

Final Report

Exploration into Reusable Learning Object Repositories

For

Reusable Learning Objects Working Party

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April 2005

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Informants

'If I am forced to use some artificial system I suppose I will make some effort. But I would like to have someone show in what way this will benefit me as a teacher. How will it improve my teaching?'

'Look, I build my teaching around the students. This place pays me to know my stuff. What I have thought about for a session might change just because someone asks a cute question. Jeese I might be off in the other direction. Is this a bloody University or a tech college?'

'Sharing is a great thing. I see it as the way of the future in economically and ideas strapped universities. But, really, is Monash in such poor economic straights that it must enforce a lowest common denominator model on pedagogical and intellectual pursuits.'

'There are all these people who don't have a clue about quality educational materials. Unless we put a lot of resources into this we will have a pile of crap. I can see bits of PowerPoint presentations pretending that they are learning objects. You have to add to that scrappy notes that aren't even properly proof read.'

'Virtual unis are virtually impossible and are not universally acceptable.'

'I would hate to have a surgeon who studied surgery online'

Quote from Wiley (2002)

In addition to the various definitions of the term "learning object," other terms that imply the general intention to take an object-oriented approach to computer-assisted instruction confuse the issue further. David Merrill uses the term "knowledge objects" (Merrill, Li, and Jones, 1991). Merrill is also writing a book on the topic of object-oriented approaches to instruction to be called "Components of Instruction" (personal communication, March 21, 2000), which is sure to introduce yet another term, "instructional component," into the instructional design vernacular. .. ARIADNE project uses the term "pedagogical documents" (ARIADNE, 2000). .. Educational Software Components of Tomorrow (ESCOT) project uses the term "educational software components" (ESCOT, 2000.... Multimedia Educational Resource for Learning and On-Line Teaching (MERLOT) project refers to them as "online learning materials" (MERLOT, 2000)....., the Apple Learning Interchange simply refers to them as "resources" (ALI, 2000). Depressingly...: the field is still struggling to come to grips with the question, "What is a learning object?"

Leslie, Landon, Lamb & Poulin (2004) p.5

Kevin Harrigan, project director of the Co-operative Learning Object Exchange (CLOE), which is Ontario's post-secondary learning object repository. To create the commitment to the repository they developed faculty and staff champions, held monthly conference calls, and met twice yearly in-person meetings (one of which is the MERLOT annual conference). A unique feature of the CLOE situation was that members not only submit LOs, and sign out LOs to use but they also collaboratively design/build LOs across institutions in addition to participating in peer reviews.. The clear inference from the CLOE experience is that success in developing a LO repository does not just happen but requires both a vision and a good deal of ongoing work to make it happen at the level of a whole educational system.

Executive Summary

A. General

This scoping project was initially aimed at looking at three broad topics and the basic summary of results for these is:

- There has been no data presented to the scoping project on actual functioning activities within Monash on Reusable Learning Object Repositories. The only known repository is Informer (see Appendix 1) and that is currently being used by some FIT staff. There are staff across the university who are using various external repositories for professional and specialist activities. Few are directly related to the delivery of teaching materials.
- There appears to be no documentation or policy that can be operationalised into a definition of a Monash-based RLOR. Much of the data collected in this project shows a lack of interest in RLOR at the teaching level. The external data plus the staff data suggests a more comprehensive approach is needed to decide on any Monash implementation of RLOR systems. Data also suggests that there are specialised needs for repositories to hold high cost multimedia materials to facilitate reuse.
- Work is being carried out at a number of other universities with commercial or open source RLOR. Data gathered to date suggests that some those that might be of use are currently in a development stage (eg Deakin) while some have a different intention to conventional RLOR (eg. the UNSW LRC). Others appear to be based upon a particular organisational approach (eg Griffith). Without a clear idea of what Monash needs, further data collection from other universities is not warranted.

B. Repository Issues

The exploration of Reusable Learning Objects and their Repositories has failed to resolve the issue of what should be done but it has indicated key factors Monash should take into account. These have been extracted from all the various data sources contacted:

- Any attempt to implement a repository system should be done through a trial within a limited teaching area. Such a repository should be initiated with some significant materials already having been entered into it.
- Any repository system should have a range of capacities from highly structured and controlled at one end, through to open-access, self-managed control at the other. This covers quality, IP and the functional processes such as submission.
- As an addendum to the above point, those areas where high cost, high quality teaching materials are produced should be looked at as a specialist end of the spectrum. They may have needs that can be best met with a particular type of repository.
- The major features that should be addressed in looking at repository systems are:

- There should be the capacity to support teacher behaviour through credit for submission and credit for good quality submissions
- Any RLOR should interface with LMS/LCMS, or the RLOR should be a part of the LMS/LCMS similar to what has been done with Blackboard and what WebCT appears to be doing according to recent documentation from them.
- The facility for Google-type searching that could be coupled with any metadata-based search
- Full text searching should be available (on appropriate LOs) rather than metadata only
- The storage process should require minimal effort such as in the level of metadata entry
- As maintaining the use-by-date of submissions is an issue, repositories that are dynamically indexed and have management systems that dynamically update repository items should be preferred by many users. This issue is particularly relevant in disciplines where there is rapidly changing subject matter.
- A comprehensive needs analysis should be carried out, coupled with a cost-benefit analysis and all of this should be done within the context of pedagogical needs.

C. Field data

A major conclusion from the data collection is that the approach to reusable learning objects has not been pedagogically well-developed and has not been placed within any educational behaviour context. More basically, data from all sources point to a set of issues:

- Learning objects themselves are not clearly definable. A recent summary of the area at ICCE2004 in December 2004 added very little to what Wiley said in 2002. There seems to be little reason to believe that Learning Objects are not best defined as any entity that is used in teaching and learning.
- Reusable Learning Objects simply compounds the problem. What constitutes reusability is dependent upon a combination of technical and pedagogical questions. The technical side covers questions on the nature of the repository for reusability. The pedagogical side tries to find a basis in educational practice but, unfortunately, there is little data on the pedagogical issues.
- The approach in designing, developing and implementing RLOR systems has not taken into account the needs, interests and work practices of the users – the teachers and students.
- The storage of RLO has become an industry that has a certain basic philosophy – that effective RLO must be classified and accessed through a classification system. It would appear that the industry has limited interest in alternative models.
- This industry appears to be more a part of the professional area associated with Instructional Design than the general educational practice area.

The data from university teachers suggests that:

- Very few teaching staff have experience with RLO and repositories. Those who have show little interest in including RLOR in their normal teaching practice.
- The previous point is qualified by the fact that about one quarter of the 27 staff who have been interviewed see WebCT as a type of RLOR. This then generated, in their thinking, the issue of the need for multiple storage and its cost factor. There is no suggestion in this that there is any high level understanding of the RLOR issues by staff, simply that when they are introduced to the idea they equate the two.
- The work practices of teaching staff vary within and across discipline areas. These work practices need not support an emphasis upon RLOR particularly because of practicalities such as the use-by-date of teaching materials.

D. Where to next?

The key recommendation from the project is that this it is premature to invest resources and energy into implementing any Monash wide system of RLORs. This is based upon the accumulated evidence found from all aspects of the project and is strongly reinforced by changes in system structures. These include the need to move to a service orientation in building specifications. Such a move will effect all levels of design and implementation, including the security and IP issues. Combined with this are rapidly changing software engineering methodologies, such as agent-based software and Web Services, that are changing the management methodology of distributed systems

There is a need for more extensive research on LO, RLO and RLOR. This research should look at:

- The educational need for LO, RLO, RLOR as defined by staff.
- The educational need for LO, RLO, RLOR as defined by instructional design and multimedia specialist.
- The educational value of LO, RLO, RLOR within various types of courses including distributed courses.
- The organisational need for LO, RLO, RLOR and the economic balance sheet for any implementation.
- The educational reality of attempting to implement an RLOR in terms of the work practices used by teaching staff.

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I. Introduction

According to Polsani (2003) the term *Learning Object* was first popularised by Wayne Hodgins in 1994 when he named the CedMA working group "Learning Architectures, APIs and Learning Objects". Since Hodgins invented the name, an industry has evolved that lacks clarity and lacks an educational focus.

The development of learning object repositories appears to have been multisource. IMS had its beginnings in 1999 as did ADL. Also in 1999, Roger Mundell was talking about the practical work he was doing at the ICCE conference in Taiwan, although there was little else on this topic at that conference. The OKI project began in 2001.

The current status of all of these developments is difficult to simply assess because of the complex interweaving of factors – defining standards in different ways, various conceptualisations of core issues, the educational content of the systems, the focus of standards approaches and so on.

The Structure of the Area

The hierarchy of components in the RLOR-oriented systems can be seen in a number of ways. The presentation here will be from structural to more functional:

High level structures:

SCORM (<http://www.adlnet.org/>) - Sharable Content Object Reference Model
SCORM references specifications, standards and guidelines developed by other organizations that are adapted and integrated with one another to form a more complete and easier-to-implement model (SCORM 2004 Overview 1-8)

A second high level integrative specification comes from:

CORDRA (Content Object Repository Discovery and Registration/Resolution Architecture)

CORDRA is designed to be an enabling model to bridge the worlds of learning content management and delivery, and content repositories and digital libraries. CORDRA aims to identify and specify (not develop) appropriate technologies and existing interoperability standards that can be combined into a reference model that will enable several key capabilities ..

(<http://www.lsal.cmu.edu/lsal/expertise/projects/cordra/intro/intro-v1p00.html>)

A Middle level functional specification come from:

IMS Global Learning Consortium

Functional level metadata specifications include

IEEE Learning Object Metadata (LOM)

EDNA Metadata Standard

Dublin Core Metadata Initiative (DCMI)

Research centres are involved in the area such as

Learning systems architecture laboratory at Carnegie-Mellon

Australian Commercial Repositories based on various aspects of above material

Harvest Road

Impart
The Learning Edge

Associated with this are various types of *special interests groups* such as:

<http://www.elearningguild.com>

Tasks

Within this context, the aim of the exploration being reported here was to look at what RLOR system might be appropriate for Monash given what is known from current use and from what is being done elsewhere. This then generated a range of issues were to be addressed in this process, including:

- ☞ Metadata systems
- ☞ Types of repositories
- ☞ Scaleability
- ☞ Intellectual Property
- ☞ Interface with other RLOR
- ☞ Quality assurance approach
- ☞ Security
- ☞ Pedagogical Issues
- ☞ Scope and function

To this was added 'Why bother..?' – what is it that the teacher (plus the student and the university as a whole, for that matter) will get out of using learning object repositories.

A further factor in looking at learning objects and their repositories is that it is an area that has taken on a life of its own. In a sense, it is becoming an industry. This makes it very difficult to directly tap into the intellectual and practical content of the area.

As the data collection progressed, the need for refocussing became evident and this will be dealt with below.

The intellectual content and approaches in the area

An early exposure to learning objects and repositories was at the ICCE conference in Taiwan through discussions with Roger Mundell. As has been subsequently reported in descriptions of the educational materials produced by the Royal Roads University (eg. Muzio, Heins, & Mundell: 2002), he took a very practical approach to what he was doing. This could be described as a functional educational orientation rather than a systems orientation. Over and above this he was interested in educationally appropriate approaches that could lead to direct distributed learning applications.

Subsequent exploration of the various converging systems suggests that the Royal Roads approach is quite different to what has been going on in parallel.

The intellectual content and approaches of the SCORM, CORDRA, IMS, etc could be called a systems approach in that their concern is to produce formal structures that allow for common access, basically within the framework of cataloguing systems. There is no pedagogical or practical educational component in any of these systems. This conclusion is based upon searches of their web sites plus the lack of educational publication in the area.

The actual repositories appear to be applications of the standards that have been generated and do not, in their published information, indicate any developmental thinking that has an educational reference. Some of the commercial houses talk about educational issues but it is unclear how these have been established when no research, by them, has been found on the topic.

Developments in specification models and particular repository systems introduces key intellectual components from other areas such as software engineering. If we look at the 'Services' approach being used by IMS for its communication specifications and the use of related concepts by the OKI project, we move into the intellectual domain of distributed, mobile and ubiquitous computing. It can be shown that Web Services could form the framework for a less specified repository system yet this has not been reflected at e.g. the IMS forum at Idea2005.

Also within this particular area is the use of XML (and its many variants). In introducing information systems based upon XML, there is another intellectual model being applied to RLOR thinking.

Of particular interest should be the concern expressed during the IMS workshop (Idea 2005) about the lack of a people component in much of the specification and system building. A move to a model with a clear psychological and sociological content would be a major shift in the thinking and approach, such that the intellectual traditions within pedagogy might be represented.

II. The data collection processes

Data has been collected for this exploration through a range of processes.

1. Background Data

The first was simply the search for as many key players as could be found. This included the major developers, the major users and any educationists who were looking at the question.

Appendix 1 contains a list that is by no means complete

A general data collection exercise was the collection of information on RLOR through the Web, talking to those involved and through available reports.

2. Staff View

The first field data collection was based upon informal interviews (chats) with staff around the university plus some outside the university. This was done to simply get a feel for the way academics viewed the area. The summaries of these interviews are included as Appendix 2.

We attempted, as per the brief, to involve staff more formally through an email, within the weekly bulletin. Staff were asked to contribute thoughts, experiences and ideas. *Not one member of academic staff responded although two from support areas did.*

3. Staff Work Flow and Impact on RLOR Data

The next data collection exercise was based on more formal conversations with a sample of staff that was designed to address some of the questions raised in evaluating various inputs in the previous two sections that pointed to the need to investigate work practices of staff in relation to RLOR. The summary of that data is contained in Appendix 3.

III. Results from data collections

The attempt to define the area that encompassed Reusable Learning Objects and associated repositories proved difficult. The structural definition given in the introduction tells us how components might be defined and how they might be interrelated but it fails to show what the dynamics of the area look like.

These issues are compounded by the lack of high level educational reports on the use and relevance of RLOR in educational settings. There is any amount of documentation on systems but most of the commentary on these systems tends to be limited. For example Wollongong University project talks about what it is applying but had delivered very little on its functional achievements. Similarly, COLIS continues to be a test bed for various products but without some actual implementation it is of limited practical value.

In parallel to this is the apparent lack of interest of the educational community in RLOR. The literature in the area is extremely small. There are very few papers that purport to explore the pedagogical implications of RLOR and those that have been found contain very little coherent theoretical or conceptual material. For example, Collis & Strijker (2001) write about a new pedagogy based on shifting the emphasis from the teacher to the student and justify the development of a reusable learning object repository as a learner activity. Unfortunately, there is little to support the effectiveness or this against any of the issues being raised in this report. Collis (2004) was a keynote speaker at ICCE2004 where she presented similar material but still failed to provide empirical support. In fact, there was no mention of pedagogical issues in that presentation.

Weller, Pegler & Mason (2002) create a complex set of additional issues by introducing 'narrative objects' because the particular implementation of learning objects they work with did not allow cross-referencing of objects.

As we have had little input from staff who are experienced in using RLOR, we have little basis from which begin understand what local experience might look like. The first set of informal chats with staff pointed to possibility that RLOR could be relevant but there were qualifiers.

The one system operating at Monash, Informer, that was developed under a federal government grant over the past 4 years, has had mixed response from staff. It is a stand-alone system that uses a conventional metadata model for both submission and retrieval. It has no capacity for the dynamic updating of resources, leading to some of its holdings being very dated, a problem for staff. It is designed for high quality data storage and control. As will be seen from the second set of interviews, staff tend to be looking at less formal and less structured systems.

The other Australian universities implementing RLOR were accessed mainly through the material that they have published. Some conversations were held with staff who were associated with the projects but a more formal collection of information was suspended due to the lack of a systematic set of questions that would reflect Monash's needs.

Added to this, there is also a diversity of intention in the approach being adopted in implementing RLOR in other places. A good example of this is the Learning Resource Catalogue at UNSW for Universitas21. This is not intended as a repository but as a Catalogue using dynamic indexing rather than storage. Another approach is that being used by the University of Wollongong where they appear to be building a repository where only well-developed resources are deposited – similar to the school based system through The Learning Federation and the VET system.

Deakin University appears to be using a more general approach but they are in the trial stage of their implementation.

Work Practices

An accumulation of impressionistic data coupled with the specific comments from two people working in the area indicated that the role of the teacher and his/her work practices were not being dealt with in implementation and evaluation of RLOR.

Consequently the second field data collection was carried out to try to relate how staff saw their curriculum development and delivery methods and the relationship of that to RLO/RLOR.

The results from these interviews show that a number of approaches can be defined and that these would impact on RLOR use. No matter what their work practices look like, most staff think in terms of ease of use as a primary consideration with RLOR. Many also see the Google-type full-text search engine as their preferred means of data access.

Basically, few see formal data-base structures as being appropriate to their curriculum development and delivery. Some commented on the risk that they might be encouraged to generate electronic materials even though this was not appropriate to what they were teaching.

The conversations went against some stereotypes of discipline areas, teaching style and pedagogical concerns. The different approaches noted in Appendix 3 were spread across discipline areas with no trend for certain approaches to belong to any given one or group.

An issue the conversations highlighted was the difference in orientation of staff towards student-centred versus teacher-centred teaching. Where staff were explicitly student-centred they expressed concerns about the way in which RLOR might prove to be difficult for their mode of teaching. Some suggested there could be a problem of straight-jacketing staff to make them fit to what the RLOR could and could not do.

Coupled with the above point is the lack of clear definition of what an RLOR might be. This strongly suggests that any move to introduce an RLOR system would require a well-designed staff training and development program.

The interview data suggests that the high end of the teaching resources scale, where quite sophisticated multimedia materials are generated, may need some special analysis because it is highly likely that work practices in this area may cope quite well with RLOR. Work practices might also be supported by an RLOR in that the cost-benefit pay-offs may be improved if such material were accessible in an RLOR.

IV. Discussion of tasks

⇒ *Types of repositories*

Defining types of repositories can best be seen in the broad classification of highly structured to very unstructured. A part of this process is coloured by the specification system being used by any repository. In addition, each system is responding to changing technology and changing thinking, so the IMS specifications have adopted a Service framework while SCORM2004 has incorporated user response pattern.

In spite of this, it still appears to be possible to see the group of MERLOT, eduSource and Informer as highly structured. This type of structure is defined in terms metadata definition, formal quality control, formal IP control and static version control¹.

At the other end of the scale is the unstructured repository where there is no required metadata (although the depositor has to identify his/herself), quality control is based on a combination of user acceptance and user rating, IP is predominantly based on trust and version control is dynamic through virtual indexing². This is the PIAVEE (Platform Independent Agent-based Virtual Educational Environment: Krishnaswami et al, 2004) model and it appears to be unique in the published literature.

The Learning Resource Catalogue at UNSW is a mixture where the catalogue is a set of pointers to LO but the content being catalogues is based upon metadata rather than upon full-text Google-style indexing.

The federated repository system could include both ends of the scale although the unstructured repository would have to adopt some of the design specifications, including information transfer protocols, to take part. But the federated repository system is simply an extension of the highly structured RLOR because it needs that structure for communication.

Having said all of this, the responses from staff vary greatly in the way they see types of repositories although it is very clear that an RLOR would have to easily accessible – “I didn't have to seek permission or jump through hoops (bureaucratic or computing)”. They do not want yet another layer of constraint.

Retrieval-only repositories

The general discussion on RLOR tends to assume that we are talking about repositories where staff enter and retrieve RLOs. This is the model that was assumed when looking at Monash's needs. But there are quite extensive activities where an RLOR is purely for retrieval. The Learning Federation system is based upon this and the Smart Learning Design Framework at Wollongong appears also to be retrieval only.

Integrated repositories

One of the interesting observations that came out of the analysis of the conversations with staff as that some informants talked of an RLOR as a complex educational delivery environment and not just a repository system. They were seeing the RLOR as an extension of a sophisticated LMS.

Important in this was the idea that the RLOR system was for teachers and students so that the teacher was not simply pulling objects out for students, but the students were either pointed to materials or were able to utilise the information in the repositories.

¹ The term 'static version control' refers to the need to go through a process of updating an RLO rather than having the RLO update itself in the repository as it is changed.

² 'Virtual indexing' is used to describe a repository that simply holds pointers to the resources. The resources themselves are retained by the depositor.

High cost, High quality components

There are areas such as medicine and science where multimedia objects are developed for teaching purposes. The teacher specifies what is wanted and then the object is built. This is usually a high cost element in a teaching environment.

Currently, Monash does not appear to have any way of monitoring and sharing this type of material. One informant has pointed to the fact that staff are often surprised to find out that the university has such materials.

At the structured and controlled end of the repository types (Appendix 4, Figure 2), there appears to be a functional reason for developing repositories to hold this type of material.

⇒ ***Metadata systems***

Metadata systems represent a technical issue that has implications for the way in which any RLOR can be implemented.

There is a clear user issue in that both the amount of metadata and the type of metadata have to reflect the interests and needs of the users, rather than of the developers. As most staff have not used RLOR, there is limited data on what is wanted (Appendices 2 & 3).

It is important to note that there is a tendency for staff to think in terms of Google-type search and retrieval rather than in terms of the more formal search found, for instance, in the Voyager catalogue. This cascades into asking why we have to use metadata on text-oriented materials when we can do full text searches. Image and sound materials cannot be dealt with easily in this way, although descriptive headers can form the basis of user-based definitions. (Appendix 3)

Alternative Tagging Approaches

As an alternative to the highly structured metadata systems, Muzio, Heins & Mundell (2002) describe how their ELO's at CEDAR are tagged with user defined keywords. They have done this because of the difficulty in deciding which of the many systems being developed might be used.

The PIAVEE system under development at Monash (Krishnaswami et al 2004), follows the user definition but then indexes each document. Search is Google-like. It will also be developing what is called associative filtering to help users find commonly used associations – vis-à-vis Amazon.

The other extreme in this area is MetaTagger, a proprietary automatic metadata generator. Monash has incorporated this into the Web Content Management System deployment and will warrant more detail investigation in any further work on RLOR.

⇒ ***Scaleability***

Scaleability is seen here in terms of the extent to which a repository system can grow. This issue is less easy to evaluate from the data collected. The various reports point to this as a problem.

Any attempt to implement a system at Monash would have to spend some time developing and evaluating user models and consequential costing models to determine how scalability is dealt with.

Detailed consultation needs to be carried out with other universities who have implemented RLORs. The qualifier on this is that care has to be taken to distinguish between those who have introduced general repositories and those who are focussed upon distributed learning.

For this report, it was not possible to collect any data that reflected upon scalability because no university has been found in Australia with RLOR that have been in place, serving as a general repository, that have enough content to be meaningful.

⇒ ***Intellectual Property***

Everyone in the RLOR industry seems to talk about IP: The Colis report makes strong comment, papers at ICCE2004 commented on IP.

Monash staff are less concerned about IP if the interviews in the third data collection are indicative (Appendix 3). But there was also some indications from this data that a proportion of staff were unclear on what formal IP structure within Monash. For example, one staff member talked about removing his/her teaching materials if Monash took over the IP. This is further support for the need for a well-developed training and development program if an RLOR system was to be introduced.

Realistic approaches have been developed. At a local operational level, we have the approach utilised by the CEDAR ELO group (Muzio, Heins & Mundell, 2002) where a combination of ELOs being defined as personal or shared combined with a version control system. Any modification of a shared document becomes attached to the person making the modifications.

When we deal with cross-communicating and federated systems then more sophisticated authentication systems have been developed, such as the open source Shibboleth system, to establish the right of a person to access materials in a given repository.

IP and local ownership

During the discussions with CeLTS staff, the point was made that we need to distinguish internally between formal IP and local IP or ownership. The individual or group that develops an object see themselves as having ownership of the object. They object to not being consulted about others being given access to their creation.

This can become contamination with the economic issue where staff see their teaching area spending the money to develop resources that others now use for free.

IP and economics

One small point on economics is the risk management within the university that covers the cost of significant IP breaches. This could be an important issue.

⇒ **Interface with other RLOR**

Interoperability, federation etc. are issues for the specification industry. For any given university, this is academic *until there is a clear definition of the legal and pedagogical structures that will define the RLOR to be implemented.*

For example, if Monash were to become a part of distributed repository systems then the current IP issues at Monash have to be redefined in such a way that staff could put their material on such a system and that it could be accessed outside the university intranet.

The whole question of accessing complex cross-communicating systems was not raised by staff, even as a possibility.

⇒ **Quality assurance approach**

The analysis of quality control comes from a manufacturing and industrial approach and this is reflected in the computer-based views (eg. Wand & Wang, 1996). Attempts to define quality in education and educational delivery appear to have been derived from this base rather than from a base that reflects the dynamic nature of the educational environment. For example, Postema and Markham (2002) have looked at the nature of student satisfaction with their course within the context of continuous improvement while Guolla (1999) directly used the quality assurance approach contained in a customer satisfaction model.

Defining a possible quality assurance approach is difficult to do without taking into account a critical economic issue – staffing of a quality system. A quick look at the size of the MERLOT support system, as shown by the staff list on the web site, indicates that RLOR of the structured type are not cheap. If we look at Monash and begin to think of the quality control issues with validating deposits and establishing acceptable norms, we have to look at the number of faculties and schools within the university. Within each teaching unit we have to then look at the discrete discipline areas and within these we have to consider specialties.

Credibility in a formal quality control will depend upon the controllers being seen by users as people who can make judgements about their academic area.

Quality can be looked at in other ways. For example, we can assume that academics know enough about their own area not to be fooled by bad items. We might also assume that the more frequently an item is accessed, modified and saved by others, the more likely it can be seen as having quality. Coupled with this can be user ratings of materials, although users tend to be poor in carrying out such ratings.

⇒ **Security**

Security has not been addressed although some staff (Appendix 3) did mention it as an issue.

⇒ ***Pedagogical Issues***

At the time of drafting the issues that might be looked at in this project, the committee accepted that pedagogy was a big area that might have to be put to one side. As the information collection continued it was obvious that pedagogy-RLOR topic might be big but it had to be taken very seriously.

In fact, the reusable learning objects industry has an interesting limitation on its credibility in its failure to address pedagogical and learning questions. What I mean by this is the failure of the industry to talk about and do research into the nature of learning objects and RLOR in the educational context. A search of the key websites of industry participants failed to produce even basic discussion of the pedagogical and learning issues associated with learning objects and RLOR. The industry appears to be operating from the technological model that failed with programmed learning and CBT; the model that disregards the users of the system in favour of the system.

- The IMS site produced 7 documents (only one of which was an IMS page) and about 8 references to pedagogy/pedagogical. There were no references to epistemology. There were no references to “learning theory”. “Work practices” and “work flow” produced nothing.
- The ADL sight had 6 documents of pedagogy/pedagogical with very limited content. Zero on epistemology/epistemological and zero on learning theory. There appeared to be no discussion of work practices or work flow.
- The IEE LTSC site has no search capacity although, indirectly, information was found on the LOM Educational categories.

The LOM Educational categories are given by Bergner & Baumgartner (n.d.) as:

- The interactivity type, i.e. whether the learning object is more suited for active or expositive learning;
- The resource type, like for instance exercise, simulation, questionnaire, etc.
- The interactivity level
- The semantic density
- The intended end user role
- The context
- The typical age range
- The difficulty level
- A description of how the learning object is to be used in education or training;
- The language of the intended end user

All bar the first two are purely procedural or clerical and have little to do with educational method. This does little to place learning objects within any definable educational context except at the instructional design level, that is they are more concerned the development of educational support materials rather than with core teaching and learning processes.

The lack of clear pedagogical definition is also illustrated in the Monash Colis (Collaborative Online Learning & Information Systems³) report (Joy, O'Neill & Howey, 2003). The nature of the Monash contribution to the Colis project was to carry out interoperability tests within the framework of user workflow analysis. It is recognised that staff were observed and staff were interviewed but there is no sense in the report that they are the prime operators for whom Colis was initiated. They appear to simply be operatives in a systems definition process. It is difficult to understand how this activity could be reported with no reference to the educational relevance for users, to the way users would place this within curriculum development and implementation and other educational and human concerns. It belongs within the same thinking that has seen CoolCampus work on library aids for the visually impaired without consulting the visually impaired on their needs (this was until early 2004).

It has to be pointed out that the superstructure of RLOR building would appear to be contrary to many of the current pedagogical positions particularly Constructivism (and its variants) and Activity Theory.

The only major report that has been found that compares various RLOR (Leslie, Landon, Lamb & Poulin: 2004) does not have one single pedagogical or learning-based criteria in its analysis.

Appendix 5 contains a diagram that attempts to bring together some of the information on the relationship between RLOR and the education system.

⇒ ***Scope and function***

Not directly addressed.

⇒ ***Who decides what an RLO is?***

Within the limited framework of this data collection activity, the practical questions on the nature of reusable learning objects has raised its ugly head.

During one significant interview, an informant was adamant that RLO could only be things that were 'well-developed' in the context of instructional design. The informant was highly critical about the RELOS website because it was not 'good enough'.

Discussion with staff from CeLTS Gippsland, emphasised the well-developed RLO and they also pointed to the value of some type of RLOR to make it easier to access such RLO.

From the staff data, most respondents had either no definition learning objects or a very general one.

There may be variation between schools and faculties on how this issue would be resolved but it has been impossible to begin to find any basis for initiating a general definition process.

³ See <http://www.colis.mq.edu.au/> for more information on this project.

⇒ **Staff work practices – the extension of ‘Why bother..?’**

The Monash component of the Colis project looked at work flow and the various products it was exploring. Unfortunately, its report suggests that it was assumed that the products fitted and that staff simply had to show how they would use them. There is nothing in the report that indicates any attempt to find out what the actual work practices were being used by staff and how these work practices might fit using such products.

Exploration of the world of the RLOR has suggested that they are not well used. One of the most accessible RLOR, MERLOT has approximately 13,000 deposits, starting from about 1998. Careo contains about 4,000 objects.

Koppi & Lavit (2003) and Koppi, Bogle, Bogle (2005) point to problems with staff usage of their LRC.

The quote on the front of this report from Leslie, Landon, Lamb & Poulin (2004) shows that much time and effort has to be expended for K-12 staff to get involved in RLOR.

⇒ **Leading Edge Technology**

It is difficult to evaluate the extent to which RLOR thinking is up-to-date. There are too many parameters to make a simple analysis. What we can do is look at some of the available information although this, obviously, cannot include the proprietary world of the commercial products.

For example, the work being done on specifications by IMS includes the Service Oriented Architecture for information transfer, a part of a major trend in thinking. The way this has been done advances the process of unconstrained information transfer between users. A more extensive model might also use Web Services to define ways of searching and extracting data from repositories. It is unclear whether this is what OKI is doing.

As RLOR thinking is about distributed education, there is the issue of the extent to which systems are being built in ways that reflect the power of distributed, mobile and ubiquitous computing. It does not appear to be happening in the world of LMS/LCMSs where a fairly conventional software engineering model appears to be in place. The development of agent software, particularly mobile agents, is not a simple solution to any problem. But there is considerable evidence that agent software provides the basis for ubiquitous and distributed systems that are far more flexible than other approaches.

This issue has been raised because it may be the case that technology will, in fact, overtake the whole of this area and make it redundant quite quickly. For example, the technology associated with Web Services is capable of doing a number of tasks, quite economically, that presently are quite complex, albeit with some resource management issues. It may be the case that security and authentication could be handled this way, with greater simplicity, than that used in Shibolet (www.immagic.com/TOC/elibrary/TOC/meteor/downloads/shibblth.pdf).

At the same time as energy is being allocated to more refined metadata systems, the world of data mining is moving towards more intelligent means of evaluating the way in which data sources are used and from this to add to the classification information – such as associative filtering. Some work is currently

being done on building dynamic, user pattern indexing. This may eventually relate to the work being done on automatic meta-tagging.

Similarly, the Google-type search approach is becoming the norm for data search and acquisition by computer users. When this is coupled with searching full text documents, the level of search flexibility is extremely high. If we further couple some form of associative filtering we have high level flexibility.

The above situation need not have any meta-tagging with all search requests being based upon the actual content of the documents. Of course, any graphic or sound files need associated descriptive information if they are to be included in the system.

V. Case Studies

Case study 1

This example comes from a user of the Informer system and raise a number of issues that are not specific to Informer.

The staff member added a range of materials to Informer early in the development of the system. The material covered a series of pedagogical developments in delivery. The deposit process was, at that stage, quite time consuming.

In the past 2 years the material in Informer has become outdated. The teaching has changed, the material has changed and the owner would prefer that it not be kept in its current form. But he is too busy to update it and see no value in doing so.

Informer appears to have no 'refresh' mechanism. It appears to have no way of checking and managing the use-by-date of what is in the repository. For example, does a member of staff get a message to ask if they want an item kept in the repository at the end of an academic year? How many repositories take seriously the question of time-based relevance?

Case study 2

CERG, from the second stage of an AUTC grant, developed a repository for educational innovation. The intention was that it would be an exchange point for ideas, where educationists could find out what others are doing rather than re-inventing the wheel.

The motivation for the repository came from collecting field data on what educational innovation was being done by ICT staff. It was the staff who attended workshops who asked for means of exchanging information.

The design concept for the repository focussed upon minimal effort on the part of the user, in the sense that we did not dictate what was wanted but encouraged staff to deposit materials in a relatively flexible way.

The repository has never been used.

This reflects the experience of similar exercises in other countries.

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Appendix 1

A sample of RLOR and related sources

Name	Location	URL
COLIS	Macquarie	http://www.melcoe.mq.edu.au/projects/methodology.htm
ARROW	Monash/DEST	http://www.arrow.edu.au/
LSAL	Carnegie Mellon	http://www.lsal.cmu.edu/lsal/
OKI The Open Knowledge Initiative	MIT, Carnegie etc	http://www.okiproject.org/
elearning guild	Private co.	http://www.elearningguild.com/index.cfm
Design for reusability	Qld.TAFE	http://www.tnqit.tafe.net/RLO/
LRC	UNSW - Universitas21	http://www.edlrc.unsw.edu.au/
MERLOT	not sure	http://www.merlot.org/Home.po
Advanced Distributed Learning	US Defence Dep (?)	http://www.adlnet.org
Harvest Road	Private Co.	http://www.harvestroad.com/products/hive-modules.cfm
Impart	Private Co.	http://www.impart.com.au
VET Learning Object Repository Project	TAFE	http://flexiblelearning.net.au
edusourceCanada	Canadian Gov.	http://www.edusource.ca/english/what_eng.html
The Learning Edge	private	http://www.thelearningedge.com.au/assembler_tute.asp
Reload	Boulton and Strathclyde	http://www.reload.ac.uk/background.html
WebWorkforce/Informer	Monash	http://www.webworkforce.org/
Campus Alberta Repository of Educational Objects	U Alberta	http://www.careo.org/
Smart learning design framework	Wollongong	http://www.digitalmedia.uow.edu.au/sldf.html
InterLearn	Monash	http://www.monash.edu.au/interlearn
CORDRA	Carnegie Mellon	http://cordra.lsal.cmu.edu/cordra/index.php
Handle System	Open Source	http://www.handle.net/index.html
Digital Identifiers	private	http://www.tsoid.com/default.aspx
interwoven	private	http://www.interwoven.com/
NMC	Canadian Gov?	http://www.newmediacenters.org/projects/lo/lsiandp.shtml
Dspace	org/MIT	http://dspace.org/index.html
JORUM	org	http://www.jorum.ac.uk/

Appendix 2

Preliminary interviews

These interviews were informal conversations with staff mainly from Monash. They were staff known to the researcher.

Each respondent told that this was a scoping exercise and that he/she would not be identified in any reporting

#1

This academic works across campuses and prepares unit materials for and with other staff.

She does not use RLOs but does use an LMS. Is not clear on how RLOs would help in long term unit development. Accessing an RLOR would have to be reasonably straight forward because she does not have time for something with a long learning curve – nor a steep one. Has had no contact with RLORs.

#2

No involvement in cross-campus units and does not use an LMS. Understands that exchange of materials could enrich his teaching environment but is unclear on how this can be easily done in his area as most of the materials would be non-text. Would have to see an RLOR in action to explore its likely benefit in his teaching. Raised questions about how an RLOR fits into a more creative teaching environment. Has had no contact with RLORs.

#3

Teaching includes e-learning system and is always looking for things that can enhance this mode – as well as the face-to-face mode. Sees that RLOs could help develop a better structure of the two delivery modes he uses. It could mean that there would be less re-working of materials. Does feel that he would have to adopt quite a different approach to curriculum development to bring in RLOs and this is not possible under current academic loads. Knows about RLOR through his contact with people in e-learning but has never used one.

#4

Very similar to #3. Also sees that using RLOs would require significant changes in educational delivery thinking. She has had no contact with RLOR.

#5 [external]

Believes that she uses RLO in the sense that she has team-taught for many years. The teaching team develops common teaching/learning resources and all of them access them as they are needed. Most of this is physical although some of it is now via URLs. Finds it hard to believe that her team would gain a lot from putting these materials into a formal RLOR – there is no obvious time or educational benefit. The students are enthusiastic about the way materials are currently accessed. She would have to be convinced that were some benefits before even beginning to explore this option.

#6

Uses an RLOR – has teaching materials in a web-accessible file system that is used by tutors and students. Only teaches to his local students but sees the approach easily expandable if he has to teach across campuses or to provide materials to other teaching on other campuses. Cannot see the value of some larger system that includes materials other than for his subject matter. His area is specialised and he does not bring in material from outside it.

Appendix 3

Workflow Practices and its Influence on RLOR

The data collection for this task was carried out by two interviewers. Given the unstructured and informal nature it was decided that this would add objectivity to the process. When the interviews for the two researchers are compared, there is some difference in discipline areas of the subjects but there is no obvious difference in content.

Sample Selection

The Conversation sample was selected informally. The two interviewers used their involvement in committees and other projects to find academics who they could approach without difficulty. Each respondent told that this was a scoping exercise and that they would not be identified in the reporting.

These academics cannot be seen to represent any particular point of view or position on pedagogical issues – and this is shown by the responses to teaching-learning questions. Although, as they were willing to participate, they may be seen as giving a biased set of responses.

Basic questions for Work Flow Conversations

- How do you go about developing a course?
- How do you go about developing the materials for the students?
- What sort of useable lifespan does material you produce have?
- What is the proportion of electronic versus hard copy materials?
- What definition would you use for a learning object?
- If you were asked to put learning materials in an electronic repository, how would this work for you?
 - If you were asked to retrieve materials from a repository how would this fit with what you do?
 - What do you see as the general issues around using repositories for teaching materials?

Work Flow Conversation Participants by Discipline

Arts	3
Business	2
Fine Arts	2
IT	3
Education	5
Engineering	4
Law	1
Medicine	1

Science	3
Social Sciences/Psychology	3

Summary Work Flow Conversations

The figures in the square brackets show the number of respondents who used this category. As multiple responses are possible the total in each area may exceed the total number of respondents. Some respondents also talked about more than one teaching area and these were quite different in nature.

How do you go about developing a course?

Objectives > blocks of material related to topics not weeks > assessment structure	[5]
Objectives > blocks of material related to topics not weeks > Case studies/Examples/Etc	[2]
Objectives > blocks of material related to topics not weeks > changes based on student performance	[3]
An objectives approach that develops web-based resources.	[1]
A structured approach but has to respond to changing subject matter even in the short term	[1]
A student oriented objectives to outcomes approach but where colleagues are consulted.	[1]
High level preparation before teaching begins. Reflects need for integrated practical work.	[2]
Define student performance> Lectures as framework > Tutorials as support> Independent student work	[5]
Driven by external course guidelines .	[3]
On the fly but this is from a deep subject knowledge (<i>stated in a number of ways</i>)	[4]
Based on teaching team using the formal structure to generate a student-centred program	[1]

Developing the materials for the student

Exploring ideas and then developing a variety of media including (specialist) files	[5]
Use problem-based learning model so that all topics are tied to action	[5]
Focus upon self-managed student learning and how support materials fit.	[3]
Look at materials against independent learning needs of students	[5]
Looking at most appropriate mode of delivery for student group.	[1]
Extensive use of materials developed through instructional design	[1]

- Based on experience of student needs in subject(s) [1]
 Uses the formal material associated with set texts plus appropriate practical exercises [3]
 Use the course objectives etc. and generate the various student materials. [2]

Useable lifespan of materials

- Not sure – everything is changing dynamically as electronic resources are updated [1]
 Very short term to short term [1]
 Mainly short term – revisions needed each semester [6]
 Needs revising each year but is tweaked due to situation – but material is based on longer term materials [3]
 Medium term – 1 to 2 years with minor changes. [5]
 Reasonably long term (2-3 years) but practical material has to be updated to reflect student responses and system changes. [6]
 Very long (3-5 years) subject to student prior knowledge and minor revisions [4]

Electronic versus hard copy teaching material

- Mainly hard copy. [7]
 Uses a lot of concrete materials to support teaching – this cannot be electronic [1]
 Uses multiple media but notes, reading etc is all hard copy. [5]
 About 50% hard copy and the rest electronic [4]
 Mixed using WebCT. [1]
 Mainly electronic via web (including WebCT) and ftp. [7]
 All course and exercise material is presented via a common folder on the unit server. [1]

Defining a learning object

- Not thought about it. [7]
 It means nothing to me [1]
 A bit of jargon for the obvious [1]
 Any object provide to support student learning [7]
 Any item that focuses learner on understanding to achieve learning outcome [6]
 Materials that help prepare students for professional roles [1]
 Generalised pedagogical position [1]

If you were asked to put learning materials in an electronic repository, how would this work for you?

- Not very well because they do not fit with development and delivery style. [5]
- Would be OK but my teaching approach is not the common approach of others teaching in the subject area. [2]
- Extremely difficult because it would be time consuming – mainly non-text files. [1]
- Difficult because does not have many people teaching similar content. [3]
- A lot of effort for limited returns [3]
- OK, but must be interactive and allow commentary. [2]
- A good idea, in principal [2]
- All major materials are paper-based so not relevant [2]
- Could be a good idea but has to be very easily updated [1]
- No problem – I do it all the time in terms of Web/WebCT as RLOR. [3]
- Currently use MY PORTAL as RLOR but to go to a more formal repository would require training and support [1]

If you were asked to retrieve materials from a repository how would this fit with what you do?

- Little use but if done must be easy without procedural complications. [3]
- Some use of WebCT to exchange materials with co-lecturer [1]
- Prefer Google-type search and retrieval – not experienced anything else [6]
- Some ‘repositories’ are used but these are mainly based on sharing some materials such as sound file. [1]
- Currently use central repositories of non-text files. [1]
- Currently use LMS in DE mode as ersatz-repository. [3]
- Already use ‘repositories’ in the sense that there is a lot of public domain material on the web [4]
- OK if materials could be sucked out of WebCT. [1]
- Has to be pedagogically appropriate and involve active involvement in the process [2]
- Would be good particularly if students could directly access the materials as well [2]
- Not sure. [3]

General issues around using repositories for teaching materials

- Have not had an interest in this [2]
- Appropriateness of electronic media given the nature of the subject [2]
- Pedagogical issues on the relationship between repositories and student-centred teaching [2]

Credit for work done.	[6]
Quality. Particularly for specialist material	[3]
Stability and security.	[2]
Would never use a general repository unless it was well controlled.	[1]
The way in which entries are catalogued (metadata).	[4]
IP of own specialist material (eg art works).	[2]
IP of retrieved materials.	[4]
Having veto rights on who can access my materials.	[1]
The personal style of the depositor.	[3]
Cost is an issue – needs to be free	[1]
Time to develop quality materials	[3]
Not sure	[2]

Classifying Work Patterns and Work Flow.

- **Systematic, structured (S-S)**

Based upon developing curriculum in a well structured way where much of the developmental work is done before the course begins.

May include needs analysis associated with the curriculum area – to determine what are the key areas to be covered.

Learning materials are integral to the course content. They may or may not be stand-alone entities.

- **Systematic, structured but responsive to student needs (S-S/R)**

Sets up a well defined model – although not as well-developed as in the **S-S** type.

The teaching materials are evaluated during the first sessions to check for needed modification given student characteristics.

Materials will then be produced on the fly if that is required.

- **Subject Control (S-C)**

The starting point for this approach is immersion in the content through reading and accessing information. – Could be through practice with Art/design.

Ideas are checked against thinking of colleagues.

Material taken into lectures and tutorials tends to be process oriented rather than structure. Much of the work done with students is process-based.

Often material, content and activities will evolve as the students respond to materials.

- **Unstructured, existential – ‘fly by the seat of your pants’ (U-E)**

This approach works from the general content of the subject and its broad outcomes where the lecturer works from his discipline expertise to generate course content.

There will often be learning materials but they are often illustrative and entities that point to ways of thinking. This environment can utilise a ‘Google’ structure quite well at both teacher and student level.

- **Providing a learning environment (PLE)**

This approach focuses on the best ways to encourage the students to take control of their own learning. It may be a subset of other approaches. It should not be confused with constructivism.

The lecturer develops learning materials that provide a critical, problem solving orientation. There can be multiple entities dealing with the same curriculum area. These are best accessible to the student through a ‘Google’ structure. The staff tend to favour ‘Google’ as a data exploration approach rather than a structured data base approach.

Implications for Electronic resources

The **PLE** work flow supports generalised use of electronic resources. This could include RLOR but they would simply be another resource accessed by learners. The most appropriate for this learning environment would be unstructured repositories. A very highly structured repository would most probably be seen as constraining the students.

There does not seem to be a lot of interest in the **PLE** for LMS/LCMS systems. The most positive comment is based on it saving on printing costs.

In contrast, the **S-S** type would utilise electronic resources well, so long as the resources were easily accessible. The structure given to students would indicate that students would probably also be comfortable with structured RLOR.

The **S-S** also seems to talk about LMS/LCMS as a natural adjunct to their teaching.

The position of the **S-S/R** type is less clear. This teacher may find RLOR as useful, but would work better with an RLOR that was flexible. As he/she is responding to student needs, he/she would want students to explore.

An **S-S/R** does not seem to have a problem with LMS/LCMS but they are referred to as functional entities that help delivery printed content to students.

The **S-C** teacher will use whatever is available that is up-to-date and educationally coherent. The problem with structured RLOR for this type of teacher is that they have to constantly monitor the use-by-date of the material. Consequently, they would only be comfortable with low structure, virtually indexed RLOR.

The **U-E** teacher will use what is available. As students are being encouraged to be critical, the unstructured RLOR would fit better into the pedagogy than the structured ones.

The only value of LMS/LCMS to the **U-E** teacher is as an easy way to give students notes.

Appendix 4

Diagrammatic representations of the domain.

Figure 2 below attempts to define a structure for RLOR based on three dimensions:

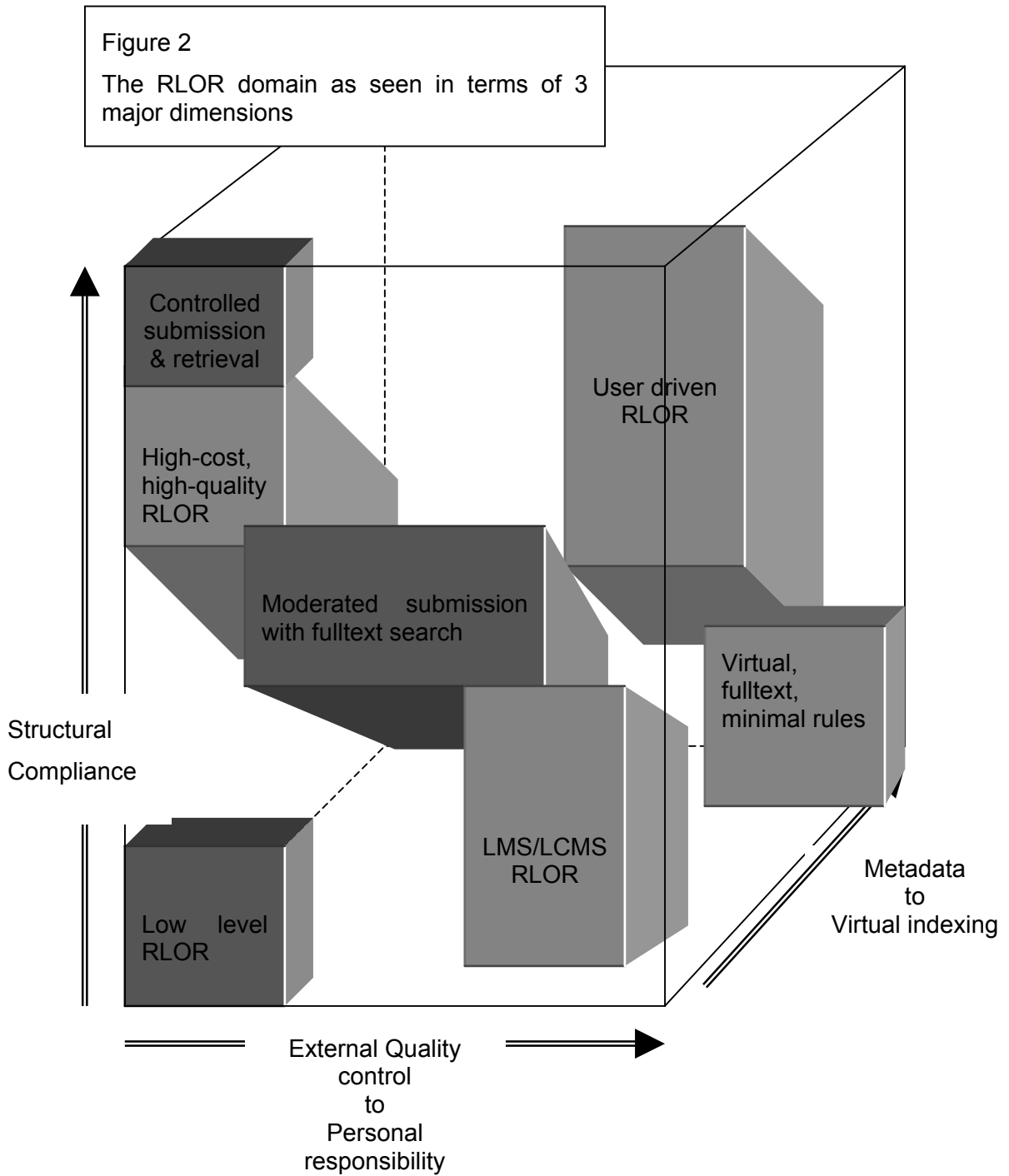
1. Compliance with specifications
2. External versus internal quality control
3. Metadata versus dynamic indexing

If an RLOR was developed that fitted the needs of staff and others, as seen from the field data, then it would fill the three dimensional space.

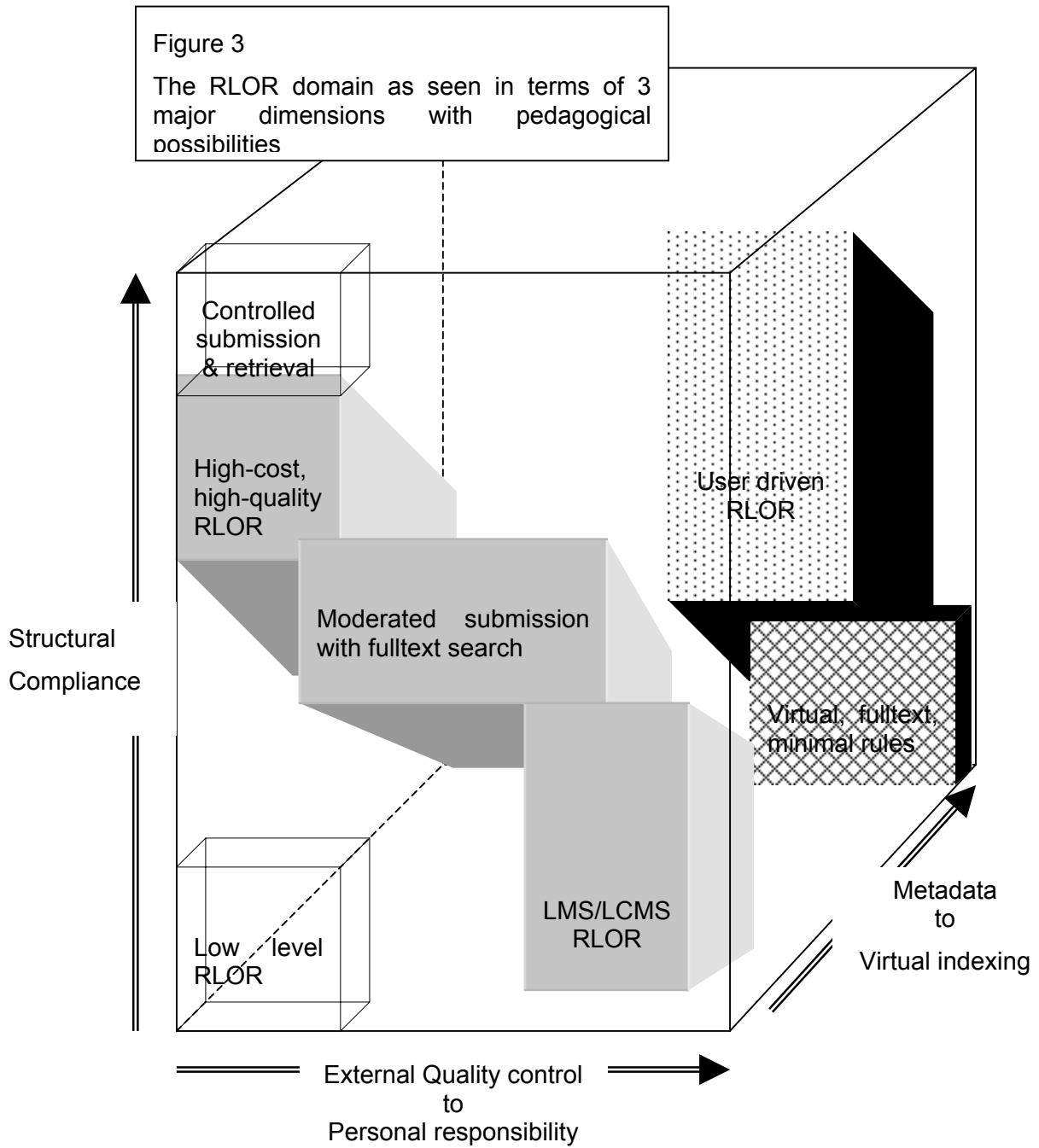
The components included are defined as:

1. *Controlled submission & retrieval* – standard RLOR fitting a specification, based upon meta-data and using external quality control.
2. *High-cost, high-quality RLOR* – one that works with the multimedia-type RLO, developed by eg CeLTS
3. *Moderated submission with fulltext search* – this is in the middle where there is control over submission but it is indexed for full text search. It will have some metadata. It will not be driven by compliance and external quality.
4. *Low level RLOR* – basically the poor-man's RLOR.
5. *User driven RLOR* – this is the type of RLOR that fits into the majority of comments on what might be needed and what might be used.
6. *LMS/LCMS RLOR* – this is very speculative but it is where the WebCT RLOR might fit.
7. *Virtual, fulltext, minimal rules* – this is where PIAVEE would fit

Figure 3 is an attempt to relate pedagogical thinking to the RLOR structure. This is not based on anything but impressionistic, anakyticaal response – for the purpose of discussion.



Note:
A fully developed federated model incorporating harvesting would fill the domain as it would be able to accommodate all major dimensions.



Wire frame: Most likely instructivist thinking
 Spotted face: Constructivist
 Cross-hatch face: Action / Distributed/ Critical Theory
 Flat face: Indeterminate

Appendix 6

Scenario illustrating Work Flow practices

Margot Schuhmacher

Consider the following scenario:

1. Lecturer is **assigned** to teach *unitX* in *semester-n-yyyy*.
2. Lecturer **creates/sources** resources/content for *unitX* in *semester-n-yyyy*:
 - a. Searches for resources (e.g. library, books, google) AND/OR
 - b. Creates new resources AND/OR
 - c. Lecturer identifies that resources/content for *unitX* from *semester-n-yyyy* can be revised AND
 - i. Lecturer retrieves resources/content from *unitX* in *semester-n-yyyy* (local PC, server, **REPOSITORY**) AND
 - ii. Lecturer modifies resources/content from *unitX* in *semester-n-yyyy*
3. Lecturer **stores** resources/content for *unitX* in *semester-n-yyyy* (local PC, forwards for printing, uploads to server for students to access, **REPOSITORY**).
 - a. If resources are stored in a CMS/Learning object repository AND linked to a LMS, they are accessible for printing and viewing online
 - b. Version control required – e.g. MS12Mar2005
- 4.** Resources/content for *unitX* in *semester-n-yyyy* **delivered to students.**
5. Return to step 1.

Trials/investigation for repository:

1. Monash owns IP.
2. Staff given credit for production of original material.
3. Staff to acknowledge other sources as per copyright compliance.
4. Naming conventions for files (suggest *topic-activity-staff-date*)
 - a. e.g. *ProjectManagementScope-LecturePresentation-MS-12March2005.html* and *ProjectManagementScope-MS-12March2005.pdf*
5. Monash staff can access Monash resources
6. Follow the direction research is carried out and published:
 - a. Can introduce peer reviewing
 - b. Can implement a quality system for Monash