this study is split into three main parts: a literature survey to review the background and identify work already carried out (see section 0); a series of workshops and interviews to carry out a use case analysis to define the requirements for DRM in UK HE and FE (see section 5 and Appendices); a detailed analysis to evaluate the options available to meet these requirements (see section 6). The recommendations are in two sections: Section 8 lists the recommendations grouped by priority, while Section 9 describes a possible DRM Programme through which JISC might address many of the recommendations.

4 Background

It is worth starting by considering some basics. What do we mean by Digital Rights Management? "Digital" refers to the medium of the material over which the rights exist. "Rights" applies to the intellectual property rights, primarily copyright, linked to the material. "Management" involves

² A mail list for further discussion exists at jisc-drm@jiscmail.ac.uk and further project information is available at <http://www.intralllect.com/drm-study/>

defining a policy and enforcing that policy in such a way that rights are respected. Rights management is not new, but management of digital material raises some new issues.

In the UK, copyright protection is provided under the Copyright, Designs and Patents Act 1988 (CDPA as amended most recently in 2003). For a good summary of the background to copyright law, including aspects outside the UK, see Bide (2002). For an in-depth analysis, particularly of the international situation, see Sarrocco (2003).

Digital rights management is also important in many spheres other than education and as a result has been studied extensively (e.g. Rosenblatt et al, 2002, Rosenblatt and Dykstra, 2003). In some cases these studies have been wide-ranging, such as the European Standards Organisation, (CEN), study on *Digital Rights Management* completed in September 2003. Others, such as the World Intellectual Property Organisation's (WIPO) report *Intellectual Property on the Internet: A Survey of Issues* focus on the impact of the move to digital material in a networked world. Many are concerned with piracy in the world of music, software and films and this is also of interest to publishers, particularly of e-books (AAP, 2000; LaMacchia, 2002). The technology to support DRM is also a major topic of debate (Erickson, et al, 2001; Ianella, 2001; IEEE LTSC, 2003; Coyle, 2004). The views of DRM sceptics are also of interest, whether they are sceptical about the technologies being used (Spedding, 2003) or about the way copyright law might still need further changes in the digital, networked world (von Lohmann, 2003).

4.1 What is DRM?

One definition of DRM has been provided by LaMacchia (2002):

the ultimate goal of a distributed DRM system is for content authors to be able to project policies governing their content into remote environments with confidence that those policies will be respected by the remote nodes

This sums up the two key aspects of DRM in one sentence. First, DRM is about managing the policies under which material will be made available, and then it is about ensuring that these policies are respected.

The first stage, policy management, includes recognising the objects over which rights exist, what those rights are, and who owns them. The policy then needs to be extended to include who might use these objects and under what conditions. Once agreed, the policy needs to be stated unambiguously. This is often done in the form of a legal licence.

The second stage, enforcing the policy, is what happens when objects are offered and used. In the past this mechanism was much simpler, the chain from an author to a publisher, to a book distributor, to a shop, to a reader, is well established and the rights and responsibilities at each stage are well understood. When objects are accessible in digital form through networks, the number of potential channels for access is much greater. As pointed out in LaMacchia's quotation above, authors (and others) need to

have confidence that their rights will be projected and respected in remote environments.

4.2 What already happens? Is DRM needed?

What are the problems for which DRM offers a solution? Are they new problems or new manifestations of long-standing problems? Copyright law grants exclusive rights to owners of creative works and provides means by which those rights may be enforced. Rights-holders own rights over the use of their works and can assign or licence these rights to others. The owner of the copyright has the exclusive rights:

(a) to copy the work;

(b) to issue copies of the work to the public;

(b_a) to rent or lend the work to the public;

(c) to perform, show or play the work in public;

(d) to communicate the work to the public;

(e) to make an adaptation of the work or do any of the above in relation to an adaptation;

(Extract from section 16, CDPA)

Fair dealing is a defence to an action of infringement which can be used by an individual making a copy of a substantial part of a work for the purposes of research and private study, criticism and review, or news reporting (photographs are excluded). Normally only a substantial part of a work (and not the whole work) may be copied under fair dealing, for example, a chapter of a book, one article from a journal issue, or about 10% of a work. However there are some indications by the courts that copying the whole of a work in order to extract what is to be used under the fair dealing defence will be acceptable. There is no precise definition of fair dealing, although it is clear that the dealing must be fair. Much will depend on such factors as the amount of the work taken in the context of the whole; the motives of the person pleading fair dealing; whether the work is used in a commercial context and whether the work has been published. Descriptions of fair dealing are provided by the JISC Legal Information Service (<http://www.jisclegal.ac.uk/ipr/fairdealing.htm>) and a working group established by JISC and the Publisher's Association which also addresses the issue of digital material (<http://www.ukoln.ac.uk/services/elib/papers/pa/fair/intro.html>).

In relation to the database rights, fair dealing only applies to extraction from a database for the purposes of illustration for teaching and non-commercial research. The defence does not extend to re-utilisation of the contents of the database. The source of the work must always be acknowledged in fair dealing.

In addition to fair dealing, organisations such as the Copyright Licensing Agency and the Educational Recording Agency, establish industry-wide

agreements to extend the use of works, for example in the realm of education. Is this not enough to allow effective work practices within Further Education and Higher Education Institutions?

What has changed in the digital, networked world that suggests more is needed. The most significant differences between the digital and non-digital world are:

- ready access to digital resources on a world-wide network has made it difficult to establish the provenance of resources (it is easy to include a copyright statement on a work fixed in a paper-based medium)
- the ease with which digital resources can be modified encourages modification often without establishing if modification is permitted (in the past copying was limited to photocopying while excerpting/disaggregation was too labour intensive so it was limited to small chunks)
- there is no quality degradation when copying or modifying digital resources so it can be done repeatedly through a long chain of users (in the past the poor quality of photocopies of photocopies rapidly limited the chain)
- almost anyone can now be a publisher (e.g. by placing resources on the Web) so there is far more chance of resources being distributed without appropriate permission. Policing of such activity is problematic – most people are unable to define legally-sound licence terms under which they will permit use of their published material – so large volumes of material are published without visible conditions of use. In the past only large organisations could publish material and it was economically feasible for them to use lawyers to produce terms and conditions of use.
- digital media often consist of a variety of interlinked files. This can make it difficult to have legally enforceable agreements which are applicable to all types of digital materials. For example, an agreement permitting the reproduction of a substantial part of a work might be difficult to apply to a website.
- the diversity of new publishers and their many reasons for publishing resources means there is a need for many different types of licence (in the past there has been no easy way for someone with limited finances to declare that resources are published under a licence over which they have had some choice)
- international boundaries are much more easily crossed in the networked world so cross-border infringement of copyright is common – this is both difficult to detect and difficult to prevent, partly because laws may differ on permitted uses. In the past the same situation existed but the frequency of infringement was very much less.
- When infringement occurred in the past, it was likely to be carried out on a scale that made pursuing the infringer worthwhile – for example a publisher might reproduce a text on a large scale without

authorisation. Now that many infringements are carried out by individuals, pursuit of those infringers, while not impossible, is much more difficult and costly.

So these are the reasons why DRM is needed:

- to allow staff and students in HE and FE to make use of digital resources in confidence that they are adhering both to what is permitted by law and to the rights-holders permitted uses;
- to enable self-publication of resources supported by the ability to declare the permitted uses;
- to enable users to work within the confines of copyright (such as being able to copy an insubstantial part of a work and working within the parameters of fair dealing) knowing they are not engaging in infringement;
- to ensure that all of the above can operate in an internationally connected, digital environment.

DRM in an academic environment should be an “enabler” not a “preventer”. Its purpose is to let people work as freely as possible in the knowledge that they are both working within the bounds of the law of copyright and respecting the rights of others.

4.3 DRM Stages

Throughout this study a model has been used to encourage participants to think of digital rights management in several stages. These stages are not meant to be restrictive but to ensure that all aspects of DRM are considered. The diagram below shows the stages.

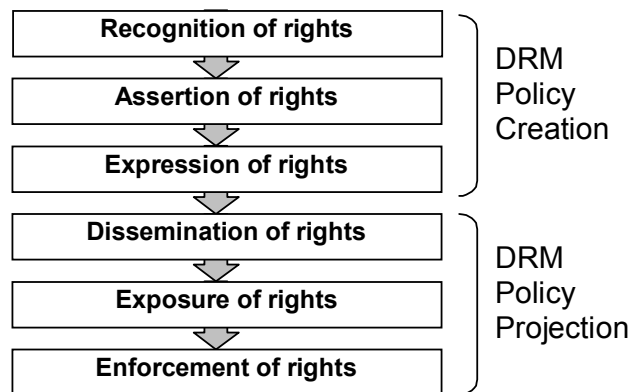


Figure 1: Stages in the DRM process

Within the context of UK HE and FE these stages all require action:

- **Recognition of rights** is the stage at which staff, employers and suppliers (e.g. publishers) all need to be aware of who the rights holders are and what uses they might be licensed for. HEFCE produced guidance in 2003 on intellectual property rights in e-learning

programmes which includes model employment contracts (HEFCE, 2003).

- **Assertion of rights** is provided by a legal framework in which people and organisations can assert their rights in a form that is defensible under law. Several licence models are emerging. Adopting an existing licence such as those used for open source software, selecting a licence from a number of options available, such as Creative Commons (2003), or drawing up a licence specific to the institution, project or repository. In the cases where a licence is adopted, legal advice should be sought concerning its applicability in the UK.
- **Expression of rights** has traditionally involved only a copyright statement in a human-readable form. While this is still important it is also essential to take account of machine-to-machine (m2m) communication when considering digital rights management. This is achievable through digital rights expression languages (DREs) which allow the asserted rights to be expressed in a machine-readable as well as a human-readable form. (See, for example, Ianella (2001)). These first three stages all address the creation of a DRM policy.
- **Dissemination of rights** ensures that wherever a resource is described its rights are also described. This is the first stage in projecting the DRM Policy. It requires that when resource hubs, catalogues, or portals gather metadata they also gather rights metadata. This metadata gathering is currently supported by direct querying and by metadata harvesting (Powell (2003)) using protocols such as Z39.50 and OAI-PMH. Since data providers may have to provide metadata in several different forms the simplest approach is often to take a “least common denominator” view. This may mean that the only metadata effectively passed is unqualified Dublin Core. The Dublin Core rights field is only “recommended” and has no encoding scheme and therefore cannot be relied upon to be machine “actionable”.

Typically, a Rights element will contain a rights management statement for the resource, or reference a service providing such information. (Dublin Core (2001))

The extent to which rights information should be disseminated with other information about the resource or be resolvable on request is addressed in this study. This is a most critical area. Asserting and expressing rights is wasted effort if the information cannot be disseminated properly.

- **Exposure of rights** is the stage at which a user will see the rights information associated with a resource. This will often be when searching for resources. If there are differences between the permitted uses for different objects then these should be easily apparent without detailed scrutiny of licence conditions. Terms or symbols that have a clear and unambiguous meaning need to become familiar to all if understanding rights information is to become effective.

- **Enforcement of rights** includes both protective measures to ensure that rights are not infringed and steps to be taken when infringements are detected. The most basic protective measures ensure that access to resources is granted only to people who have acknowledged that they have accepted the licence conditions under which the resources are made available. At this basic level a system of authentication and authorisation are required. Authentication is a means of identifying that someone is who they claim to be. Authorisation permits someone access as a member of a specified group or because they have satisfied some condition. It is then the task of the institution or the resource provider to check this assertion against the policy or licence and to grant or deny access.

4.4 Digital Rights in UK Higher and Further Education

The purpose of this study was to identify the requirements of UK HE and FE for digital rights management and the process by which that has been achieved is described in later sections. However, there are many aspects of DRM that have already been identified or studied, often through previous or current JISC Programmes and these are summarised here. The purpose of this section is not to be all-embracing but rather to demonstrate that DRM touches many aspects of academic life and it is impossible to consider it in isolation.

4.4.1 Types of activity

The main areas of activity in HE and FE for which DRM is important are: teaching and learning; research; libraries.

Teaching and Learning

Digital resources play a major role in much of modern teaching and learning but staff are wary of using resources that are easily accessible without knowing how they are permitted to use these resources. This has led to a culture in which resources are gathered and used for personal teaching but are not shared because the teachers are cautious about being seen to have used material which may not have been cleared for use.

Even when teachers have created completely new resources there is often still an unwillingness to share them because it is not easy to project the policy for use of the resources. Teachers are often willing to share, in principle, but only when they can project a clear DRM policy. The lack of a suitable DRM approach has been seen as a genuine barrier to sharing and reuse of learning resources (Campbell et al, 2001; JORUM, 2004).

Research

Collaborative research is becoming increasingly common. This is perhaps more evident in science disciplines, where very little modern research is carried out by individuals working alone. It is common for research data

to come from multiple sources. It is also common for data, as well as analysis and papers, to be self-published by research groups.

Policy documents note that the assertion of IP rights in the scientific field may be harmful to the progress of science (e.g. Royal Society, Keeping Science Open, 2003). The relevance of the law pertaining to databases also needs to be taken into account when dealing with the resources used by the scientific community. The underlying rights may be different – the one (the e-book) protected by copyright, the other (the dataset) protected by *sui generis* database right (and perhaps copyright as well).

There are strong parallels between the use of resources for research and those for teaching and learning. Common uses include copying, disaggregating, aggregating, modifying (reanalysis). Therefore, it might be expected that all the same DRM issues would be exercising the research community as the teaching and learning community. This does not appear to be the case.

During the course of this study it proved very difficult to find enough people with an interest in DRM issues in research to run a single workshop. Those in the teaching and learning and library communities were sufficiently enthusiastic that five workshops were run when only three had been originally planned. However, there has been recognition of the importance of DRM in a number of areas pertinent to research including self-publication (Gadd et al, 2003a, 2003b) and licences for research data (Creative Commons, 2004).

It is thought that the lack of interest from the scientific community may be because scientists are developing their own solutions to the restrictions posed by the law of copyright (and other rights including, notably, the database right). Research-active universities usually have well-established policies for handling rights such as patents and IP arising from research.

Libraries:

The library community has always been very aware of copyright issues and managing access to publications and has been at the forefront of developing digital libraries and their integration with learning environments (JISC programmes such as eLib, FAIR, DiVLE, Digital Libraries in the Classroom). These studies include the management of publications in electronic form from traditional publishers, initially through e-journals but increasingly through e-books.

How are the DRM policies of the publishers projected into the university library and beyond to the places where students and staff access these resources, both on- and off-campus? Publishing houses are still developing business models to cope with electronic distribution, some of which can limit the number of times publications are viewed, or printed, or limit the total number of people granted access.

Libraries need to cope with the vast increase in e-prints from formal publications, to grey literature, from theses and dissertations to exam papers. Now that networked access is possible for the digital form of these resources new access policies are required.

Libraries are also finding that there is significant overlap between the roles of librarians, teachers and learning support staff. Where once these were quite distinct, now the production, storage and reuse of reading lists, the cataloguing and management of learning object repositories, and the archiving and preservation of digital teaching resources are areas where responsibilities are blurred. All these aspects of managing digital resources require careful management of digital rights, including defining ownership, permitted uses (on which there is increasing emphasis), and authorisation. The diffusion between teaching and librarianship is an international phenomenon as seen by the Digital Libraries in the Classroom projects³.

4.4.2 Types of resources

Different types of resources will be protected under different laws such as copyright, database right and contractual agreements. Even if resources are protected under the same laws, there will also be differences in practical terms and these differences are usually linked to the granularity of the resource (Erickson, 2001a) and the fact that there may be several contributors. This is a topic on which many academics are unclear. At this stage some examples are used to highlight the issues but possible solutions are not presented.

Imagine a situation in which lecturer A writes a new topic for a course and, needing an image to illustrate a point, finds one in a repository which offers it freely for educational purposes. Lecturer A's topic is combined with others written by lecturer B and the course is made available to their students on a web site.

In the next academic year a visiting academic from the US, lecturer C, offers a new topic to replace one of lecturer B's topics and his topic is incorporated into the course. Lecturer C makes a CD-ROM copy of the course, with the agreement of lecturer A and B to take home to use in the US during the next academic year. He shows the CD-ROM to a publisher friend who wants to publish commercially. Who owns the rights in the works contained within the CD-ROM?

In a situation like this the only legal agreements are probably the employment contracts⁴ of lecturers A and B, which may or may not make clear who owns the work and who has authority to approve uses. However, many UK academics may assert that there is joint ownership of the contents of the CD-ROM although legally, where the contributions are 'identifiable' then ownership of the respective 'shares' will fall to those individuals or organisations, unless joint ownership and exploitation rights have been agreed, for example through a consortium agreement.

To summarise, there are many issues involved including:

³ http://www.jisc.ac.uk/index.cfm?name=programme_dlitc

⁴ Though the lecturer's institutions may have formal Copyright Policies which could be recognised as legal agreements.

- who owns what after resources are aggregated
- how much modification of an object is required to define a resource as a new work
- what are the rights of someone who has assembled a collection of works of others (e.g. a slide collection),

These issues are all resolvable through legal channels but there is little clarity in the eyes of academics.

4.4.3 Legal Framework

Many resources are made available within the existing legal framework but without any consideration given as to contractual provisions that may govern use. It is often preferable to provide a statement of permitted uses and conditions of use thus making it clear which exclusive uses have been licensed and for what purposes. This is usually done by licensing use of a resource.

In some cases the original author offers a licence to use a resource directly to those who will use it. This is the self-publication model where the author also takes on the role of publisher. An alternative is that the author licences the work to a publisher and the publisher licences the work to those who wish to use it.

The conditions of the author's licence to the publisher will usually be quite different from the conditions of the publisher's licence to the user. It is worth noting that for administrative efficiency publishers tend to "clear rights broadly and licence narrowly". The publisher might be a traditional publishing house but this role could also be taken by an organisation supporting electronic publication, for example a repository run by a subject specialist centre. In this case the author/creator licences the resource to the repository owner who then sub-licences the resource to users.

So there are three broad licence types: author – publisher; publisher – user; author – user. In the first two cases both licences are usually produced by the "publisher" as they have the financial capability to produce such legal documents. Each publisher may have very different conditions in the licences they agree with authors. As publishing houses experiment with different business models for the digital world, some diversity of licence conditions is likely to occur. The Copyright Licensing Agency and similar collective licensing societies might be expected to introduce a degree of commonality in licences but this has not been evident to date. JISC through its site licensing initiatives has been extremely influential in creating coherence and consistency in electronic licensing, for example through the JISC/PA model licence (Wise, 2004).

In the self-publication scenario neither the author nor the user may have the means to have a lawyer draw up a licence agreement. There has been widespread adoption of a number of standard licences which meet the requirements of many authors and users. An example of such a licence is

the GNU General Public Licence (GNU, 1991) commonly used for open source software. There are no options, though there are many variants, with this licence (also known as copyleft) but many people are willing to make resources available under its fixed conditions. It provides a legal framework rather than trusting to none at all. It offers an irrevocable licence to copy, modify, and redistribute the work freely but only under the condition that any redistributed material must be distributed under the same licence conditions.

More recently Creative Commons has introduced a selective licence approach allowing authors to choose from a limited number of conditions which are then combined to form a licence agreement. One feature of Creative Commons is that, like the GNU General Public Licence (GPL), it can include a “share-alike” condition. Creative Commons originated in the US and is finding some adoption in the UK through Oxford University, although there is some question about its applicability under English law and JISC is investigating an equivalent for use in the UK.

In addition to the licences under which traditional publishing houses operate there are a number of licences in use that have been produced by commercial providers (e.g. Ordnance Survey) or by specific projects (e.g. JORUM+ for their learning object repository, RoMEO for self-publication).

4.4.4 Technology aspects

Digital Rights Management technology has been evolving for a number of years and no clear technological solution has emerged. The first part of this DRM study very specifically avoided detailed consideration of technology as its focus was to establish the **requirements**. Only when requirements were clear could a technology be investigated to satisfy those requirements. It was outside the scope of this study to test and evaluate appropriate technologies. Fortunately, a considerable amount of work has been carried out by others, summarised here.

- **Metadata:** There is now widespread recognition that metadata is required to describe digital resources but there are various forms of metadata in common use: Dublin Core, MARC (libraries); IEEE LOM, Dublin Core (teaching and learning); metadata formats in research communities are very domain dependent but there is recognition that data needs to be accessible across disciplines (see for example O’Neill et al, 2003). The one thing that all these have in common is a completely inadequate structure for handling digital rights information.
- **Identifiers:** The importance of identifiers (Paskin, (2001)) cannot be underplayed as there is no means of asserting rights without being able both to identify the item over which rights are asserted and also the metadata in which the assertion is contained. Globally unique identifiers and their properties have been the subject of discussion in various standards bodies (TSO, 2004, Duncan, 2003; Powell, 2003) but, as yet, there is no clear consensus about which identifier system is most appropriate for UK HE and FE. There are several viable options but some leadership is required, perhaps from JISC, in advising on the approach to be adopted.

- Digital rights expression languages (DREs): Studies by CEN/ISSS (CEN, 2003), IEEE (IEEE, 2003) and the US Library of Congress (Coyle, 2004) have all surveyed the available digital rights expression languages. The IEEE study is still ongoing. None of these surveys has been able to recommend one DREL over all others for use in an educational context. In addition, there is no agreement on how rights metadata stored in a digital rights expression language should be linked to other metadata such as Dublin Core; MARC (libraries); IEEE LOM.
- Protection: Security methods such as watermarking (for visual resources), encryption which ensures that only those with a suitable “key” can use the resource, and tracking which is aimed at counting the frequency of use, are all rather “heavy” for self-publication but some have a role to play when a major publisher is the provider. Some image banks aimed at education use watermarking (e.g. Royan, 1999) as this allows them to identify any use of their images which is not permitted (e.g. commercial use)
- Projection of policy (middleware): While there continues to be no agreement on metadata and digital rights expression languages there does not appear to be a great demand for interoperability to enable portals, repositories, aggregators and brokers (as shown later in the JISC Information Environment diagram) to exchange digital rights information. However, technologies such as OAI, METS, IMS Content Packaging and IMS DRI are available to support projection of DRM policies.
- Authentication and authorisation: Authentication has been well served in the UK by EduserV ATHENS (<http://www.eduserV.org.uk/athens/>) and the JISC has recently committed to working with EduserV to offer a service “ensuring that users are given the simplest route to any resource, internal or external”⁵ using Shibboleth technology (<http://shibboleth.internet2.edu/shib-intro.html>). Authorisation has been investigated by the European project PREMIS (Privilege and Role Management Infrastructure Standards, <http://www.permis.org/>) and in the UK at Salford (<http://sec.isi.salford.ac.uk/permis/>).

4.4.5 Uses

Digital rights management is commonly about offering resources and reaching agreement on the uses to which the resources may be put. However, there is not often much discussion about what it means to *use* a resource. The Copyright, Designs and Patents Act, 1988, grants exclusive rights to the copyright owner, who may, in turn, grant licences to other to carry out the restricted acts. These include (as stated in section 4.2):

- To copy the work
- Perform, show or play the work in public

⁵ http://www.jisc.ac.uk/index.cfm?name=jisc_athens_shibboleth_pos_news050804

- To rent or lend copies of the work to the public
- Issue copies of the work to the public
- To communicate the work to the public
- Make an adaptation of the work

These actions are quite broad and in practice many academics wish to place more detailed restrictions on the uses that can be applied to their work. The law, however, is still unclear as to the extent to which a licence term might override any one of the exceptions/limitations to be found in the 1988 Act, such as fair dealing for non-commercial research and private study. Also, in law, if technical means override certain exceptions/limitations, there is not a quick and easy redress for the would-be user.

A useful vocabulary of uses can be created by merging the “use” terms from two of the most common DREs, ODRL and XrML. This yields the following uses:

- display** The act of rendering the asset onto a visual device.
- print** The act of rendering the asset onto paper or hard copy form.
- play** The act of rendering the asset into audio/video form.
- execute** The act of executing the asset. (For example, machine executable code or Java)
- modify/edit** The act of changing parts of the asset creating a new asset.
- excerpt/extract** The act of extracting (replicating) unchanged parts (or all) of the asset for reuse into another asset.
- annotate** The act of adding notations/commentaries to the asset creating a new asset.
- aggregate/embed** The act of using an asset (or parts of it) as part of a composite work or collection.
- sell** The act of allowing the asset to be sold (ownership transfer) in exchange of value.
- lend/loan** The act of allowing the asset to be made available for temporary use then returned (without exchange of value). During this period, the asset is only available to the lende. Temporal constraints are required for downstream use.

- give** The act of allowing the asset to be given away (ownership transfer) in perpetuity without exchange of value.
- lease** The act of allowing the asset to be made available for a fixed period of time then returned (for exchange of value). During this period, the asset is only available to the lessee. Temporal constraints are required for downstream use.
- move/transfer** The act of allowing a digital asset to move between data storage devices. Specification of constraints on the data storage devices may be allowed.
- duplicate/copy** The act of making an exact copy of a digital asset between data storage devices. Specification of constraints on the data storage devices may be allowed.
- backup** The act of making copies of an asset for the purpose of guarding against the loss of the original due to accident or catastrophic media or equipment failure.
- install** The act of allowing for the operation of loading, verification and certification of an asset into a data storage device.
- delete** The act of deleting a copy of an asset.
- verify** The act of allowing authorisation to check the authenticity of an asset.
- restore** The act of allowing the conversion of a backup copy into a usable copy in a controlled manner.
- uninstall** The act of allowing for the removal from or disabling of an asset in a data storage device.
- save/export** The act of saving a copy (including any changes) of an asset to permanent storage.

It is expected that in constructing licences these terms might be useful to specify which uses may be permitted or denied, but they may be insufficient.

4.4.6 Digital preservation

Preservation in this context means preservation of the digital rights information but this will be inextricably linked to long-term preservation of the resources themselves. Preservation of rights is technically no more complex than preservation of other types of media, but the most difficult aspect of preservation is the fact that rights will change over time so that

an item may have a whole series of rights associated with it over its lifetime. Eventually all copyrighted works enter the public domain.

For example, 80 university libraries may subscribe to an e-journal. Some of these, in years when funds are restricted may cancel subscriptions. In later years the subscriptions may be reinstated. Records will have to be kept for all subscribers for every year to ensure that those who have paid will retain access to the appropriate e-journals. This should survive the closure of journals or publishers. In the Netherlands the National Library (Koninklijke Bibliotheek, 1999) is taking responsibility for establishing a national repository of e-publications so that they may outlive their publishers.

Another aspect of digital rights management related to digital preservation (Ayre and Muir, 2004) concerns the activities that must be carried out as part of preservation. Typically, preservation requires: "migration", often involving format conversion, to overcome obsolescence; "emulation", in which obsolete systems are emulated to maintain the look, feel and functionality of the original; "re-creation" which may involve re-keying of data or reverse engineering. All of these are at least forms of copying and some may be considered forms of re-publishing. The CDPA allows copying for the purposes of preservation by libraries but only when the items are part of the library's "permanent collection" and even then only "where it is not reasonably practicable to purchase a copy of the item". This could mean that an item can only be preserved after it has become obsolete. The example above of the Koninklijke Bibliotheek is important because the library has entered an agreement with the publishers while it is still possible to carry out preservation, prior to obsolescence.

4.4.7 Architectures

JISC has developed an Information Environment architecture over a number of years, shown in the diagram below.

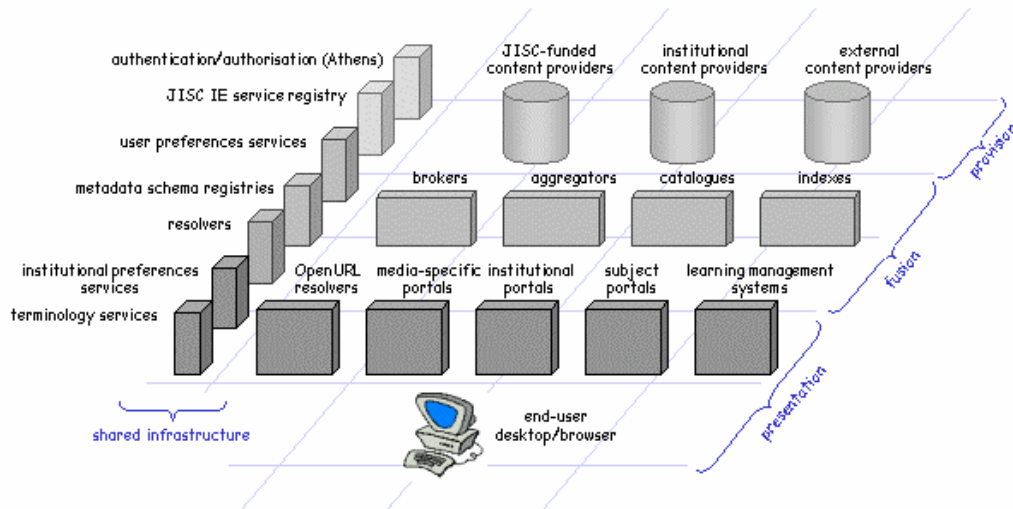


Figure 2: JISC Information Architecture (with thanks to Andy Powell, UKOLN, University of Bath (Powell 2003b))

DRM does not appear specifically on this diagram because when the diagram was put together, there was not clear demand for DRM solutions. In addition, DRM services need further scoping and specification. DRM will exist as part of the shared infrastructure (middleware). Each of the content providers (in the provision layer) can hold information about the digital rights associated with their content. The metadata schema registries (in the shared infrastructure) may hold the schema for one or more digital rights metadata schemas. The various components of the fusion layer may gather rights information from the provision layer in order to be able to present it to the user in the presentation layer.

The user might expect to be able to see the rights associated with any resource. They might also expect to be able to sort resources according to some rights properties. The full licence conditions should be available to the user, but some "shorthand" means of conveying this information would be useful since it is unlikely that many people will read full licence agreements for many resources. This may simply be a matter of user education as it is the users' responsibility to read the terms and to make sure they have read them when they say so (e.g. by clicking the "I accept" button on a web site).

Another architecture towards which JISC is working is the e-Learning Framework, shown below.

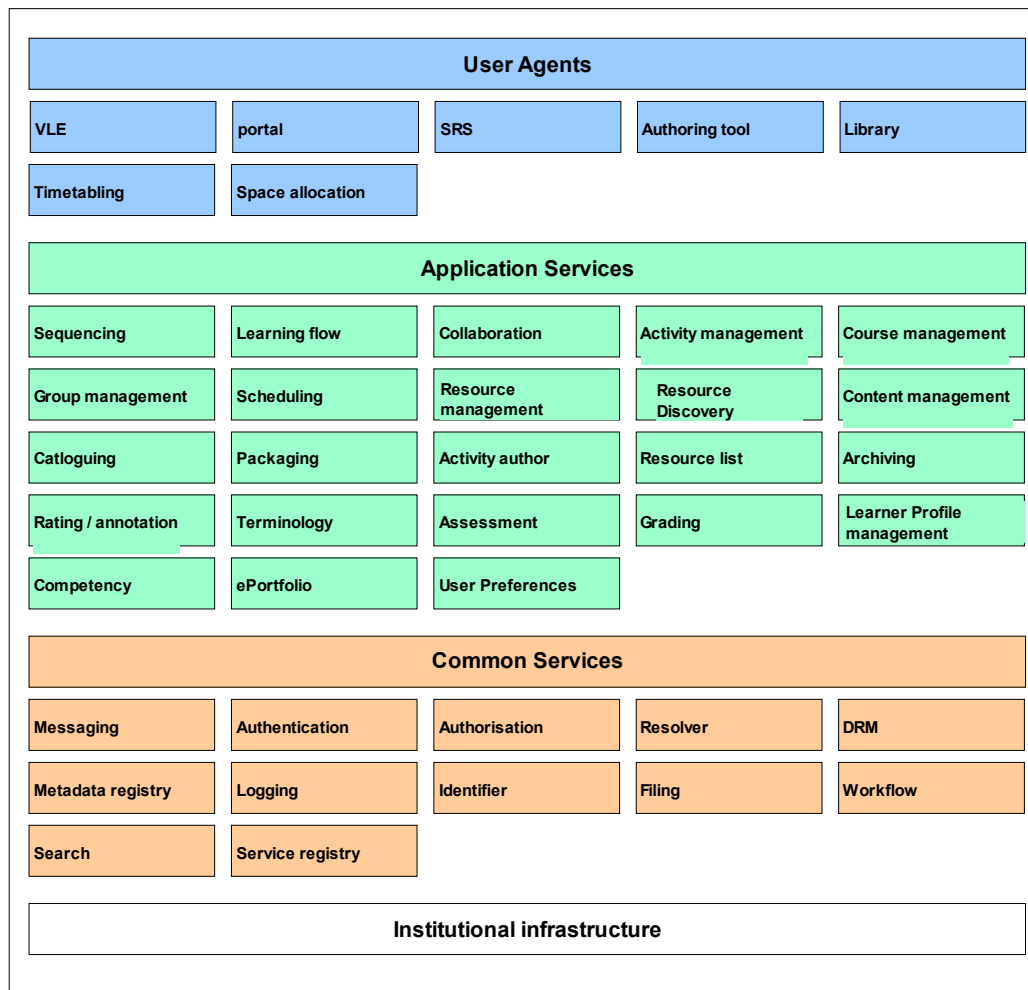


Figure 3: JISC e-Learning Framework (with thanks to Scott Wilson, CETIS (Wilson et al, 2004))

This slightly more abstract view has the user at the top of the diagram. Note that in both architectures it is assumed that the overall architecture will be accessible through a number of different tools. Behind the tools for e-Learning (VLE, Portal, Library, etc) lie a number of services which any of these user agents will require. These include ePortfolios, Resource Discovery, Packaging and other services which are specific to e-Learning. Below that the diagram shows other services which these e-Learning services may call upon but which are not exclusively for e-Learning. Note that many of these “common services” are the same as those in the JISC IE diagram in the shared infrastructure section. In this diagram DRM is shown as a common service.

One point that these architectures highlight is the need to define the relationship between a resource, which could exist in several location, the metadata for the resource, which could exist in many more locations, and the licences for the resource, which could be available from several different sources under different licence conditions. There is currently no clear definition of where licence information should optimally be stored. Some options are:

- Every resource contains within its rights metadata all details about its licence conditions.
- Each resource contains a reference to its licence conditions. The licences themselves being stored in a licence registry which can be treated as a “service”.
- Each resource contains a reference to its licence conditions which are stored by the licence granting body.
- A combination of all of these because some organisations will insist on one approach while others insist on an alternative. This can be described as a federated or distributed DRM approach (Martin et al (2002), Downes et al (2004)).

The requirements gathering part of this study helped to produce sufficient examples to make clear any advantages of one approach over another. There will always be a need to store some rights information with every resource if all contributors to each resource are to be recorded.

4.4.8 Standards

The UK HE and FE communities are also part of many world-wide communities. It is desirable that any DRM solutions used in the UK should adhere to international standards to maximise interoperability. The relevant standards bodies are: IEEE, CEN/ISSS, OASIS, W3C, METS, and ISO. Specific standards related to digital rights management are ODRL, MPEG-21 REL/RDD and METSRights though these cannot be considered in isolation as their use needs to be related to other relevant standards such as IEEE Learning Object Metadata and IMS Content Packaging in teaching and learning and MARC and Dublin Core in libraries.

5 Methodology

The approach taken in this study has been to develop a comprehensive set of in-depth *use cases* in order to ascertain the DRM *requirements* of UK HE and FE. All the available (and emerging) *options* to satisfy these requirements were then examined. This in turn highlighted where there are multiple options. The resulting options were then subjected to a cost/benefit analysis and a risk analysis. These analyses were placed in the context of two very different scenarios as the costs, benefits and risks depend on the context.

5.1 Use Cases

The “Use Case” methodology (Cockburn, 2001) is a means of defining the requirements of a system based on the goals of the users of that system. This ensures that the study is focused on the requirements of the users. The use of the word “system” should not be taken to imply there is some single software system in use. Although this methodology originated in software engineering it is now used just as frequently to develop business processes as it is to develop software systems. So the “system” may be a process or a series of inter-linked processes or systems. The point of the “use case” approach is that it doesn’t matter what the architecture is because that comes later. The use cases are simply a way of defining what people want to achieve.

The methodology is based on identifying the key participants (sometimes called “actors”) and their goals. For each primary actor and goal, one use scenario (or “use case”) is developed in detail and is examined to consider all possible alternatives to that scenario. A set of use cases is complete when use cases have been developed for the goals of all the primary participants. These use cases are described in terms of the user’s actions and make no assumptions about underlying technology. The use cases are then used to define the requirements for a system that will support these scenarios.

In order to create use cases a group of knowledgeable people with broad-ranging experiences of digital rights management in teaching and learning, research and libraries was required. The stakeholder groups who have contributed to this study include:

- **Projects:** Stor Curam, SUNCAT, eprints UK project, Project Romeo, Subject Portals Project, Spoken Word Project, HERON
- **Organisations:** Publishers Licensing Society Ltd (PLS), Authors’ Licensing and Collection Society (ALCS), Copyright Licensing Agency (CLA), British University Film and Video Society (BUFVC), Chartered Institute of Library and Information Professionals (CILIP), British Library, Rightscom, Copyweb, The Digital Archiving Consultancy, The Stationary Office (TSO), International DOI foundation, Jessica Kingsley Publishers, JISC Legal Information

Service (JLIS), Centre for Educational Technology Interoperability Standards (CETIS), Learning Teaching Support Network (LTSN), Higher Education Academy, Arts and Humanities Data Service (AHDS), Western Colleges Consortium, National Information and Learning Technologies Association (NILTA), Manchester Information and Associated Services (MIMAS), EDINA, Scottish Institute for Excellence in Social Work Education (SIESWE), Social Care Institute for Excellence (SCIE), Council for the Central Laboratory of the Research Councils (CCLRC), British Atmospheric Data Centre (BADC), Edinburgh University, Open University, Manchester University, Strathclyde University, Derby University, London School of Economics, Dundee University, Nottingham University

- **Policy Groups:** The Joint Information Systems Committee (JISC), The British Educational Communications and Technology Agency (Becta), Scottish Higher Education Funding Council (SHEFC), Scottish Further Education Funding Council (SFEFC)

All stakeholders were invited to a series of Use Case Workshops. These workshops were held around the country, and by popular demand a second workshop was held in Glasgow.

- London, London Metropolitan University 13 April 2004
- Glasgow, University of Strathclyde 15 April 2004
- Manchester, University of Manchester 14 May 2004
- Glasgow, University of Strathclyde 21 May 2004
- Milton Keynes, Open University 24 May 2004

In total 47 people took part in these workshops. They are named in appendix B and thanks are expressed to all of them for their significant contributions and for allowing their work to be used in this way.

At each workshop the objective of the study was introduced and an overview of digital rights management was presented. The productive parts of the workshop were in two parts. First, participants worked on their own to produce two use case summaries – short descriptions of a primary actor and their goal, usually no more than one or two sentences. This resulted in a collection of 125 use case summaries (appendix C). Then, working in pairs, the workshop participants expanded on one of their summaries to develop a complete use case. The process of producing a detailed use case is best illustrated by an example.

5.1.1 A Sample Use Case

The brief use case summary. Originally written by one person but now expanded by two to encourage challenging of assumptions

Use Case Summary

A researcher wants to compare and criticize the approaches of two other researchers on personality development by publishing an eprint that hyperlinks to papers by these researchers that are published in the e-journal collections of two commercial publishers.

The primary actor is a researcher and her specific goal for this "use" is clear.

Primary Actor (and goal)

Researcher	Publish her research and provide reference and access to cited journal articles.
------------	--

Other actors may also be involved. These are people (or tools) which have a direct involvement with the "system"

Other Actors (and goals)

Author	Provide access to all information required to understand her research
Reader(external or internal)	Gain access to all information required to understand the research paper

Stakeholders are those who are directly interacting with the system but who have an interest in its success.

Stakeholders and Interests

Institution	Enhance profile of institution via research of its staff
Authors of 2 papers	Authors know that their work can be read by those that seek it.
Library	Meet the information needs of researchers: authors and readers
Library and other institutions	Meet the information needs of their research
Publishers of commercial databases	Maximise usage and profile of service

Every use case has at least one success scenario. This is a situation in which the primary actor's goal is achieved in a clearly defined sequence of steps. It may not be the only way this goal can be achieved.

Main Success Scenario

1	Researcher publishes her paper with hyperlinks to the two cited papers
2	Internal reader reads papers and clicks on hyperlinks
3	Internal reader is linked to one paper in Science Direct and one in Emerald

4	Internal reader is authenticated by IP address
5	Science Direct and Emerald both authorise access
6	Internal reader can now see and print the eprint and both cited papers

Extensions

The extensions section shows alternatives to the main success scenario. The numbering relates to the steps on the success scenario so 1a and 1b are two alternatives to 1.

1a	Researcher uses Open URLs ⁶ rather than hyperlinks
1b	Internal or External Reader is routed through Open URL router and local open URL Resolver Service (if one exists) to the service offering the appropriate copy.
2a	External reader clicks hyperlink
2b	External or internal reader clicks Open URL
2b1	No E-Copy available
2b2	OpenURL router directs request through either local OpenURL resolver service or Balsa
2b3	Reader presented with appropriate record for print copy in local OPAC
2c	Internal reader using from external computer, clicks OpenURL
2c1	OpenURL router requests details of reader's institutional affiliation
2c2	OpenURL router directs request through local OpenURL resolver
2c3	Science Direct and Emerald both request ATHENS authentication
2c4	Reader provides ATHENS password
2d	URL of published article in service changes.
3a	Link fails

The extensions themselves have extension so 2b1, 2b2, 2b3, are all possible extensions of 2b. Extensions may result in success or failure. A failure will bring an end to the series of steps. A success brings progress to the next step in the main success scenario.

⁶ OpenURL is a method of creating a link to a resource without hardwiring it to a specific location. The link includes information that allows a resolver to identify an appropriate source for the resource.

A total of 26 detailed use cases resulted from the use case workshops (appendix D). Each has been edited to make the information anonymous and the original authors have been invited to check and revise the use case before it entered the analysis phase.

An additional set of 29 use cases was obtained from the IEEE Learning Technology Standards Committee Working Group on Digital Rights Expression Languages (DREL). These were not nearly as detailed as the use cases produced at the workshops associated with this study. They are similar to the 114 use case summaries produced in our workshops. The IEEE use cases and the remainder of the 114 use case summaries were held in reserve awaiting the result of a “completeness” analysis.

A set of use cases can be considered “complete” when all of the goals of all of the primary actors have been described. An initial completeness analysis indicated that the research community and publishers were under-represented. A series of additional interviews (section 5.2) was carried out and an additional six use cases were obtained. Another completeness analysis of these use cases was carried out and the results are shown in Appendix E. The 32 use cases were considered sufficiently complete in covering the goals of all the primary actors.

This use case methodology supports a direct relationship between a requirement and the scenario in which it is necessary. The converse is that no requirement is established unless someone has defined a scenario in which it is essential. It ensures that the requirements match the uses that have been defined, keeping the focus firmly on the needs of the primary actors.

5.2 Interviews

A series of interviews were used to gather additional information. Details of these interviews (agreed with the interviewees) are included in appendix F. As well as the information obtained from the interviews a total of six additional use cases were produced.

5.3 Requirements

The 32 detailed use cases were then analysed to distil requirements from them. An initial pilot phase was carried out to ensure that the methodology was consistent. This involved the analysis of two sample subsets which both consisted of six use cases.

The first subset was analysed by a group of experienced consultants annotating each case and then discussing the requirements arising from each case. From this process a set of requirements was produced with each requirement written in a generic form. For each requirement it is possible to identify every use case supporting that need.

The second subset was then analysed in the same way. As might be expected this second exercise both identified new use cases which support the first set of requirements and revealed new requirements. However, this process also began to suggest groupings for sub-sets of requirements. The analysis was repeated for further sub-sets of use case and the requirements and the way they are

grouped was refined at each stage until the categorisation described in the next chapter was reached.

It is important to recognise that the use cases and requirements have been developed in a way that is completely independent of technology infrastructure or architecture. As a result, the requirements define what stakeholders want to achieve. This may change with time but is likely to change more slowly than the emerging solutions for DRM which are developing rapidly. An indicator of just how rapidly the DRM field is developing is given in the very high proportion of references produced in 2004.

Although future government/institutional policy and court cases may have an effect on requirements the use cases and requirements, being independent of the technology, should stand the test of time and could be used in future as a benchmark against which to measure newly emerging technologies.

5.4 Interim Report

Once the use cases and requirements had been identified an interim report was published and a discussion meeting was held in London on 28 June. Interest in the Interim Report was very high. It was made available on the web and in the first five weeks after it was published it was downloaded 3000 times.

At the discussion meeting, attended by 22 participants, the initial requirements gathered from the use cases were discussed in breakout groups. Two scenarios requiring DRM solutions were also analysed and much of this analysis has been used to shape the cost-benefit analysis section.

5.5 Identifying Options

The requirements were categorised according to the DRM stages defined earlier:

- Recognition of rights
- Assertion of rights
- Expression of rights
- Dissemination of rights
- Exposure of rights
- Enforcement of rights

A detailed description of the requirements under each of these headings is provided in section 6. In each section the requirements are followed by a detailed discussion of options capable of meeting these requirements. It is intended that anyone in UK HE or FE will be able to identify a stage in either DRM Policy creation or projection and examine a set of options to determine which is most appropriate.

5.6 Requirements Analysis

Choosing one among several optional solutions to a DRM requirement is possible only by considering all costs, benefits and risks associated with that choice. Cost are high or low, benefits significant or not, and risks serious or negligible, depending on the context.

During the Interim report meeting, the individual requirements were discussed and marked as being core, frequent and occasional. Core means that the requirements are so fundamental that they will probably apply to the DRM needs of any organisation, large or small. Frequent requirements will probably occur in at least 30% of organisations. Occasional requirements have not been included in this report. In subsequent sections, requirements are referred to by the number of the use cases (Appendix D) which gave rise to them, e.g. UC17. For core requirements the use case is indicated in capitals (UC) and for frequent requirements lower case is use (uc),

6 Outputs

In this section requirements are derived from the use cases and options which can meet these requirements are discussed. For a summary of these options in the form of recommendations for implementing DRM see section 8.

6.1 Recognition

The first stage in DRM policy creation is the recognition of digital rights. There are many different aspects to this recognition stage. These start with defining who owns material, and then considering how that material might be managed. The management differs depending on whether the material is owned by the organisation or by a 3rd party. Plans for the use of the material must be established and on the basis of these plans the rights clearance process can be undertaken. This process must be recorded. The outcome of the clearance process may also require a stage of planned risk management.

This section gathers the requirements that have been identified at this recognition stage and offers some solutions for these requirements.

6.1.1 Requirements

6.1.1.1 Define Ownership

Clarification is needed (on all sides) regarding the following points:

Who owns the copyright in resources produced by academics employed in HE and FE (UC13)? The law is clear about the employer owning resources created during the course of work. What is not clear is what the position is within insititutions.

Which methods of publishing materials are permitted to employees of institutions? (uc20, uc28)

What happens if there is a conflict between employment contract and individual rights? (UC15, UC19)

What is the institutional policy for use of materials which have been created or modified by students: who owns the IP rights and how might these rights be transferred? (uc22, uc10)

Ownership of resources must be agreed from the outset (UC13) or at least at an early stage (UC4).

As it is necessary to ensure compliance with copyright law (UC11 UC24) there is a need to raise awareness about what is already covered by copyright law, and what is considered fair dealing.

6.1.1.2 Control of Own Material

Even when material is clearly owned by an institution, management of the material over its lifecycle is important. For example, it needs to be explicitly agreed who owns IP when collaboration ends (Interim report meeting).

Who is to own the IP in a particular resource after delivery (UC13)? What happens to ownership if changes are made to the resource?

When research sets are stored in data centres it is not always clear who the owner is (Appendix F: Interview 5) and procedures vary for different subjects

6.1.1.3 Control of 3rd party material

Over 10 use cases were concerned with the use of third party materials and the problems which could be involved.

For data centres, which have responsibility for storing materials from third parties without taking ownership, the depositor trusts the data centre to provide adequate security (UC25). This can be through policies for dealing with misuse (UC7) or protection by technical means (UC2). Similarly when collaborative data is produced as a result of work by several institutions and are stored, the responsibilities for storage need to be clear (UC15, UC25).

Generally within the community and the use cases, there appears to be recognition that publishing and sharing material with others requires a higher degree of adherence to the rights of third parties than does using the same material for personal study. The main challenge is for the librarians to be able to communicate the licence terms to the users (Appendix G: focus group) though communication of licence conditions between other groups is also important (e.g. teachers to students; research group heads to postgraduate students, etc). It has been suggested that a standardised set of licences agreed between the library and publisher communities (UC2) is needed.

6.1.1.4 Plan Use

Consideration of the intended use of third party materials is an essential stage in the clearance process; having to clear rights a second time can be an expensive process (Appendix G). However it must be accepted that the type of usage may be extended in the future (uc15) and that licence conditions may have to change

with time (uc10) or new licences may need to be granted (interim report meeting)

The possible types of use include rendering, transport, editing and utility. The following types were identified directly from the use cases:-

- Types of rendering usage suggested by use cases were read (UC6), print (UC6, UC16, UC19), view (UC6) and use in face to face teaching (UC19) or VLE (UC19, UC31).
- Transport uses include download (UC11, UC19) and republishing and redistribution of material (UC4)
- Allowing methods of editing materials also has to be considered including modify or re-version (UC14, UC12, UC11, UC24), disaggregation while maintaining integrity (UC12, UC1), aggregation (UC12).
- In addition changing of format (UC15) may be needed for archival (UC20) or compliance with the Disability Discrimination Act (DDA).

For all these types of uses there are often restrictions which the author or publisher may impose, or requirements that the user is obliged to adhere to. A frequent requirement is for the crediting or acknowledgement of the author (UC14, UC 22, UC19, UC28). Another typical condition is that the resource should not be used for commercial purposes (UC2, UC19, UC20, Appendix F: Interview 1)

Another common restriction is that the integrity of the digital object must be maintained – it may not be edited (UC17, UC 27). Also there can be restrictions about having to make any modifications publicly available or making sure that the original data cannot be extracted from a modification of the data (Appendix G: interview 3).

Restrictions may also be placed on the categories of people using the material. For example, user groups (UC21, UC19, UC16, UC4, UC10, UC25, UC21, UC32) may be restricted to teachers (UC 19, UC 27) or students (UC 21) and the number of permitted end users may be capped (UC 19, UC 10, UC 32, UC 32). In addition limits may be placed on the duration for which uses are granted (UC3, UC26, UC19, UC4, UC 32), and the territories in which they may be used in terms of jurisdiction (UC10) and geographical boundaries (UC10).

To summarise, there are many different possible uses and conditions which may need to be negotiated.

6.1.1.5 Record Clearance Information

Rights clearance methodologies are not always well known within the FE and HE sectors; institutions need information about procedures for obtaining copyright clearance and best practice guidelines (uc8). There also needs to be an efficient method of clearing rights (UC22). Centralised clearing agencies already in use

by HE⁷ could increasingly help the FE sector. Use of HERON shows there is demand in HE.

Many different types of use and restriction conditions are possible and detailed communication between librarians or resource managers and right holders will be required (UC4, UC12, UC14, UC22).

In addition, there is a need to capture agreements relating to costs as well as conditions of use (UC31). The methods of capturing agreements will vary and can range from email agreements to electronic contract agreements (UC30) to signed paper licences (UC30)

Risks associated with use need to be known and made clear (UC3, UC14, UC18, UC 10, UC27) at institutional and individual levels. Risk assessment decisions based on methods of clearing rights and permitted uses will have to be made and stored (UC3, UC10).

Individuals need to know more about the consequences of breaching conditions (UC11, UC24). Institutional policies need to be put in place for dealing with misuse (UC17).

6.1.2 Options

6.1.2.1 Define Ownership

There is evidence of confusion within the academic community about who owns resources they have created as part of their employment duties. However the HEFCE report *Intellectual property rights in e-Learning programmes* (HEFCE, 2003, pg 10) clearly states that the institution has ownership though it would be helpful to make this explicit in the contract of employment. Model contractual clauses for members of staff creating e-learning materials are appended to that report. If external contractors are paid to produce content, it is necessary to be clear about ownership of the IP in the contract. HEFCE has model clauses for freelance staff. Students producing materials own the rights to their own IP and HEFCE recommends that optional contracts should be used and model clauses are provided.

Despite this clear guidance from HEFCE, custom and practice⁸ in higher education suggests that there are aspects in which individuals are permitted to assign rights in their work, for example when writing a textbook which many might regard as beyond the job description of a lecturer. Teaching materials and research/scholarly materials are sometimes treated differently, with some universities assuming complete ownership of teaching materials while agreeing to shared ownership (shared between the individual researcher and the institution) of research outputs such as patents. There is an obligation on each

⁷ Gadd (2002) found 77% of HE libraries use clearance agencies.

⁸ For example, after complaints were received, Cardiff University withdrew a clause in a proposed new employment contract pointing out that the University owned lecturer's lecture notes and that they should be handed over to the university when staff leave. (Times Higher Educational Supplement, 27 July 2004, http://www.thes.co.uk/search/story.aspx?story_id=2014695 (registration required))

institution to make very clear the policy within their own institution. Until this is achieved the present confusion will continue.

Agreement	Page
Model contractual clauses for employment of staff	26
Model contractual clauses for freelancers	29
Model contractual clauses for students	31
Sample consortia agreement for multi-partner collaborative R&D projects	38

Table 1: Summary of Contractual Information provided in the HEFCE guidelines *Intellectual property rights in e-Learning programmes* available at http://www.hefce.ac.uk/pubs/hefce/2003/03_08.htm (HEFCE, 2003)

When there are several parties involved in creation, under copyright law, each contributor will have ownership over the material they have created. Often this issue is dealt with through informal agreements though this may cause problems in the future, particularly if there is potential for exploitation or reuse. To make the situation clear, a contract is necessary. Examples of such contracts are available (JISC/TLTP, 1998; HEFCE, 2003).

For research activities, it is often a condition of funding that data is deposited with a data centre though it is often not clear who owns the actual data (Appendix F: interview 5) and there appear to be different attitudes within different communities (Appendix F: interview 3). Since there are new data centres for research data starting up, a study into how research data is managed by established data centres may help to provide guidance. For example it appears that some data services, such as the Arts and Humanities Data Services (AHDS), are more aware of the issues involved in long term storage than many of the scientific research data storage centres.

Further information about teaching and research material ownership is given in Policy Approaches to Copyright in Higher Education, pg 35 (Weedon, 2000).

6.1.2.2 Control of Own Material

Although institutions **may** have ownership over material, it will be the individual who takes the decision as to what can be done with materials. This can be for quality checking or for making sure that material which may be of commercial value is exploited. Different institutions will have different policies about how to deal with this.

When an institution asserts ownership in the copyright, the moral rights of the employee are not the same as if they are the copyright owner. The right to object to derogatory treatment is qualified where the employer is the owner such that it does not apply unless the author is identified at the time of the derogatory treatment. It can further be limited by the use of a disclaimer. The right to be identified as the author does not apply in employer-owned works to anything done by or with the authority of the employer.

So, if an employer (the institution) circulates copies of a work without the name of the author attached – there is nothing the author can do. If that work is subject to derogatory treatment then the author will have no come-back unless he/she is identified as author at that time. It is still possible for an employee to assert the right to be identified as author, and indeed object to derogatory treatment if they are so identified at the time of that treatment.

The procedures involved in disseminating materials belonging to the institution were discussed in interviews and focus groups (Appendix F: Interview 5) and (Appendix G). In some cases an internal clearance procedure is necessary but in other situations it is permissible for the individual to disseminate their work. Even if the institution does take control of content created by an individual, there is a strong feeling within the community that the author's right to attribution and to object to derogatory treatment should be preserved. (HEFCE, 2003)

Generally, the indication here is that pragmatic solutions are necessary. It is important that members of staff are aware of their institution's procedure and who they should contact if there is any doubt.

6.1.2.3 Control of 3rd party material

When 3rd party material is used, either through an author incorporating it into his or her own work or by obtaining a composite work which already includes 3rd party material, it is necessary to record details of the 3rd party material. This process is well established, for example, when the 3rd party material is broadcast in TV or radio programmes (www.intellectual-property.gov.uk, 2004) through the Educational Recording Agency (ERA) or the Open University Worldwide Licence. ERA (ERA, 2004) makes it very clear what information about the third party material (in this case TV or radio programmes) must be recorded.

For other 3rd party material, not covered by a collective licence such as ERA's, similar information also needs to be recorded but, in addition, the conditions of use must also be established and recorded.

When material containing 3rd party material is stored there may be a lack of willingness within the community to carry out this task, particularly in the e-learning community where the value of the material is often unclear. It is good practice for the author or aggregator of the original material to collect the relevant information and pass it on when material is offered to others. This information needs to identify all licences required to use the 3rd party material.

The types of skills involved in storing and using third party material include knowledge of several aspects of the law including the Data Protection Act and copyright law along with the practical issues involved in the administration and storage of appropriate records. Practices and laws do change so the person involved must keep up to date. The Chartered Institute of Library and Information Professionals (CILIP) website contains up to date information about professional ethics codes (<http://www.cilip.org.uk/professionalguidance/ethics/default.htm>) and copyright

law (<http://www.cilip.org.uk/professionalguidance/copyright/guidelines.htm>). The JISC Legal Information Service (<http://www.jisclegal.ac.uk/>) can provide legal information to people in the FE and HE sectors.

Institutions could provide a contact member of staff as recommended in Policy Approaches to Copyright in Higher Education, (Weedon, 2000) and raise staff awareness, of the issues involved with using third party materials. The report on IPR in Networked e-Learning (Casey, J., 2004) comments on the fact that librarians have skills in this area and should be involved. There could also be a role for JISC in coordinating or providing a rights clearance management system. Gadd (2002) found that satisfaction levels for existing clearance services are mixed with equal numbers of negative and positive comments.

6.1.2.4 Plan Use

Obtaining clearance for use of third party materials can be a time consuming and costly procedure which may not always be successful. Not obtaining clearance can mean infringing copyright and/or database laws. There is little case law in this area concerning academic institutions, though many say that there have been out of court settlements. Institutions tend not to want to risk becoming a test case. While respect for the law should be maintained, rights clearance is also about risk management. The appropriate procedure to adopt will vary depending on:

- Types of material (For example incorporating material from a recent well known film or medical images may be risky)
- Intended use (Commercial exploitation or modification in such a way that could be seen as affecting the integrity of the work increases risk)
- Audience (For example, risk is far greater if the material can be seen publicly than if it is on a university network)

Critically, it is necessary to look at the time and effort involved and develop a plan for how to approach clearance, particularly where risk is involved.

6.1.2.5 Record Clearance Information

Gadd (2002) has surveyed the copyright clearance approaches of HE libraries in the UK⁹, finding that 56% of clearance is carried out by staff in libraries. The most common purposes for which clearance was required are coursepacks, short-loan and distance learning. From this survey Gadd produced a step by step clearance guide:

1. Receiving request from internal customer
2. Assessing request to see if clearance is necessary
3. Checking accuracy of bibliographic information
4. Check if requested materials were authored in-house
5. Trace rights holders
6. Generate and send request letter

⁹ Links to the copyright clearance units in many universities are provided at <http://www.lboro.ac.uk/library/crightpages.html>

7. [Chase request]
8. Check terms and conditions of granted permission (or negotiate a refusal)
9. Notify internal customer of request outcome
10. Receive approval from customer
11. Pay rights holder

Zheng (2003) also describes the copyright clearance mechanism for libraries in Singapore where the copyright law is based on the same principles as in the UK. Crew and Wong (2004) have surveyed the copyright policies of US Universities.

Casey (2004) discusses many aspects of obtaining copyright clearance for third party materials in networked e-Learning. His report gives details of different approaches which may be required for text, film, music, broadcast media and newspapers. It then explains the methodologies involved in clearance of rights (including negotiation and storing of records). The report also comments on the role of institutional librarians in administering such processes.

With research data sets, there are issues associated with database rights and ownership of data may not be clear. Different subject areas appear to have different codes of practice (See Appendix F: Interview 3) which may be controlled by a number of different laws and regulations and a plethora of advice/practice from professional bodies. Examples of situations in which obtaining clearance could be necessary include use of data about patients in which patient's consent is needed (See Appendix F: Interview 2) or for particular uses of large atmospheric data sets in which some of the data is to be reproduced (See Appendix F: Interview 3).

The CLA (www.cla.co.uk) offers a licence for educational institutions for photocopying of copyright work within set limitations. In addition they are currently working on a licence for the digitisation of materials. Other licensing agencies exist to deal with different media types.

Organisations such as HERON (<http://www.heron.ingenta.com>), Appendix F: Interview 2) and MAAS (<http://www.bufvc.ac.uk/maas/>) can reduce administration for institutions in obtaining rights to use third party materials.

The Institution may also apply to publishers, data centres or author's agents directly to get permission to use material or they may obtain subscription licences. This means that there will be different types of materials from different sources obtained under different types of agreement. The types of agreement involved are important as this provides evidence of clearance. The amount of evidence required depends on the data and supplier: e-mail acceptance depends on the clarity of the email; a click agreement is based on a formal licence; a physically signed document formally links the identifiable person to the agreement in a form that can be stored. The only time an issue might arise is where an assignation is required to be 'in writing'. A licence can be in any form – including verbal (but that is difficult to keep in records).

This will mean that there will often be a range of materials which have to be given different levels of access to different users. Librarians may find it necessary to adopt the lowest common denominator approach and avoid the risk of litigation. This means that if there is any doubt in the contracts or if information is omitted, the resource will be given to a narrower audience (Appendix G: focus group) or to an audience but for a narrow set of uses.

Although it will not always be possible to make use of standard licences due to the differences in allowed uses and restrictions between different publishers, the move towards publisher/librarian standard licences such as the JISC model licence (<http://www.ukoln.ac.uk/services/elib/papers/pa/licence/>) can help to allow wider access.

6.2 Assertion

6.2.1 Introduction

Assertion of rights is provided by a legal framework in which people and organisations can assert their rights in a form that is defensible under law. Resources are protected through different legal channels including, for these purposes, copyright law, contract law and database rights.

In the process of asserting rights, consideration will have to be given to the method to be used for publication, types of permitted uses and constraints upon use and publication.

6.2.2 Requirements

6.2.2.1 Publication Method

There are many different methods of resource publication including;

- Publication in Journals
- Publication of books through publishers
- Publication in e-journals
- Self Publication (e.g. posting on an internal institutional intranet or VLE; posting on the internet allowing wider access)
- Depositing in data centres
- Open access publishing: institutional repositories in which all publications, or at the very least those produced under government funding, will be made readable by all with no charge

Incentives for publication can be very different including recognition, attribution and providing access (Appendix E: Stakeholder Analysis) or it may be a condition of funding that project outputs are placed into a data storage facility (Appendix F: Interview 1 & Interview 3).

6.2.2.2 Permitted Uses and Constraints

There is much flexibility in how digital materials can be used. In section 6.1.1.4 the uses identified in this study's use cases were detailed. Here we look further afield to ensure that a comprehensive view of uses is presented.

For digital resources, the rights of use can be thought of in terms of the permitted uses and the attributes which are associated with those uses (Rosenblatt et al, 2002). It is also suggested, by Rosenblatt et al, that these

permissions can be split into four groups: Render Rights, Transport Rights, Derivative Rights and Utility Rights. ODRL (2002) also splits permitted rights into four groups called Usage, Reuse, Transfer and Asset Management

- Render (or Usage) rights are the rights to represent content on some specific output medium. They include viewing on a screen and printing out as hard copy
- Transport (or Transfer) rights are the rights to move or copy content from one place to another. They would include such actions as downloading a resource onto a PC, copying onto a CD-ROM, scanning or digitising, moving or lending a resource, or selling or giving the resource to others.
- Derivative (or Reuse) rights are to do with manipulation of the content to create additional derivative rights. These include the use of excerpts from a work, the right to embed the content in its entirety in a different content item and the right to edit/modify the material
- Utility (or Asset Management) rights are to do with technological necessity such as backing up a file or altering a file format for preservation purposes.

Each right may also have specific attributes or constraints. Rosenblatt highlights cost, location of users (geographical) and extent of use (number of users) while ODRL adds device restrictions, temporal bounds and target uses as additional constraints. For FE and HE, target uses might also include a prohibition on commercial use and a requirement that the author be acknowledged. In addition it may be necessary to monitor the use of resources.

An individual author or contributor may not necessarily wish to consider issues to do with use or constraints on use. It is therefore important to think about what author's general requirements might be and how those could be addressed. The sample group of use cases (32) from this project is rather small to represent the views of the community, so consideration should be given to the results of other studies. In particular, studies by RoMEO and the ALCS give an indication of the concerns of authors.

6.2.2.2.1 ALCS Summary

The ALCS has kindly allowed the use of an unpublished research report on digital scanning of books and journals, produced in July, 2004. The report is based on 662 questionnaire returns from writers whose published work(s) are used or are likely to be used for various courses at colleges and/or universities. The study concentrated on the attitude of authors to digital scanning of their work.

The major concerns of the authors appear to be to do with moral rights, accreditation and retaining integrity of work, though a significant number of concerns were raised about royalty payments. In general they feel that the rights associated with scanning should be the same as those currently associated with photocopying (see current photocopying conditions at <http://www.cla.co.uk/>).

For storage and access it was noted that the majority of authors agree with students being able to access materials through a university network or by using

a password protected system. However the majority were not in favour of allowing access by an unprotected website and there were concerns about saving materials on CD-ROM, downloading to PCs and printing out multiple copies of resources. The length of time over which the material would be stored was also considered to be important and most agreed that one year would be an acceptable period of time to store a scanned copy but there were concerns over storing the material for a period of 5 years.

Modification of work was clearly the area which authors showed most concern about. In particular very few were in favour of editing of words and phrases within text and for this reason there was concern about the use of OCR technology. There was also a 50/50 divide over whether parts of the author's work should be integrated with other text. However the majority were not concerned about altering those aspects which have less effect on the integrity of the work such as fonts, formats and colours.

Although not covered in the questionnaire, there was a section in which authors could raise comments. Many comments were raised about moral rights including integrity and accreditation, and ownership of copyright was an issue. Comments were also made concerning royalties and the control of scanning.

6.2.2.2 RoMEO Study

The RoMEO Study (Gadd et al, 2004) is the final study of a series of six which investigated IPR issues relating to academic authors self-archiving research papers. It reports on results of a survey of 542 academic authors showing the level of protection required for their open-access research papers.

The results from the analysis were used to form general permissions, restrictions and conditions (PRCs) required for open-access works which could be expressed as elements in a digital rights expression language. When over 60% of academics agreed to a (PRC) it was considered important enough to make it a mandatory element and if there was a 50-59% agreement it was considered as an optional element.

The issues associated with saving and access were given mandatory status so that resources could be viewed on screen and copies could be forwarded to colleagues, printed, or saved on disk.

With regard to modifications, users would only be permitted to use exact replicas, though they would be allowed to use excerpts. Aggregation was considered to be an optional element. With all types of use, attribution of the author was considered mandatory.

Selling on a cost-recovery basis or as a commercial enterprise was prohibited and use for non-commercial purposes was as an optional element.

6.2.2.3 Summary

There are similarities between both studies in the author's concern about accreditation and integrity of their work. Other references such as the JORUM DRM report (Halliday 2004) also note that attribution and intellectual fidelity are as important to the author as economic gain. Both studies showed a high level of concern about modification of text and the need to preserve integrity and

some concern about aggregation. However the use of excerpts was considered acceptable.

The major differences between the results of the studies were to do with controlling access. The RoMEO permissions allowed for free transfer, viewing and printing of resources whereas the ALCS study results showed that the authors were more concerned about control, protection and royalties for their works. It should also be noted that neither of these surveys was intended to embrace all authors, each addresses a specific group, and others may be unrepresented.

The results of these studies have been confirmed to some extent by the use cases. Ten were concerned with the modification of digital resources and many dealt with issues of controlling resources (for example 9 use cases were concerned with permitted user groups)

Topic	Number of Use Cases	Cases
Modification	10	UC 14, UC 12, UC 11, UC 24, UC 1, UC 21, UC 20, UC 15, UC 17, UC 27
Commercial Use	3	UC2, UC 19, UC 20
Duration of Use	6	UC4, UC32, UC 13, UC 26, UC 19
Allowed User Groups	9	UC21, UC 19, UC 16, UC 4, UC 10, UC 25, UC 21, UC 32, UC 27
Number of Users	4	UC19, UC 10, UC 23, UC 32
Acknowledgement	4	UC 14, UC 22, UC 19, UC 28

The RoMEO study is aimed at the self publishing community and the ALCS study deals with authors who use commercial publishers. It is thought that between these studies the views of a representative sample of authors, who produce resources for the academic community, have been canvassed. However, more information is needed with regard to research data sets since, from interviews with the British Atmospheric Data Centre (Appendix F, Interview 3), it seems that there would be quite a degree of variation between different research communities concerning rights associated with data sets.

6.2.2.3 Licences

There are several situations in which a resource can be offered from one person to another. It should be noted that assignation, an outright transfer of property, is not expected to be a common occurrence. Here we focus on transferring a copy of a digital resource under a licence which permits or restricts its use. Such licences might include:

- Licence between author and user (e.g. reader)
- Licence between author and publisher
- Licence between publisher and user

For each of these transactions, a licence is necessary. These can be in the form of formal documents, letters or emails.

When materials are contributed to data centres, the types of licence agreements can differ quite widely, a result of the differing communities and their concerns and practices (See Appendix F: Interview 3). The same can be said of publishers who have different attitudes towards use and constraints. (Appendix G: focus group). As a result there is considered to be a need to move towards a standardised set of licences agreed between the library and publisher communities (UC2)¹⁰

There is also a desire for common licences to allow all UK FE/HE to use materials (UC14). In particular a study by the CLA, E-Learning Research (FE and Schools), A Discussion Paper on User Needs (Dyer, 2002) has shown that FE institutions acknowledge that there are problems with the current situation with regard to exploitation of digitised materials and that there are frequent infringements. The study concludes that there is an awareness that this is happening and that authors should receive royalties.

The formation of licences is important:-

- They must be valid. Putting together different terms from various licences may not make a valid licence (UC18).
- Care must be taken with definitions. If a definition is unclear it can lead to confusion and intentional/unintentional misuse. In particular several use cases commented on the lack of clarity concerning non-commercial use (UC2, UC 19, UC 20)
- Only those uses that are expressly permitted in a licence are allowed. If one type of use is not mentioned in a licence then it is not permitted (unless it is already permitted under copyright law or fair dealing exceptions).

Other terms and conditions which should be included in a licence are:-

- Defining who takes legal responsibility for any third party materials contained within a resource (UC6, Halliday, 2004)

Capturing details of agreements was considered to be important for both contributors (UC15) and users (UC15, UC16, UC10, UC19, UC20, UC23, UC2, UC 27, UC30). For user licences it was suggested that licences should be based on universal permission statements when joining/subscribing to a service (UC23)

6.2.2.4 Changing of Licences Terms

It was noted that resources may frequently be updated so some form of version control is required (UC 12). In addition situations may occur in which a resource needs to be withdrawn from a system so there needs to be a procedure to

revoke previously agreed permissions (UC26, UC17). Conversely there will also be situations in which the terms of the licence will have to be extended (UC12, UC 11)

Conditions will also change with regard to subscription licences to data services and details may have to be stored to identify what resources the (ex)subscriber has access to (uc25).

6.2.3 Options

6.2.3.1 Publication Method

The traditional "supply-chain" for published information, books, video, data, etc. has enabled an author or creator to work through a publisher which then supplies a distributor which may be a shop¹¹ or library and for the user or reader of the information to obtain the material directly from that distributor.

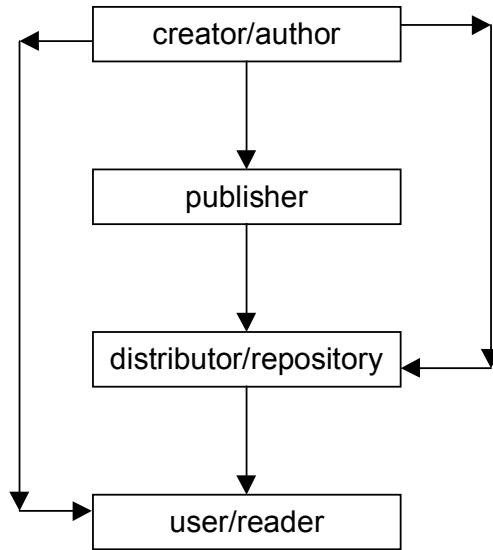


Figure 4: Simplified view of traditional and new supply chains

In Figure 4 above this chain is shown as the central downward arrows. At each stage in the process there is a licence or contract (sometimes implicit, for example, in the sale of a book) between the participants. Examples of such contracts can be seen in Appendix H.

The appropriate publication method to use depends on the motives of the rights holder. The rights holder needs to be aware of the different methods of publication and what the implications are. In particular the process needs to be fair and the rights holder should be able to receive independent advice. Such advice can be obtained through the JISC Legal Information Service (<http://www.jisclegal.ac.uk/>)

Issues which the rights holder should be aware of include:

¹¹ wholesale and retail components of the supply chain are merged into this single entity

- What are they trying to achieve with this work and which “publication” route or agencies are best to facilitate this goal
- What rights should be giving to publishers (e.g. how this might affect future exploitation or what rights the author has to use the material once it has been licensed or assigned to the publisher)
- Consideration of self publication and methodologies available (see for example the RoMEO website, <http://www.lboro.ac.uk/departments/ls/disresearch/romeo/index.html>)

Self publication of materials is becoming more common as people become more familiar with the internet. When resources are posted on the internet they are automatically protected by copyright though this copyright can be somewhat restrictive and may not permit the uses the rights holder may wish to grant. Publication under a Creative Commons licence (<http://creativecommons.org/>) allows the rights holder to choose a licence which permits different uses of their materials whilst still retaining ownership. This approach has been used for educational resources in the USA, e.g. MIT OpenCourseware. It is currently being adapted for UK use at Oxford University (<http://creativecommons.org/worldwide/uk/>). As well as adapting it for use with a different legal system, resources created at UK FE and HE institutions will generally to be owned by institutions whereas Creative Commons is designed for situations in which individuals have ownership.

Digital repositories can now also fill the role of distributor and authors can provide material directly to repositories without involving publishers. Repositories need to be able to licence material from individuals, projects, institutions and publishers and sub-licence the material to users on terms agreed with the suppliers.

The Committee on Science and Technology has just produced a report¹² focussing on an open access model. The recommendations include that all UK higher education institutions establish institutional repositories on which their published output can be stored and from which it can be read, free of charge, online. It also recommends that Research Councils and other Government funders mandate their funded researchers to deposit a copy of all of their articles in this way.

6.2.3.2 Permitted Uses and Constraints

Before looking at licence agreements it is important to be aware of the concerns of authors and users of digital material in order to identify practical solutions. The results from the ALCS and RoMEO studies clearly identify areas which are of concern to authors and have important implications for expression of digital rights and for writing licences. For individual projects, it is recommended that a permitted use and constraints table (appendix I) is drawn up before considering DRM solutions.

¹² <http://www.publications.parliament.uk/pa/cm200304/cmselect/cmsctech/399/39902.htm>

No studies involving different permissions and constraints for different types of research data sets have been found and it is thought that the research community could benefit from such a study.

Such studies should be used to inform the development of licences and digital rights expression languages.

6.2.3.3 Licences

Appendix H lists different types of licence. These include examples of licences in which:-

- Authors license material to the publisher/data service
- Publishers license materials to the user
- Higher Education Institutions photocopy material under licence from different publishers
- Material is published by the author

Moves towards the use of standard accepted licences (where possible) may help to simplify the administration involved in dealing with licences and the development of digital rights expression languages. The need for standard licences was noted in the JISC Long Term Retention and Use of E-Learning Objects and Materials (Barker et al, 2004) which recommended a model licence for sharing of e-learning materials. The JISC have recognised the importance of such licences and have developed a model licence (Appendix H, Licence 24) between publishers and librarians.

The move to form such standard licences might involve classifying licences into types of permitted use. This sort of activity has been carried out by Creative Commons and AE Sharenet (<http://www.aesharenet.com.au/>)

The licence categories used by AE ShareNet include:-

- AShareNet U – Unrestricted, typically low value material which is not specifically associated with a particular copyright owner
- AShareNet P – Preserve the integrity of the material. This lies between U and S. it is typically material which derives value from its completeness or consistent form
- AShareNet S – Standard Licence. Typically for commonly available material or low/medium value material where the cost of a one-off licence is disproportionate to the value of the material or where open access is the principal objective
- AShareNet C – Customisable licence suitable for commercial, value-added or discretionary training material which does not warrant a standalone agreement.

The JORUM report on DRM (Halliday, 2004) for a repository of learning objects recommended that two licences be formed: one to permit repurposing of deposited items and a second which would prohibit repurposing.

Such moves to form standard licences need wide consultation with stakeholders and could make use of surveys such as those conducted by RoMEO and ALCS. This would facilitate a selection of licence terms to cover the viewpoints of stakeholders.

Standard licences can also be used by individuals, as well as those involved in projects, as models to form new licences. The Headline project (<http://www.headline.ac.uk/public/m-licence.html>) gives an example of how this can be done. Using such standard licences could help to evolve clauses for common problems such as who takes responsibility for the accuracy of primary materials and for the use of third party materials.

It is thought that there are some commonly occurring issues from the requirements, not covered by current licences which could be addressed by the construction of model contract clauses. These include:

- Types of "Commercial Use" since many definitions are currently open to interpretation.
- Modification. Although most contracts do not seem to allow this at all, there is evidence that specific uses such as modification of fonts/formats are seen as being acceptable as long as integrity is maintained.

When someone agrees to use resources under a licence there are several different ways in which the agreement can be confirmed (verbal, email, agreement by an electronic click by an authenticated user, or a signed paper licence). While it is desirable that a single agreement can apply to a complete collection of resources there may be cases in which different resources in the same collection have different permitted uses. This problem is discussed further in Section 6.5 on exposure.

6.2.3.4 Changing of Licence Terms

Once a licence has been agreed the contributor should not be able to revoke the licence. However in practice, there are likely to be situations in which material may have to be withdrawn. The licence should make provision for this eventuality. This can present problems for downstream rights if a resource has been licensed from the creator to a distributor and the distributor has sub-licensed the work to a user.

The JORUM project (Halliday, 2004) recommended inclusion of terms for early termination of licence and for dispute resolution. Changing of licence conditions may also be facilitated through a centralised licence registry which could provide long-term provision of licences through all revisions.

If permitted uses are to be extended then it will be necessary to contact the rights holder. This again highlights the importance of good record-keeping and these records will have to be kept in accordance with the Data Protection Act.

6.3 Expression

6.3.1 Introduction

After deciding which rights to assert, the next stage is to decide how to express those rights. In this section we consider both how the rights information is stored internally by the organisation managing the resources, and also how that information, or more likely a selected subset, can be expressed externally. Note that the actual dissemination of the rights information is considered in the next section. The focus in this section is on digital rights metadata.

6.3.2 Requirements

6.3.2.1 Metadata elements

Metadata describing digital resources is essential. This metadata can be categorised in many different ways.

- **General metadata** includes elements such as title (UC22) and description but some elements are directly relevant to DRM, such as author (UC22, UC14), publisher (UC31), contact details (UC14, UC12, UC26, UC19, UC 27, UC31), date of production (UC22, UC25), details of all contributors (UC4), their role and their share of the work (UC13, UC15). Some of these may be particularly important if the resource is created by a consortium.
- **Rights metadata** (UC11, UC 13, UC15, UC16, UC17, UC21, UC24, UC26) includes information on permitted uses, constraints and payment models.
 - Permitted uses: The permitted uses can be grouped according to the four categories defined in the *Assertion* section: Render, Transport/Transfer, Derivative and Utility. The *render* rights raised in the use cases included read (UC6), view (UC6), Print (UC6, UC19), present in a VLE (UC19, UC31), present in face-to-face teaching (UC19). *Transport/transfer* rights include download (UC11, UC19), republish and redistribute (UC4). It is interesting that none of the use cases raised reselling as a specific transfer right. *Modification* rights include disaggregation/excerpting (UC1, UC12), and modification and re-versioning (UC11, UC12, UC14, UC24). In some cases the use cases wished to specifically allow these rights but in others they were to be denied. The modification rights are those on which there is the greatest variability between policies for different organisations and concerns by different authors. *Utility* rights include archiving (UC20), the right to change the format of the resource (UC15).
 - Constraints: Typical constraints include: duration of licence (UC4, UC13, UC19, UC26, UC32), geographical region (UC10), a requirement to acknowledge the author (UC14, UC19, UC22, UC28, interview 5). Limitations on the permitted types of user may also constrain use (UC21, UC19, UC16, UC4, UC10, UC25, UC21, UC32), for example, student use (UC10), all future students (UC21), teacher use (UC19, UC27). Constraints may also be imposed by

what 3rd parties will and will not allow (UC18, UC22). In some cases research data may be made available on condition that distributed products must not allow the original data to be extracted from the analysed data (interview 3). Perhaps the most important constraint often required is that resources are made available only for non-commercial use (UC2, UC19, UC20, Interview 1)

- Payment models: Different payment models may need to be supported, for example, payment or none (UC20), access fee for a period of access (UC32), the textbook model of owning a single copy (UC32) after payment.

It should be noted that this study did not set out to define every element of rights metadata that might be appropriate so this list of elements is not exhaustive but represents those identified across a substantial range of use cases.

- **Metadata about the rights clearance process** is very important as clearing rights twice is expensive (Appendix G). As the rights clearance process progresses, the permissions (including those of 3rd parties) need to be recorded as they are granted (UC16, UC10). In fact the status of rights negotiations should be recorded and kept up-to-date (UC26, UC17, UC14, UC11, UC19, UC24, UC2, UC31). This status might include information such as: not yet done, rights holder not known, rights holder not contactable, rights clearance refused (UC14, UC11). Reasons for no action being taken should be recorded (UC14). The methodology used to clear rights should also be recorded (UC19, UC24, UC22) as this offers a route to validating the rights metadata (UC22, UC5, UC20). Of course, the completion of clearance of all rights on a resource also needs to be recorded (UC10, UC24, UC22, UC31, UC32)
- **Metadata about the users** is also important as it is necessary to record their agreement to costs and/or conditions of use (UC31). This agreement may be in the form of signed paper licences (UC30) or clicked electronic licence (UC30).

6.3.2.2 Creation, updating and quality control of metadata

Any organisation managing digital resources needs to be able to create rights metadata for a resource that has none (UC16, UC14, UC17, UC5, UC24, UC7, UC27). It is desirable that when creating new resources methods of gathering rights metadata should be adopted during its creation (UC4, UC5, UC1).

Metadata quality control is always important but it is especially important in the case of rights metadata where incorrect information could have serious consequences (UC22). There is some uncertainty over the implications for modifying rights metadata (UC27). In any case, details of the metadata creators must be recorded (UC22).

Rights metadata may require more maintenance than some other forms of metadata. Permitted uses may be extended in the future, licence conditions may need to change with time (UC10) or new licences may need to be granted (interim report meeting).

6.3.2.3 Matching licences and metadata

Since licences are the legal agreements covering the way digital resources may be used the information in licences needs to be captured and stored in a machine readable way (UC2, UC13) which can be matched to the rights metadata and is printable (Interim Report Meeting)

If a licence is created by choosing discrete options (as Creative Commons does) such as permitted uses, licence duration, etc then care must be taken to ensure that the licences are valid (UC18). However, there is a need for a variety of different licences (Appendix G) as contributors may want to choose from a wide range of different permitted uses (UC21,UC20)

6.3.3 Options

6.3.3.1 Metadata elements

In section 6.3.2.1 a number of sets of information were identified which should be recorded when describing digital resources. It is likely that much of this information should be exposed to describe the digital resource although some information may be for only local use. The first stage in considering metadata elements is to define the complete set of information to be stored, for example in a database or repository.

One approach is to seek an existing metadata standard and base the fields in the database on the elements in the standard. For example, many creators of e-learning metadata have chosen IEEE LOM to define the fields of their database. While this approach has the dual advantages that it builds on the wide experience of all those who helped create the standard and ensures that it is possible to disseminate metadata in the form of that standard, it is not the best approach because no single metadata standard covers all the information requirements. It is better to consider multiple, suitable standards and use these as a first estimate of what should be recorded. Then consider if there are requirements that are not being met by these elements. If these additional requirements exist then the metadata database should be designed to include them. That way it is possible to build on the experience of one or more international standards, ensure that your metadata meets your specific requirements, and be able to disseminate metadata according to one, or more standard format.

Once the information is stored it can then be exposed and transmitted between systems. Metadata standards and their application profiles are for transmitting metadata between systems, the metadata stored locally need not be restricted to the set of elements in the standard.

In the requirements four categories of metadata were identified: general metadata; rights metadata; metadata about the rights clearance process; metadata about the users. Suitable standards for general metadata include Dublin Core (for general digital resources), MARC (for libraries), IEEE LOM (for e-learning) and a wide range of subject-specific options for research data. As these are well documented and commonly used they are not considered further here. Standards for rights metadata are not currently in a stable state. The two main contenders are MPEG-21 REL and ODRL. XrML is also important but has

been adopted by MPEG-21 REL. METSRights is also of relevance, particularly in the library community. There are no known standards for metadata about the rights clearance process or about users. These need to be defined in terms of the specific requirements of each organisation though work on identifying common practice would help to define rights clearance metadata.

In order to define a vocabulary for permitted uses it is worth considering the models and terms used by ODRL and MPEG-21 REL.

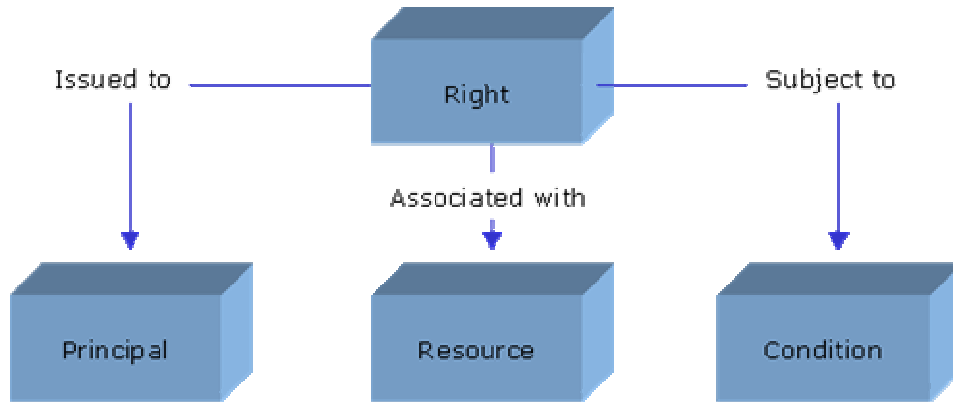


Figure 5: MPEG-21 REL Rights model. A right associates a principal (in ODRL called a Party), with a resource (in ODRL called an Asset), subject to conditions (in ODRL called Permissions). (from MPEG-21 REL, 2004)

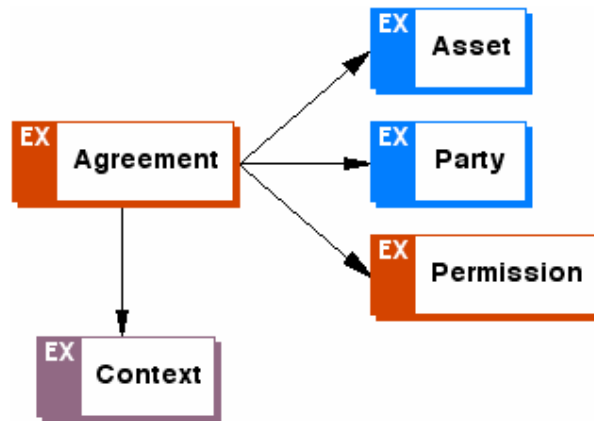


Figure 6: ODRL Agreement model. An agreement associates parties (in MPEG called a Principal), with an Asset (in MPEG called a Resource), subject to permissions (in MPEG called Conditions). Context can be used to provide additional information. (from ODRL, 2002)

ODRL
Display
Print
Play

MPEG-21
Modify
Enlarge
Reduce

Execute	Move
Modify	Adapt
Excerpt	Extract
Annotate	Embed
Aggregate	Play
Sell	Print
Lend	Install
Give	Execute
Lease	Uninstall
Move	Delete
Duplicate	
Backup	
Install	
Delete	
Verify	
Restore	
Uninstall	
Save	

Figure 7: Comparison of the rights data dictionaries of ODRL and MPEG-21 for describing permissions/conditions.

There are very strong similarities between ODRL and MPEG-21. This has been noted by Polo et al (2004) who produced conversions between ODRL and XrML (on which MPEG-21 REL is based). Coyle (2004) has also produced cross-walks, between the terms of ODRL, XrML and METSRights.

To establish a terminology for metadata to describe permitted uses, a suitable approach is to ensure that all of these terms can be supported internally, then it would also be possible to disseminate rights metadata which conforms to several different standards. This avoids being tied to any one standard while it is not clear which is likely to gain dominance over the next few years.

A similar approach can be taken with constraints and payment models.

6.3.3.2 Creation, updating and quality control of metadata

The ability to create, update and quality control rights metadata (and metadata in general) depends to some extent on the tools used. While there are a number of creation tools for general metadata, particularly in the e-learning community including Reload (<http://www.reload.ac.uk/>), the Curriculum Online Tagging Tool (<http://www.curriculumonline.gov.uk/SupplierCentre/taggingtool.htm>), and metadata editors linked to repositories, there is no common approach to managing *rights* metadata. Each institution, or even project, tends to define its own approach. However, there are useful lessons to be learned from the television and radio industries and useful guidance is provided by McCracken and Gilbert (1995) and Casey (2004). Managing the quality of metadata requires professional standards which in turn depend on experience. Currier et al (2004)

have discussed how to maintain the quality of metadata when the expertise is likely to reside in more than one subject domain.

6.3.3.3 Matching licences and metadata

Rights metadata stores information that is linked directly to each digital resource. Each resource will be made available under a specific licence, though in any collection of resources there may be several different licences represented. The ability to search, discover and sort resources is based on machine-readable information – the metadata. It is necessary therefore to ensure that the metadata can exactly represent the licence.

Matching the licences to be used with the metadata that will act as the machine-readable expression of the licence is no easy task. Among the factors involved are: the range of different permitted uses of resources; the presence of 3rd party material which already has licence conditions attached; the desire to use a common licence which people will find familiar; the expense of having a lawyer create or validate the licence; the risk of not having a lawyer check the licence.

Two examples illustrate that all of these factors need to be considered simultaneously and often iteratively. These examples are Creative Commons (and its use by the RoMEO project) and JORUM+.

Creative Commons and RoMEO (Gadd et al, 2003a): Creative Commons offers a common licence allowing some uses (display, public performance, incorporation in other works, reproduction, and distribution) while offering optional restrictions on other uses (attribution, non-commercial use, no derivative works, “sharealike” - meaning that subsequent works have to be made available under the same terms as the original). The common uses are included in all licences and options can be chosen which leads to one of eleven possible licences. The rights metadata can be briefly described by stating the optional conditions, e.g. no attribution, commercial use, derivative works, no sharealike. The RoMEO project highlighted some concerns. Firstly, several authors surveyed by RoMEO would want to limit or prohibit the aggregation¹³ which is permitted by the common part of the CC licence. Secondly, sale of a work is not expressly forbidden, only commercial sale. RoMEO decided to adopt the Creative Commons principles and created ODRL representations of each of licence they wished to use. An example of a RoMEO ODRL Creative Commons Attribution-NoDerivs-NonCommercial licence (from Gadd et al, 2003a) is included in Appendix J.

JORUM+ (Halliday, 2004); JORUM+ provides learning object repositories as part of the infrastructure supporting JISC’s X4L (eXchange for Learning) Programme. Since the contributions to these repositories have been created through JISC-funded programmes (X4L and 5/99) certain conditions have already been imposed – the outputs must be freely available to HE and FE in the UK. Through surveys of users the JORUM team also established that attribution, aggregation, non-commercial use, excerpting and the “sharealike” principle could all be established as common licence conditions. In fact, the only significant difference between contributors to JORUM+ is that some are willing to allow modification of

¹³ Also a concern of authors in the ALCS survey.

resources while others require their integrity to be maintained. JORUM+ created two contributor's licences, one to permit and one to deny modification. The legal team had to produce two licences with a common part. In order to ensure that the common part of the licences very specifically permitted attribution, aggregation, non-commercial use, excerpting and the "sharealike" principle these had to be carefully defined and specifically included in the licence. JORUM+ also decided to use ODRL to create machine readable versions of the licence and took particular care to use the same terms in the licence as ODRL uses. The version of the JORUM+ licence that permits modification is included in the list of licences in Appendix H and the ODRL representation of this licence is in Appendix J.

The purpose of machine-readable rights metadata is to indicate the licence conditions in such a way that resource discovery is possible based on the rights information. For example, it should be possible to search for resources that can be modified and used without cost for at least the next three years. The rights metadata can support such discovery in the "native" repository but if the rights information is to be distributed, for example over the JISC Information Environment, then the use of standards for DRM metadata as described in the next section becomes very important.

6.4 Dissemination

6.4.1 Introduction

The three previous sections have all been about establishing a DRM Policy. Now the remaining sections concern the projection of that policy. This dissemination stage addresses the requirements when information about material is made available outside its "holding" organisation, for example into the JISC Information Environment or the e-Learning Framework (ELF).

6.4.2 Requirements

6.4.2.1 Use in a distributed system

Since digital objects are accessible in a distributed, networked environment it is also essential that DRM information about each object should be also be available (UC17). The association between the object and its rights must be maintained (UC11, UC19, UC2, UC16).

Digital rights information will have to be passed between different systems (UC7, UC19). This is essential if the permitted uses for a resource needs to be shown to the user in a clear way (UC26, UC15, UC16, UC21, UC14, UC10, UC19, UC20, UC23, UC24, UC2, UC7, UC 29, UC30) or users may wish to search in terms of use (UC23).

6.4.2.2 Distributing metadata

In the previous section on expression of rights the need for rights metadata was defined. We must also consider the extent to which the rights metadata needs to be exposed to the outside world. Although no in-depth survey of specific rights

metadata elements was carried out as part of this study a number of use cases identified examples of the elements which would be useful:

- Author (UC22, UC14)
- Rights holder (UC12, UC21, UC11, UC10)
- Author/rights holder contact details (UC14, UC12,UC26, UC19, UC 27, UC31)
- Authors agent contact details (UC31)
- Publisher contact details (UC31)
- Publisher agent contact details
- Title (UC22)
- Date of production (UC22, UC25)
- Contributor name (UC13, UC15,UC4)

It is reasonable to expect that only a part of the metadata associated with digital material would be exposed, some of the metadata, for example concerning the rights clearance process and risk analysis may be retained solely for internal use.

Rights metadata should not only be available through search mechanisms but should also be harvestable (UC16). This allows aggregators of metadata to categorise sets of digital objects in terms of common rights.

6.4.2.3 Transport and Interoperability

When metadata/resources are transported between systems, if any of the information about permitted uses is lost, then the administrators will have to restrict resource use in order to comply with copyright law. In fact resources must only be transported from one repository to another if the licence in favour of the original repository can be assigned in favour of third parties.

Disseminating authoritative rights information must also be maintained if the digital objects themselves are transported from one location to another. The original rights information must be retained (UC12) and made available (UC16, UC18, UC5, UC11, UC20). For this to be effective, agreed standards must be used for DRM systems to ensure interoperability (UC12, UC14, UC5).

6.4.2.4 Management

While some rights information will be unique to each digital object other rights information will relate to a specific licence, or organisational policy, or authorisation system. Links are needed between licensing agencies, institutional librarians and lecturers (UC32) as well as between authorisation and content management systems (UC14, UC3, UC6, UC25, UC 29). The information about licenses/subscriptions held by multiple institutions needs to be linked for shared archival services of digital material (UC25). Many of these aspects are related also to JISC's Record Management work.

The types of information to be shared across distributed systems can sometimes be complex, including for example, agreements (UC32) and consent statements (UC17). A move towards standardised agreements, forms and licences which could also be available in a machine-readable form (UC2) would help.

6.4.3 Options

6.4.3.1 Use in a Distributed System

In general, the rights information associated with a digital object is not embedded in the digital object (although in some formats this is possible). The rights information will normally be stored in a rights metadata record, most likely in a database. There needs to be a persistent link between the metadata and the object. This requirement is not unique to rights metadata. It also applies to more general metadata such as the library catalogue record for a journal, or the learning object metadata for a learning object in a repository.

Digital material may have several different types of associated metadata: basic descriptive metadata (using standards such as MARC (MARC 21, 2004) or Dublin Core (Dublin Core Metadata Initiative, 2004) in the library community and IEEE LOM (IEEE, 2002) in the educational community – the research community tends to use a greater diversity of metadata specifications related to particular subject domains); rights metadata (as described in the *Expression* sections); secondary metadata (for example describing uses or views of the digital object, such as book reviews). It is important to recognise that standards such as Dublin Core and IEEE LOM are designed for exchanging information between systems. They are not intended to specify the internal storage architecture of a metadata record system, although they are frequently used for this purpose. The internal structure of a metadata record system is only of interest to the managers of that system. The internal structure may treat general metadata, rights metadata and secondary metadata as part of a single metadata record or as separate entities but the approach taken is irrelevant to those who wish to exchange information with that system. All that matters is the format to be used for exchange.

Since Dublin Core and IEEE LOM are becoming widely used for metadata exchange they deserve examination as a basis for exchanging rights metadata. They are woefully inadequate for this task!

Unqualified Dublin Core uses a single element to define rights and recommends that it should be used for “a rights management statement for the resource, or reference a service providing such information.”

IEEE LOM uses three data elements: rights.cost which can take values yes or no; rights.copyright and other restrictions which also takes values yes or no; rights.description to contain “comments on the conditions of use”. All elements are optional and with Dublin Core there is the capability to include a link to further information but no recommended way to achieve this so that it would be “actionable”, that is, so that a machine could automatically follow the link to discover the conditions of use and display them to a user.

These metadata elements are incapable of storing the complex rights information on which this report is based.

There are two obvious approaches to overcoming this deficiency:

1. Extend the metadata scheme in use to include rights information
2. Create a link to another metadata record containing the rights information.

The first option has been adopted, for example, by Becta in Curriculum Online (Rob Tice, personal communication, 2004) where the following additional cost information elements have been added to IEEE LOM:

- Licence model
- Other model (for the cases where the predefined licence vocabulary wasn't adequate)
- Amount
- Currency
- Tax included
- Tech support cost
- Teacher support available

This is a suitable way to meet the needs of a particular group, who can accommodate the extensions, but greatly hinders interoperability with those outside the group.

The second option allows a great deal more flexibility. For example, the external metadata record can use one or more recognised international specifications for expressing rights. This not only improves the potential for interoperability but also makes available a set of data elements which have been discussed and agreed on in a diverse forum. When more than one metadata specification is to be included an application profile (see for example Heery and Patel (2000)), allows several metadata schemes (namespaces) to be combined in a way that is of value to the community which adopts the application profile.

The difficulty remains, however, that there is no consistent and actionable way of referring to such a rights metadata record in commonly used metadata standards such as Dublin Core and IEEE LOM. Further work is required to consider the options and make recommendations that would satisfy the UK HE and FE communities.

In all cases involving the storing and distribution of metadata, the provisions of the Data Protection Act would need to be complied with since personal information is stored and exposed.

6.4.3.2 Distributing Metadata

Distributing rights metadata offers many benefits. It enables people searching for digital material to be able to compare different digital objects on the basis of their conditions of use, cost, geographical restrictions, or other rights conditions. By making rights metadata machine-readable it also makes it possible to build additional services / enforcement measures which can be executed automatically in a distributed environment. For example, when the licence period for certain objects has ended, a remote system could build in a mechanism to automatically deny access to the objects. To achieve these benefits, it is not sufficient for organisations with collections of digital objects to store rights information for each object, nor is it sufficient for them to also agree to exchange information according to a given standard, say ODRL or XrML. These are necessary

conditions to ensure that rights metadata exists and that the structural aspects of the exchange mechanism are in place but there is also a need to agree on the semantic structure of exchanged information – to agree a common vocabulary. In the education community this is equivalent to agreeing to use IEEE LOM to exchange metadata (syntax) and UK LOM Core to define the vocabulary and common subset (semantics).

The UK educational community is still some way from agreeing on suitable structural ways of exchanging rights metadata. This is not a deficiency on behalf of the UK HE and FE, as many other groups have been considering the same issues without coming to any definitive decision. Recent surveys of digital rights expression languages (DREs) have been carried out by CEN/ISSS (the European Standards Organisation) (CEN, 2003), the US Library of Congress (Coyle, 2004), and IEEE (Friesen et al, 2003; IEEE, 2003; Robson, 2004). Each has identified a number of suitable contenders.

ODRL – Open Digital Rights Language: ODRL was developed by the international ODRL Initiative (<http://odrl.net/>) and has been formally adopted by the Open Mobile Alliance as the standard for rights information over mobile content, and recently published as a Note by the W3C. The COLIS project in Australia, the ROMEO project in the UK, and EduSource in Canada have all implemented ODRL to meet the requirements of the education sector.

XrML – eXtensible rights Markup Language: XrML is an XML rights expression language developed by ContentGuard (<http://www.contentguard.com>). Information on XrML is available at <http://www.xrml.org>. XrML is being used as a basis for a number of other standards or specifications including MPEG-21 REL, OASIS XACML and OeFB (Open eBook Forum)

MPEG-21: The MPEG-21 Rights Expression Language (MPEG, 2003) is only one part of the MPEG-21 standard (Rightscom, 2003). Although MPEG-21 is still in development examples of its use in specific domains have been produced (see, for example, ContentGuard, 2003). MPEG-21 also incorporates the <indecs>2rdd rights data dictionary produced by Rightscom.

METSRights: The METS community is based among academic and library organisations. While METS its self is a Metadata Encoding and Transmission Standard the METS organisation has developed a DREL for handling more detailed copyright information than is currently supported by MARC, and Dublin Core.

There are also a number of W3C security specifications which address parts of the digital rights management domain such as XML Access Control Markup Language (XACML) (<http://www.oasis-open.org/committees/xacml/>); XML Encryption (<http://www.w3.org/Encryption/2001/>); XML Digital Signature (<http://www.w3.org/Signature/>) but these are not considered further here as they are applicable only to small separate components of DRM.

While the IEEE survey of DREs is still underway, the CEN/ISSS survey did not make any recommendations, partly because some contributors felt that much

more user input was required before recommendations could be made. The survey for the US Library of Congress is a little more explicit and points out that the choice of a DREL depends to some extent on the purpose for which it is intended. If that purpose is tight usage and access control, as required by the commercial media industries, then MPEG-21 is the best candidate. ODRL offers similar usage control but is less concerned with access control. METSRights goal is to state the copyright particulars but is not intended as an actionable licence with detailed usage control.

The current situation is well summed up by Coyle (2004):

"We still need more analysis of the impact of rights statements and the systems that implement them on the dissemination of works and the way that people interact with the content in digital resources."

While further analysis is clearly necessary some projects/organisations may be in a position where they want to take decisions about which DREL to use, while recognising the risks associated with an early choice. Indeed these trailblazers are essential if the community in general is to learn from practical experience. If rights information is primarily to do with copyright then METSRights may be appropriate. For a more in-depth set of rights expressions including permission, constraints and the parties involved ODRL already has a short track record.

6.4.3.3 Transport and Interoperability

Little practical work has yet been done in the twin topics of packaging rights information with other metadata when digital objects are transported and exporting rights information to enable federated searches of multiple repositories to be achieved. The COLIS project (<http://www.colis.mq.edu.au/>) in Australia has completed some work on the former and the JORUM+ project (<http://www.jorum.ac.uk/>) in the UK is currently developing the later using OAI-PMH. In both of these projects ODRL is used as the rights expression language.

As digital objects and their metadata are moved, replicated and extended it becomes essential that they can be identified unambiguously. That is, the digital objects themselves must be uniquely identifiable, but also the metadata associated with the objects must also be uniquely identifiable, and this applies to rights metadata as well as other forms of metadata. A detailed survey of identifiers for digital objects has been carried out by The Stationary Office on behalf of JISC (TSO, 2004). The choice of which identifiers to use will depend on a number of factors including cost, ease of use, and lifetime. Other important considerations include whether or not an identifier is "actionable" – can the identifier be used (for example in a web browser) to recover the object it identifies, whether that object is a digital object or its metadata record (Powell, 2003)?

In order to support federated searches the JISC Information Environment includes a "fusion layer" in which metadata, including rights metadata, can be aggregated from multiple sources in the "provision layer". The protocol which is best established at present to achieve this is OAI-PMH (Open Archive Initiative – Protocol for Metadata Harvesting). This has already been widely adopted by repositories and portals in several JISC programmes and remains a reliable and effective way to expose metadata for harvesting. While it has not yet been used

for rights metadata there is nothing about the protocol that is specific to any particular metadata schema. On the other hand, METS (Metadata Encoding and Transmission Standard, <http://www.loc.gov/standards/mets/>) is becoming increasingly adopted in the library community.

When an object is transported it will be necessary to identify the licence governing its use. This can be achieved, as described above, by exporting the rights metadata at the same time. However, the full text of the licence agreement is the legal statement of the conditions under which the object can be used. The licence agreement may be referred to at a specified URL, or it could be included as text along with the object in a package. If the licence is a general statement governing all its objects then the same licence will be used by many objects and a static representation of that licence can be used. In some cases a licence has two parts, a common “body” and a “schedule” which contains information specific to the digital resource, for example the names of the rights holders or conditions which apply to the specific object but not in the general licence. It would be possible from a technological point of view to create “actionable” licences. Such a licence would be produced by specifying the licence and the identifier of the object¹⁴. The licence would be the standard body and the specific schedule could be generated from data associated with the identified object.

6.4.3.4 Management

The provision and fusion layers of the JISC Information Environment offer one approach to managing digital material and its associated metadata; each repository holds objects and metadata and exposes the metadata to be harvested by the tools in the fusion layer. However, it has already been anticipated in the JISC IE and is fundamental to the e-Learning Framework that there may be considerable duplication in this approach. Some capabilities might be better provided through a shared infrastructure (IE) or set of common services (ELF). The most obvious example of sharing infrastructure is ATHENS authentication which offers a common service avoiding the need for each provider to carry out individual authentication. Other common services that may be appropriate for digital rights management include:

Identifier resolvers: These would enable an identifier to be linked to the source of an object and, if multiple copies of an object exist, present the “most appropriate copy” of the object.

Licence registries: These would act as long-term archives of licences that could be relied upon to persist beyond the lifetime of projects which created the licences. They might also act as registries for other types of licence such as e-journal licence agreements between commercial publishers and institutions. Licence registries might also be capable of serving “actionable” licences as described above.

One licence may be used many times but each time it is used it constitutes a new “agreement”. The extent to which a licence registry would keep a record of

¹⁴ For example, <http://www.licence-server.ac.uk/resolve?licence=jorum&object=doi:1234> might deliver the jorum licence with a schedule specific to the object identified by doi:1234

all agreements would require detailed consideration. For example, recording all e-journal agreements between publishers and institutions would create a valuable and independent archive of rights information, while recording every agreement by individuals making many digital objects available through a Creative Commons-type licence would be enormous and of limited value.

A variant on this approach is that adopted by EduSource (Downes et al, 2004):

"A given provider of learning materials will work with one of many brokers who sell to multiple purchasers, and a given user may use one of many agents who conduct transactions with multiple vendors."

EduSource supports provider (vendor) brokers and purchaser brokers. There are multiple brokers so that each provider can offer their materials in different ways and purchasers can choose different ways to pay. Participants are free to use those EduSource components they wish to build a commercial, or commerce-free, or mixed-economy model. This is based on open standards (ODRL).

6.5 Exposure

6.5.1 Introduction

Digital rights management is a complex topic and requires careful management. However, in this section we consider how the rights information can be exposed to users. It is worth considering two different types of user. The first type is the person searching for digital material, a student, teacher or researcher. Their primary concern is "Under what conditions can I use this material?" They may also be interested to know any costs involved. An important aspect is whether these questions arise before or after they have registered to use a system. The second type of user is the data manager or librarian, who may need to know more about the details of licence conditions.

6.5.2 Requirements

6.5.2.1 Information for discovery

When displaying rights metadata to users the information must be appropriate to the use. The permitted uses for a resource needs to be shown to the user in a clear way (UC26, UC15, UC16, UC21, UC14, UC10, UC19, UC20, UC23, UC24, UC2, UC7, UC 29, UC30) and the user may wish to search in terms of use (UC23). There is a difficult balance to be achieved between ease of use and unambiguous clarity. Full legal licences need to be available for users to see and acknowledge but most people appreciate something less precise that conveys an appropriate message. Furthermore, some assistance should be provided to aid understanding of copyright statements and licences. (uc18, uc3)

6.5.2.2 Registration

A discovery system should not be unreasonably difficult to access (UC 29). At some stage before being given access to digital material a user must register. The purpose of registration is to obtain authorisation for the user (dealt with in

the next section *Enforcement*) but also to obtain acknowledgement of the conditions of use (UC28). There are two separate schools of thought on whether registration is required before or after access to metadata is provided. Some believe that the database rights associated with the metadata records should be protected, so registration is essential before any searching occurs, while others support the concept of making metadata more freely available and requiring registration only when someone has identified that there is something of value available to them through registration.

Any registration system needs to gather appropriate details such as name, affiliation, etc (UC30). The registration system must also be able to deal with: new accounts, forgotten passwords and logins left active (UC29) and the same person registering several times (UC 30).

6.5.2.3 Information for management

While “discovery” users should be protected from the overwhelming volume of rights metadata, there is a need to be able to expose *all* rights metadata to administration and library staff (UC16, UC12, UC18, UC5, UC26, UC17, UC11, UC20, UC23, UC7). In addition, the advantages of having machine-readable rights metadata should be exploited, for example to flag when the licence period for certain objects is nearing its end (UC26, UC16).

6.5.2.3.1 Risk management

The right to use a digital resource or not is not always clear. There may be cases where the rights clearance process is not complete, perhaps it cannot be completed because the rights holder is either uncontactable or deceased and their estate is difficult to trace. It might be possible to download a digital resource for which the licence will expire in the near future. A digital resource may have its use permitted but it might contain a 3rd party object for which a licence is required. In these circumstances an organisation may decide to offer the digital object for use but make clear the risks associated with using the object (UC3, UC14, UC18, UC10). Since a detailed description of the risks is unlikely to be read an initial warning system (e.g. a traffic light system using green, amber, red (uc5, uc26)) might be used with more detailed information available on request.

6.5.3 Options

6.5.3.1 Information for discovery

An assertion of copyright, with which many are familiar is © JISC 2004. Such an assertion is not required by law¹⁵ but it does have the advantage of alerting third parties to the assertion made by the owner.

The Creative Commons initiative has not only developed common licences which can be used widely (as described earlier) but it has also created symbols to

¹⁵ Historically it was required in terms of the Universal Copyright Convention. Since the US joined the Berne Convention in 1989 this Convention is seldom referred to and there will be few, if any, countries which are parties to the UCC but not to Berne

highlight the major conditions of the licence. The JORUM+ project in the JISC X4L programme has taken this a stage further and used symbols to identify conditions of use in the JORUM depositor’s licence. These symbols, shown in Figure 8, are based on the Creative Commons symbols where appropriate but new symbols have also been created for conditions of use not covered by Creative Commons.

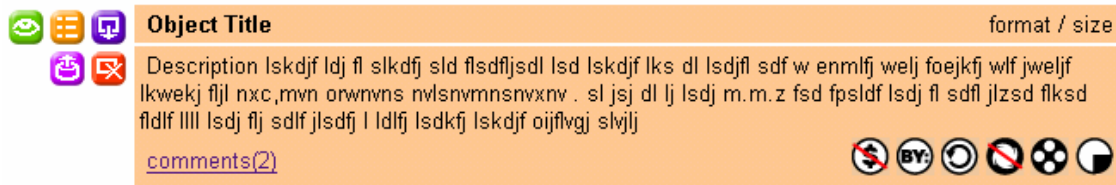






Figure 8: Mock-up of the results of a search in a JORUM+ repository in which the conditions of use of the discovered object are identified by a series of symbols.


The six symbols shown in Figure 8 represent:


Non-commercial use:  The dollar symbol has been retained as a universal symbol of currency and the red strikethrough shows that charging is prohibited.

Attribution:  When this resource is used the work must be attributed to the author.

Share-alike:  This object may be transferred to someone else but it can only be transferred under the same conditions as it is made available here.

Modify:  The modify symbol shows that permission has been granted to modify the object. In this case the red strike-through shows that the permission to modify is denied, so this object may not be changed.

Aggregate:  The aggregate symbols shows that permission has been granted to use this object in an aggregation with other objects, for example as part of a course or module which could then be redistributed. Note that if the aggregation is redistributed this must be done under the same “share-alike” conditions.

Excerpt:  The excerpt symbol shows that permission has been granted to use part of this object extracted from the complete object.

All symbols are available in permitted and denied (red strike-through) forms. It is intended that if the symbols are used on a regular basis people will become familiar with them. In the JORUM+ example, clicking on the symbol links to the full licence at the point where the condition is defined.

The first three of these are adopted from Creative Commons. The other symbols have been created by JISC and are available for use by others¹⁶.

¹⁶ Contact Susan Eales for information, s.eales@jisc.ac.uk

6.5.3.2 Registration

The details of a registration system are largely independent of digital rights management. The only significant DRM step that should occur at registration is that users are shown the conditions of use and some method of recording their acceptance of these conditions is in place. Acceptance of the conditions by “click-through” is valid. These conditions of use should be available to users whenever they have logged on to a system. If a repository contains objects with different conditions of use, this should be made clear on registration. Alternatively, the user may accept the conditions each time an object is used.

6.5.3.3 Information for management

Since the management of digital rights information is an internal matter it is for each organisation to ensure that the relevant staff have access to all the DRM information. It may be desirable to update DRM information by recording the changes and the details of the person who makes the changes, thus preserving an audit trail of all DRM recorded information.

Since commercial DRM systems are designed with enforcement as their objective (Duhl and Kevorkian, 2001), either to protect the commercial value of objects or to protect against unauthorised use, these systems may not be appropriate in the education sector where recording DRM information is the priority. However, commercial DRM systems have been used by clearing houses in the academic sector (EPS, 2004). There is perhaps some scope for exchange of good practice and software systems between educational institutions.

6.5.3.4 Risk Management

Managing risk and informing people about the degree of risk in using material for which rights clearance is not straightforward is a special case of *Information for Management*.

No evidence has been found of institutions sharing expertise on this topic. This should be encouraged.

Very broadly the law states that those who host material will not be liable for infringement of copyright if they have no actual or constructive knowledge of infringing material on their servers. Once they have knowledge and if they do not act on it then they will become liable.

The best way to deal with the risk is to institute a “notice and takedown” procedure. A UCISA informal briefing paper (UCISA, 2004) discusses the requirements on those hosting digital material to respond to complaints about copyright infringements. This note describes briefly the procedure proposed by the Publishers’ Association for carrying out notice and takedown. It should be noted that once notice is received it is advisable to remove the material expeditiously. Thus a mechanism should be put into place whereby notifications e.g. received by e-mail, will be acted upon promptly.

6.6 Enforcement

6.6.1 Introduction

In the commercial world enforcement is a major part of digital rights management. When publishers make digital material available to the educational community under licence they also want to ensure that their licence conditions will be enforced. When academics offer material to share, learning objects, research publications, or data, they are also concerned that the material is used in accordance with the conditions under which it was offered. In both cases a system based on trust has become well established. This trust is based, to some extent, on the level of awareness and compliance of staff and students. Beyond authentication and authorisation, technical enforcement measures are not a priority in the UK HE and FE community. With sound authentication and authorisation systems in place there is a high degree of trust that the organisations administering access to digital material are trustworthy and permit access only according to licence conditions. Several commercial publishers make their material available through ATHENS-based authentication and authorisation.

The only technical enforcement measure, other than authentication and authorisation, raised in the use cases was tracking and it was not considered to be a core requirement. However, it was recognised that sometimes technical enforcement is necessary as a condition of supply (uc19), for example when access to data sets or software is only possible through the supplier's proprietary licence control system.

6.6.2 Requirements

6.6.2.1 Authentication

It is widely recognised that some form of registration is important before accessing data (uc4, uc10, uc19) as a means of identifying those who wish to access resources. There is a degree of preference for this registration to be done online (UC30), though it must be recognised that more detailed communication may be required (UC30, UC31, UC32). It is important that a user can authenticate themselves from different locations within or outwith their institution (UC25, UC29). Unauthorised individuals must be prevented from using high risk/high value material (UC3)

In cases where access is denied information should be offered about how to apply for access (UC29).

6.6.2.2 Authorisation

Having identified a user, the level of access authorisation must be determined based on the licence terms and access-rights of the user (UC2). This may depend on a number of attributes associated with the user (e.g. membership of groups and the role/access-level within those groups) (UC2). So different users may have different levels of access permission (UC21, UC4). Some data will be available to everyone who is registered (UC30), while in other cases the results of searches will need to be restricted to those objects which the user is licensed to use (UC2, UC7, UC14)

It may also be required that authorisation is granted on the basis of a person's membership of groups (UC16, UC4, UC9, UC10, UC25) e.g. teacher of a subject (UC19, UC 27). Note that such groups may be cross-institutional.

Clearly an important stage in the authorisation is to validate that the licence has been agreed and that it continues to apply (UC25). Conditions may change either because licences have a limited duration or the person's role may change, e.g. a student becomes a member of staff (UC7). Often authorisation must cope with people having multiple roles (Interim Report Meeting).

6.6.2.3 Tracking/Accounting

Tracking access and producing logs of usage is a common requirement but it is not a universal need (uc10, uc27, uc2). In some cases the purpose of tracking is to account for use in the form of statistical reports but in other cases there is a need to track use by identifying individual users (uc26), for example identifying material used by individual students (uc27).

Another purpose of tracking is to identify critical events in near-real-time. Examples might include excessively large downloads (uc26) or inappropriate use where an audit trail of the access route is required (uc26).

6.6.3 Options

By comparison with many of the other issues in digital rights management, authentication and authorisation are relatively mature topics and some solutions have been in use for several years.

Authentication and authorisation are already commonly used protection mechanisms for digital resources in the UK Higher Education and Further Education sectors. The JISC has these topics under constant review through activities such as the Authentication, Authorisation and Accounting Programme (http://www.jisc.ac.uk/index.cfm?name=programme_aaa)

6.6.3.1 Authentication

Access management may be internal or external to an organisation. Internally authentication can be supported by systems such as LDAP and Kerberos. Externally, authentication across multiple institutions requires a system that all institutions consider trustworthy.

The most widespread access management in UK Higher Education is the ATHENS (<http://www.athens.ac.uk/>) system which requires the user to remember one pairing of user id and password and provides access to resources. Over the next three years JISC is planning the implementation of an authentication system based on Shibboleth.

6.6.3.2 Authorisation

The authorisation process has two components, role management and privilege management. When an authenticated person asserts that they have a specific role, or belong to a specific group, the authorisation systems must first check that this is correct. Then the system must check the privileges allowed to that

group and check that these privileges match the licence or policy for access to the resources. Most data providing services carry out this process internally.

PREMIS (PrivilEge and Role Management Infrastructure Standards Validation, <http://www.permis.org/>) is a system for handling roles and privileges by offering trusted “attribute certificates”. This is difficult to achieve because authentication, based for example on digital signatures, concerns a person’s identity which changes little over time, but a person’s roles and privileges can change rapidly and frequently. Even with the PREMIS attribute certificates it will still be necessary to match the roles and privileges to the policy or licence internally. However, the PREMIS approach may be a useful way of handling groups which are cross-institutional.

6.6.3.3 Tracking/Accounting

Tracking users’ activities is primarily an internal activity that can be managed through different strategies by different service providers. Each service provider can determine the extent to which tracking is used for statistical or for individual records.

It should be noted that while access management systems control individuals’ access to resources and accounting systems track their access to the resources they do not protect rights such as printing, copying and distribution. This means that for high value/risk material other protection mechanisms may be necessary.

Some digital materials, such as commercial e-books, already have detailed access management controls which allow the number of times a resource is accessed or printed to be controlled. If such controls were available more widely they may be in more demand.

6.7 Cost-benefit-risk analysis

A detailed cost-benefit-risk analysis should really be carried out in the context of a specific organisation and its priorities. In the case of small organisations or projects, the important aspects of the DRM policy will be to keep administration as low as possible without getting into legal difficulties. In larger organisations it may be more important to ensure that rights are handled in a fair and transparent way, to ensure that rewards can be distributed equitably and to maintain an on-going long-term service.

6.7.1 Options

The options discussed in detail in earlier sections can be considered for any scenario. In the following sections we evaluate the cost involved (in many cases the cost will be in terms of effort rather than cash), the benefits to be gained, and the risks involved.

The headings used for exploring these scenarios are:

- Definition of DRM Policy
 - Recognition
 - Define Ownership
 - Control of Own Material
 - Control of 3rd party material

- Plan Use
- Record Clearance Information
- Assertion
 - Publication Method
 - Permitted Uses and Constraints
 - Licences
 - Changing of Licence Terms
- Expression
 - Metadata elements
 - Creation, updating and quality control of metadata
 - Matching licences and metadata
- Projection of DRM Policy
 - Dissemination
 - Use in a Distributed System
 - Distributing Metadata
 - Transport and Interoperability
 - Management
 - Exposure
 - Information for discovery
 - Registration
 - Information for management
 - Risk Management
 - Enforcement
 - Authentication
 - Authorisation
 - Tracking/Accounting

This list of headings may prove useful for others examining their own DRM strategy.

It is assumed that before making decisions on DRM policy a thorough stakeholder analysis would have been undertaken. However, even before undertaking the stakeholder analysis this list may prove useful in identifying the types of information to be gathered from stakeholders.

6.7.2 Definition of DRM Policy

6.7.2.1 Recognition

6.7.2.1.1 Define Ownership

The cost of establishing ownership depends on the works being considered. The database rights created by the project need to be taken into account. This is an area where the law is currently in a state of flux¹⁷. Given that the database rights will arise as the contents are collected, prior rights should not be an issue. However, if different entities take the risk of investing in the compilation, then respective ownership shares would need to be agreed.

¹⁷ Four cases concerning the interpretation of the Database Directive are currently before the European Court of Justice

Establishing ownership of the contributed material can be done through the person making the contribution. Where material is gathered, stored and redistributed it is worth the effort to ensure that ownership is known. In the case of material which is external to the project and is referred to through hyperlinks the cost of establishing ownership is likely to be enormous and may not be necessary. The law is not entirely clear on liability for linking to material that itself infringes copyright. The greatest risks are likely to lie where those links are to entertainment products (e.g. MP3 files or films). One risk-management option would be to have a system whereby, should a third party make a complaint, there is an identifiable contact to whom this complaint should be made. That individual would then be responsible for assessing whether there was a legal liability. Another option would be to ask for permission to create a link (when the authority to ask is identifiable) and create links when permission is granted.

Care must be taken that when metadata, such as descriptions or annotations, is created it cannot be interpreted as derogatory to the owner of the moral rights in the work.

6.7.2.1.2 *Control of Own Material*

The material created by any project will be the *sui generis* database rights, copyright in the structure of the database (should it meet the criteria of the author's own intellectual creation) and any 'new' copyright in materials within the database. Management of these rights will entail granting licences for use of the content of the database to third parties. The database right subsists for a period of 15 years after the completion of the database, although it is renewed as and when substantial new additions are made to the contents of the database. These rights will require management over their period of subsistence.

The cost of managing the database rights is small and the benefits are enormous. The major risk is that if no steps are taken to manage these rights after the project is completed then the value of the work will be lost.

6.7.2.1.3 *Control of 3rd party material*

Gathering and redistributing 3rd party material requires the express permission of the rights holder. (Section 4.2 describes the uses over which the rights holder has control and the exceptions to those uses through "fair dealing".) It is essential that this is obtained, unless the required uses are covered by fair dealing, preferably when the contribution is made. Preparing a "contributor's licence" will reduce the effort of clearing different uses with different contributors. The process can be automated through a clickable licence. It is essential to ensure that the contributor warrants that they have the right to make the contribution and that they are not infringing copyright belonging to anyone else in their contribution.

6.7.2.1.4 *Plan Use*

To prepare for rights clearance all the proposed ways in which works may be used must be planned. To help with this task it is useful to draw up a matrix of the potential uses and constraints and consider which apply (see Appendix I for

an example). The risk of not establishing all the uses and constraints before clearing rights is that the whole costly process will have to be repeated if a new set of rights is to be agreed.

6.7.2.1.5 *Record Clearance Information*

Good records must be kept of what has, and has not, been agreed. The effort involved depends on the method adopted. Much of the information may be automatically gathered through form-filling, but there will almost always be exceptions. Provision should be made for handling paper records. If records are not well-kept then the entire DRM policy may end in disarray and any legal challenge might be hard to rebut. Care should be taken over the period over which rights are cleared. A common failing in projects is to clear rights for use in the project, causing the rights to expire when the project ends.

6.7.2.2 Assertion

6.7.2.2.1 *Publication Method*

Authors should be aware of the consequences of assigning copyright to a publisher. The effect will be to prevent the author from copying or further re-distributing that work in any manner or form without first seeking the permission of the publisher. It is preferable that the author should grant the publisher a non-exclusive licence, leaving the author free to further publish and disseminate the work as he/she sees fit. If assignation of rights is essential to achieve publication then it is best not to assign all rights or insist that some rights are granted back, for example the right to use the publication in teaching and place it in an institutional repository.

Permitted Uses and Constraints

Reference has already been made to the sample matrix (Appendix I) which can help to define the requirements of any particular project. However, the importance of consulting stakeholders should also be re-emphasised. The results of the RoMEO and ALCS studies highlight that authors have major concerns over the degree of modification of works, the right to be attributed as author, and the duration of such agreements.

6.7.2.2.2 *Licences*

The creation of licences is time-consuming and can be expensive, particularly for small-budget projects. If any works are to be used in ways which require the rights-holder's express permission, and almost every use case in this study falls into that category, then a legally binding agreement should be used. It may be possible to use an existing licence such as the GNU GPL or Creative Commons although almost without exception some amendments will be required. It may be possible to make adaptations to meet requirements. In all cases it is worth obtaining legal advice about the validity of the licence for the purpose and within the relevant jurisdiction. See appendix H for a list of licences to consider.

6.7.2.2.3 *Changing of Licence Terms*

It is sometimes worth ensuring that licences have termination clauses which allow them to be revoked. It may be tempting to try and negotiate a licence

which will cover all uses for a very long duration. This will reduce the effort of having to renew shorter-term licences but many publishers are unwilling to enter into long-term licence agreements. However, an alternative view is that a licence to cover all uses for a very long time may be expensive while a shorter-term licence for specific “trial” uses might be considerably cheaper. The best option, in some circumstances, may be an annually renewable licence offering the opportunity to change the conditions (more users, wider access, expanded uses) as and when required. The drawbacks of annual licences include an unwillingness of users to adopt material that may be available only for a short period and a high cost as publishers must then try to recover costs quickly. There are also risks inherent in this strategy in that the charges for licensed material may rise each year.

6.7.2.3 Expression

6.7.2.3.1 Metadata elements

A great deal of time and effort can be expended choosing a metadata scheme. Certain steps are essential. The purpose of the metadata must be defined. This needs to be done in the context of the project. What are the project’s internal requirements for metadata, and what metadata might it want to project externally? If metadata will only be used internally then interoperability is not a concern. However, even in this case it is worth investigating international standards in metadata (both general metadata and rights metadata) as these have been developed to satisfy the needs of a wide community after extensive discussion. While it may be possible to add new elements to a metadata scheme at a later date it is an onerous task retrospectively to complete that metadata for existing digital objects. Advice on both metadata standards and application profiles which describe the use of standards by specific communities should be sought (for example from CETIS¹⁸).

6.7.2.3.2 Creation, updating and quality control of metadata

The creation of good quality metadata requires a professional approach and the cost should not be under-estimated. The major risk of poor quality metadata is that no-one will be able to discover digital resources or their associated rights. The High Level Skills for Industry (HLSI) project has experience of this and of the cost of improving the metadata quality. Ryan (2003) describes their work on 2,500 metadata records which were re-edited, taking about 550 hours and costing around £6500.

6.7.2.3.3 Matching licences and metadata

Making sure that the information in the licence is matched by corresponding information in the metadata is not particularly time-consuming but it is valuable. If the permitted uses in the licence were established as a result of a user needs analysis, then the users will need to be able to search for resources on the basis of permitted uses. This becomes even more important if a user is searching more than one source where different licences mean different conditions of use

¹⁸ Centre for Educational Technology Interoperability Standards, <http://www.cetis.ac.uk/>

apply. The risk of not providing this functionality is that users will stop attempting to use the resources.

6.7.3 Projection of DRM Policy

6.7.3.1 Dissemination

6.7.3.1.1 Use in a Distributed System

In simple terms the cost/benefit ratio is improved when larger numbers of people can gain access to a resource. This is a strong argument in favour of making digital resources accessible in a distributed environment. Of course, wide access to resources increases the opportunities for a challenge on the grounds of rights violation and the need for thorough rights clearance and record keeping is emphasised.

6.7.3.1.2 Distributing Metadata

The cost of distributing metadata is not high. It is relatively easy to provide technology (such as OAI-PMH) which will expose metadata to automatic harvesters which will then aggregate and offer the metadata to others. There are several risks. First, ownership of the right to distribute the metadata must be established. Second, metadata can contain descriptions and annotations so care must be taken that these are not deemed derogatory to the work. Third, once exposed and harvested it is difficult to recall metadata against which a complaint has been made. On the other hand, the benefits of distributing metadata are enormous as digital works will become much easier to discover and locate.

The use of digital rights expression languages (DREs) for distributing rights metadata also raises a question of cost. ODRL is an open language widely used in international education. XrML is owned by ContentGuard Inc, which owns several patents in digital rights management¹⁹, and its use may require a licence. ContentGuard has contributed parts of XrML to MPEG-21 REL which is an ISO standard. ContentGuard claims to have “invented the rights expression language concept” although this has not yet been legally challenged²⁰. There is some reluctance among implementers of DRM to expose themselves to a potential challenge by ContentGuard.

ODRL is being widely used in Australia, the UK and Canada for education purposes and METSRights is of interest to libraries as it has close ties to METS.

6.7.3.1.3 Transport and Interoperability

Little work has yet been undertaken on transport and interoperability for digital rights metadata. This should be considered an area of active research interest rather than one in which practical operational decisions can be made. Any projects working in this field run the risk of being overtaken by other research.

¹⁹ <http://www.contentguard.com/patents.asp>

²⁰ <http://xml.coverpages.org/patents.html#xrml-ContentGuard>

Some bold initiatives are needed but those who cannot afford to put considerable effort into the endeavour should avoid this topic.

6.7.3.1.4 *Management*

The management of the infrastructure which supports dissemination is for organisations such as JISC and not for individual institutions or groups. The cost of providing the necessary infrastructure will be substantial but it is part of the overall Information Environment and eLearning Framework. The benefit to the entire HE and FE community will be great as a common set of services will be provided which can be used by everyone with little or no duplication of effort. The biggest risk is that provision of the infrastructure will not happen at the right pace to meet the demands of the users and fragmented, competing solutions will develop in the absence of a more coherent national service.

6.7.3.2 Exposure

6.7.3.2.1 *Information for discovery*

Exposing rights information in a way that is meaningful and helpful is difficult. Although legal documents epitomise the details of rights information they are not a convenient way of indicating rights information “at a glance”. The JISC symbols for rights are both cost-free and will benefit the entire community if they are widely adopted. It is important however to avoid the temptation to use the symbols but redefine their meaning. The value of the symbols is that their meaning becomes instantly recognisable.

6.7.3.2.2 *Registration*

When making resources available it would be possible to do so without a registration system. This would reduce the effort. However, it is almost always worth the effort of giving each user a separate identity so that an audit trail can be produced if necessary and also having an opportunity to state the conditions of use and have people accept them.

6.7.3.2.3 *Information for management*

The extent to which management information needs to be gathered will vary from organisation to organisation. Much can be done with simple open source software for access statistics. Many education enterprises have no need to track every action taken by every individual, while others do require this detailed information. The requirements of the Data Protection Act must be considered if detailed tracking of individuals is carried out and stored in a way that identifies individuals.

6.7.3.2.4 *Risk Management*

In many situations risk management will be limited to making decisions about use of materials when the rights clearance process is incomplete. In some cases where material is of high value or is highly sensitive a more thorough risk assessment is required. In some cases steps such as removing all 3rd party material have been taken to minimise risk.

As an example, there is a relatively small risk in using an image that appears to come from a private, non-commercial source when it has not been possible, in spite of best efforts, to trace the rights holder. It is likely that even if the rights holder objects they will simply ask for the image to be removed. On the other hand if the image is of a person who has an agent acting for their image rights, such as a film star or leading footballer, the risk of using the image is considerably higher. Particular care is likely to be necessary in the case of images which are both personal and sensitive, for example medical images, where the subject, rather than the photograph owner is perhaps more likely to sue if consent for this use has not been given.

6.7.3.3 Enforcement

6.7.3.3.1 Authentication

When digital resources have been gathered under licence it is important to control access and limit it to those who have agreed to act under the terms of the licence. This cannot be done without, at least, protection through a user name and password. It is relatively simple to set up password-protected systems but a more rigorous and well-trusted system such as Eduserv ATHENS shows a serious regard for authentication. It also involves a cost both in terms of a licence fee and the effort to integrate the ATHENS system.

6.7.3.3.2 Authorisation

Authorisation is a much more complex problem than authentication and there are fewer solutions available. The result is that in many cases authorisation is handled locally and differently for each organisation. Once an authenticated person is recognised it is necessary to establish what authority that person has to access resources. This is complicated by the fact that it may depend on a person's role within an organisation and that their role may change and such changes must be reflected in the authorisation. The main risk is that an authorised person may gain access. However, additional risk relates to damage they might do or resources they might extract and use inappropriately.

6.7.3.3.3 Tracking/Accounting

It is likely that only key services and those containing valuable resources will install real-time tracking and accounting systems to alert administrators to violations immediately. However, most systems will require some degree of accounting if for no other reason than to provide usage statistics.

7 Conclusions

The objective of this work was to make recommendations on the best approach for JISC and the UK education and research communities to adopt in relation to Digital Rights Management (DRM). These recommendations were described in some detail in section 6 and are summarised in section 8. While the whole topic of digital rights management is in a state of evolution some parts have proved more amenable to making recommendations than others. The approach taken has been to define requirements without considering the ways in which these requirements can be satisfied. Some of the options highlighted may change over the next few years but the requirements are likely to remain.

The definition and projection of DRM policy are considered separately.

7.1 Definition of DRM Policy

The areas in which recommendations are clearest are defining ownership of rights, planning how to use digital material and identifying permitted uses and constraints. There is also now a substantial base of licence information available and an increasing use of digital rights expression languages, particularly ODRL in the international education communities. Awareness of the options for identifiers for digital resources and their metadata records has now increased though practical examples in education communities other than libraries is still limited. These are all areas in which clear options are available and examples of good practice already exist.

However, there are other parts of the process of defining DRM policy in which clear recommendations are not possible because well established standards or examples of good practice are rare. The processes for clearing digital rights and for creating and quality controlling rights metadata are not well recognised. Good practice exists, for example in the Open University, but it is not disseminated sufficiently widely.

Considerably more information is needed on risk management approaches when rights clearance is incomplete. Although some organisations have rights management policies almost no information is in the public domain.

Furthermore there are areas where the law is clear but accepted practice is challenging this view. Staff in academic institutions need clarity in defining how they can work with the rights associate with their work. There are also other potential legislative changes which could have a very significant impact on publication methods and access rights if the Committee on Science and Technology recommendations for open access are accepted.

7.2 Projection of DRM Policy

As with definition of policy, there are areas of policy projection which are clear and becoming well established. These areas include dissemination through a distributed information environment and enforcement methods, particularly authentication.

Areas for which recommendations are now possible, but good practice is not yet established, include exposing rights information in such a way that people can instantly identify permitted uses.

There are several areas for which projection of policy is difficult to recommend, primarily because there are so few examples, and these include distributing rights metadata through an information environment, transporting rights metadata with digital resources and ensuring that when metadata or resources are transported enough information to define complete licence conditions remains is also transported.

Other areas in which expertise exists but general awareness is still low include distributed authorisation and the projection of risk associated with uncompleted rights clearance processes.

7.3 Dissemination

Throughout this study a very high degree of interest in DRM has been expressed. Although the project team has been in direct contact with around 100 people the Interim Report was downloaded 3000 times in the five weeks after it was published. Part of the reason for such interest appears to be a shortage of information about DRM issues.

At the present time the UK HE and FE communities are high on interest and low on information regarding DRM.

8 Recommendations

In section 6 requirements were derived from the use cases and options offering solutions were discussed. This section brings together the main recommendations. Earlier in this report these recommendations were described as options because they are not all likely to apply in all situations. While almost all the recommendations are aimed at JISC, a few are for those who are implementing DRM systems. “Implementers” may be projects, institutions, consortia, publishers, clearing houses, or other bodies. As there is a substantial number of recommendations they have been grouped into *imperatives*, without which progress on DRM matters will be severely hindered, *actions*, which are important if DRM is to continue to develop, and *advice*, which covers non-critical items.

8.1 Imperatives

- **Implementers** need to provide clear guidance for staff on ownership, publication routes, assignment rights and procedures and the recommended decision-making processes. An important aspect of this is increasing staff awareness.
- **Implementers** need to ensure that staff are aware of rights clearance procedures and provide advice and support on which rights to obtain.
- **JISC** should investigate ways in which permitted uses and constraints can be supported in common licences and digital rights expression languages.
- **JISC** should investigate and recommend suitable application profiles of digital rights expression languages (DREs). In particular, DREs can be used both in general terms to describe licences (permitted uses, etc) and in specific terms to describe objects (rights holders, etc). DRE application profiles and their vocabularies will be particularly important when metadata is harvested and searched across multiple sources. (Based on experience with the UK LOM Core application profile, it is likely that some practical experience is needed before good practice can be identified.)
- **JISC** needs to be able to establish in practical, demonstrable terms how DRM can be operated in the JISC Information Environment and e-Learning Framework.

- **JISC** needs to provide a lead to move the use of globally unique identifiers from “theoretically possible” to “practical implementation”. Several options are available (as indicated in the TSO (2004) report) but adoption is almost non-existent in HE and FE as no clear lead has been provided and the benefits come from adoption by large communities.
- **JISC** should promote the study and dissemination of risk management strategies for digital rights and their benefits.
- **JISC** should work towards a set of common licences (or licence templates)
- **JISC**, perhaps through the JISC Legal Information Service, should offer advice how to proceed on DRM in the light of patents held by ContentGuard.

8.2 Actions

- **JISC** should support a more detailed analysis, possibly through case studies of rights clearance methods in FE and HE. The process described by Gadd (2002) could be substantially expanded to include the roles of clearance organisations.
- **JISC** should develop, gather and disseminate good practice in rights clearance procedures including the metadata gathered during the process.
- **JISC** should consider providing a digital licence registry infrastructure so that licences can be referred to online in full text and machine-readable form with long-term preservation of the licences. This could offer an efficient and easy to manage licence infrastructure for multiple institutions.
- **JISC** should investigate how valid machine-actionable licences might be handled. The benefits of machine-actionable licences might include the ability to base searches for digital material on licence conditions, or to be alerted when licences are about to expire.
- There is much uncertainty about the different possible uses of data sets for research purposes. A further study should be supported by **JISC** to investigate views of the research community
- **JISC** should provide an infrastructure or set of services to act as the basis for identifier resolvers (for the recommended identifier system).
- **JISC** should encourage the use of a set of symbols for rights information which will become familiar as their use becomes common.
- **JISC** should consider how group membership might be authorised on a cross-institutional basis.(e.g. PREMIS).
- **JISC** should monitor the need for DRM and work to provide efficient and timely solutions to avoid wasteful duplication. However duplication at the research stage can often be beneficial offering different approaches and solutions.

8.3 Advice

- **Implementers** should use the permitted uses and constraints table (Appendix I) as a template on which to base their decisions on uses and constraints.
- **JISC** should try to define good practice on licence issues over which there is confusion: definitions of non-commercial use; degrees of modification of digital material; cross-institutional ownership; termination or revocation of licences and its implications.
- **JISC** should encourage more detailed consideration of DRM in the research community to promote common solutions for common problems and identify areas where exceptional circumstances exist.
- **JISC** should recommend how DRM metadata should be referred to by existing metadata schemas (such as Dublin Core and IEEE LOM) to enable DRM metadata to be discovered through other metadata sources.
- **JISC** should encourage common practice in the way rights information is packaged with other metadata, particularly in e-learning through content packaging specifications.
- **JISC** should maintain a watching brief on the future development of enforcement systems, particularly to ensure that suitable DREs are in use to enable enforcement to be easily implemented if desired (for example to limit the number of times an object can be viewed or printed).
- **JISC** should consider if there is a role for a nationally-accessible rights clearance registry which links the globally unique identifiers for digital material to the rights already cleared for that object. This may be achievable through harvesting rights metadata.

9 Suggestions

There are three key areas in which further work could have significant benefits for the UK HE and FE communities:

1. Good practice guides are needed to fill the information gaps. Some are beginning to appear (Casey, 2004) but many others are needed on topics such as Rights Clearance Methodology; Quality Control of Rights Metadata; Risk Management and Exposure; Publication Choices and their Implications; Institutional DRM Policies; Introduction to Authorisation.
2. There is great interest in Creative Commons licences. An equivalent approach that can be used by the UK HE and FE communities is needed. The main lesson to be learned from Creative Commons is to keep things simple! Licences must be expressible in a consistent and actionable way which will require study and adoption of appropriate rights description languages.
3. Technology to support DRM needs to move from research to practice. Much of the appropriate technology is not unique but is a combination of middleware and the shared infrastructure in the JISC Information Environment (licence registries; identifier resolvers; actionable licences). It is worth repeating the

quotation from LaMacchia at the beginning of this report “the ultimate goal of a distributed DRM system is for content authors to be able to project policies governing their content into remote environments with confidence that those policies will be respected by the remote nodes” and adding “without having to know anything about the projection technology”. Examples of the benefits offered by distributing rights information are required.

It is suggested that JISC should consider establishing a DRM Programme including these three themes: Good practice guides; Licences; Technology – practical DRM solutions.

In the same way as the JISC AAA Programme tested and evaluated several emerging authentication, authorisation and accounting technology a programme to evaluate potential solution for DRM should be established.

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11 **Appendixes**

The appendixes to this report are provided in a separate document. The titles of each appendix are included here:

Appendix A	Acronyms
Appendix B	Acknowledgements
Appendix C	Use case summaries
Appendix D	Detailed Use Cases
Appendix E	Stakeholder Analysis
Appendix F	Interviews
Appendix G	Focus Group Discussion
Appendix H	Examples of Licences
Appendix I	Table of Permitted Uses and Constraints
Appendix J	ODRL Representations of Licences