Repositories and communities at cross-purposes: issues in sharing and reuse of digital learning resources

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Abstract
Globally, institutions are setting up digital repositories to support the sharing of resources for teaching and learning. The educational rationale is that a single set of resources can be restructured to support different pedagogical approaches and to achieve economies of scale. A key problem is that these learning object repositories (LORs), like many other learning technology innovations, are often designed to exploit the capabilities of technology rather than to meet learners’ needs. The premise of this study is that the nature and organization of a community is likely to impact the way an LOR is used. Key dimensions of repositories and communities are discussed. Three repository systems are analysed to identify how communities use repositories. Guided by Activity Theory, the LORs and user communities are analysed as activity systems. These activity systems are compared and contradictions between them are identified. From the analysis, barriers and enablers for the use of LORs to support learning are discussed and a framework for addressing the key issues in the repository development stage is proposed.

Keywords
activity systems, Activity Theory, learning communities, learning object repositories (LORs), phenomenography, socio-cultural issues in technology use.

1. Digital repositories and learning communities
Rapid developments in the use and reuse of digital learning resources, or ‘learning objects’, have led to a marked increase in the number and range of learning object repositories (LORs) aimed at supporting sharing and reuse of resources for teaching and learning. Essentially an LOR is a digital store box that provides services to designated communities by hosting collections of digital resources for learning and teaching (Heery & Anderson 2005). One of the main differences between an LOR and some other sort of repository store is that the LOR hosts learning objects (LOs). Broadly speaking, an LO is a granular, digital resource developed to meet a single LO (for definitions of an LO see IEEE 2001; Koper 2001; Wiley 2001). LOs are designed to be integrated, aggregated (information resources are combined with learning activities) and sequenced to produce ‘units of learning’. Essential features of LOs are that they should be reusable, accessible, interoperable and durable (Rehak & Mason 2003). Therefore, it is crucial that LOs are stored in a way that makes them easy to share, source and adapt for a variety of purposes.

However, there are problems in trying to create meaningful ‘units of learning’ by combining and sequencing reusable LOs (Wiley 2003; Beetham 2004; Friesen 2004; Parrish 2004). Such units cannot capture the essence of a good piece of teaching. LOs do not provide insight into the tacit changes in teaching tactics that teachers adopt during real-time learning situations.
They do not offer insight into different ways in which teachers interact with students and provide feedback (Littlejohn et al. in press). This tacit information is usually communicated through dialogue. Therefore, communities of practice that support teachers talking around their use of LOs is an important aspect of extending and improving teaching practice (Falconer et al. 2007). The way repositories are used to source, share and manage LOs depends both on characteristics of the repositories themselves and characteristics of the communities that use them.

This paper is based on a study that aimed to analyse the ways in which different communities use repository systems. ‘Community Dimensions of Learning Object Repositories’ was funded by the UK Joint Information Systems Committee (JISC). The study is underpinned by the following important aspects (dimensions) of repository systems that were abstracted through a literature review and focus group activities with curators representing a number of different repository systems (Margaryan et al. 2006):

1. The purpose of the repository;
2. The subject discipline the LORs has been created to support. Although some LORs are mono-disciplinary, many are multidisciplinary;
3. The scope, for example, some LORs support single departments or institutions, while others operate at a regional, national, or international level;
4. The sector, LORs are used in schools, higher and further education institutions as well as hobby-based or work-based communities;
5. Contributors may include teachers, students, publishers, institutions, employees or hobby enthusiasts, depending on the scope and sector;
6. The business model that governs the trading, and management framework underpinning the repository.

These six dimensions draw out important aspects of the context within which the LORs operate within and across communities.

LORs are increasingly used across a range of diverse communities, including work-oriented (communities of practice), research-oriented and learning-oriented communities (classroom communities, virtual university communities). Our hypothesis is that the way repositories are used will vary according to the needs of user communities. LOR user communities will often involve a range of actors – teachers, students, support staff in institutions (librarians, educational developers, staff developers, etc.). Therefore, when discussing user communities within this paper, we refer to all these actors. The diverse needs of user communities arise from characteristics of individual communities; therefore, the issues associated with the implementation and use of repositories will differ across communities, although some will also be common across communities. For example, geographically dispersed teaching and learning communities are often loosely knit. In such communities, members will communicate and interact in different ways as compared with locally based, tightly knit communities (Littlejohn & Margaryan 2006). Dimensions of communities include:

1. Purpose, the shared goal/interest of the community; the reason why the community was formed in the first place;
2. Dialogue, modes of participation and communication (online, face-to-face, or mixed) adopted by the community;
3. Roles and responsibilities;
4. Coherence, whether the community is close-knit or loosely confederated/transient;
5. Context, the broader ecology within which the community exists (for example, institutions, organizations, professional bodies, governments, etc.);
6. Rules, implicit and explicit rules that govern the functioning of community (for example, ground rules of conduct, rewards and incentives mechanisms, control of access and use of resources, etc.);
7. Pedagogy, predominant teaching and learning approaches used in the community (for example, problem-based learning, collaborative learning).

Our starting point was that the way repositories are used depends not only on the dimensions of repositories, but also on key characteristics of communities. Therefore, it is important to integrate dimensions of repositories and communities, and provide an analytic lens to investigate issues surrounding the use of LORs to support learning within a diverse range of communities. One such analysis can be carried out through the activity-theoretical framework. The framework will help to integrate key actors and processes involved in use of repositories by communities, as well as identify and compare perception of the actors.
This paper illustrates the development of this unified framework by considering the following questions:

1. How do communities use repositories?
2. What are the contradictions among the individual stakeholders' perceptions of the repositories?
3. What barriers for the effective use of repositories to support learning within communities arise from these contradictions?
4. How can these diverse perspectives be aligned to elicit effective use of repositories?

2. An Activity Theory framework for analysing LORs and communities

Activity Theory is a useful conceptual framework to investigate the LORs and communities that use them. This theory offers a method of analysing the development of LORs as participatory environments where knowledge is co-constructed rather than ‘exchanged’ or ‘consumed’.

Activity Theory (Engestroem 1987) is one of a number of socio-cultural approaches to learning. These theories include cognitive-social theories (Bandura 1977; Leontiev 1978; Vygotsky 1978); situated learning theories (Lave 1997); and communities of practice approaches to learning (Wenger 1998). One common factor of these theories is the importance of social and cultural contexts in learning. These theories view learning as an expanding engagement with a social practice, rather than as the passive acquisition of decontextualized knowledge. Learning is located in collective practice rather than in individual activities; individuals construct knowledge needed to achieve their learning goals by accessing it socially.

While analysing LORs and their use within communities, it is useful to build on the three main assumptions of Activity Theory: (1) the social origin of learning; (2) the mediation of learning by tools; and (3) the goal-oriented nature of learning activities. The first premise assumes that cognition is socially distributed rather than located in an individual; therefore, knowledge is socially created through practice. Leontiev (1978) calls this ‘co-knowing’. The implication for LORs is that for effective support of learning processes within communities, LORs should facilitate social interactions and co-creation of knowledge as opposed to individuals using repositories in isolation. This means that the use of repositories should extend beyond passing sourcing of pre-constructed digital resources towards active and collaborative creation and sharing of resources by users. In other words, while developing repositories, repository curators should consider different trajectories of interactions within the communities. Gifford and Enyedy (1999) suggest that these interactions take place at three levels: ‘the sociogenesis of cultural practice, the ontogenesis of people within practice, and the microgenesis of ways of participating within that cultural practice’ (p. 5).

The second premise is that the social co-creation of knowledge is facilitated through the use of tools (conceptual and/or physical). For example, knowledge can be co-constructed through dialogue, using ‘language’ as a conceptual tool. Alternatively, dialogue can be supported by communication technologies, such as email, blogs, or telephone as physical tools. Certain tools are more appropriate for certain types of activities, because of their affordances (Norman 1988, 1990). Tools can be understood only in the context of use, the ways in which they are used, what they are used for and their historical development. Repositories are not used in isolation; they are part of a repertoire of tools that individuals and communities use to achieve learning goals. Therefore, the interplay between repositories and existing tools has to be considered when LORs are introduced to communities. Tools can fundamentally change the nature of activities and can lead to the creation of new types of activities (Jonassen & Rohrer-Murphy 1999). Tools themselves can be altered by the ways in which they are used. The implication is that as the way in which communities use the LORs changes over time, the learning and teaching activities within the communities may be transformed as well.

The third premise is that learning activities are outcome-oriented, and driven by learners’ goals and motives. Motivation and goal-formulation are influenced by prior experiences, interpretation of the expectations of others, and identification of the strategic purpose and value of personal actions. Leontiev (1981) argued that an activity can be analysed at three levels. The first level relates to the overall motive for engaging with an activity. The second level relates to the actions that constitute an activity that are governed by (short-term) goals. The third level of activity relates to the operations necessary for carrying out the actions. To
support learning effectively, repositories should be aligned with the learning goals and activities of communities at these three levels.

An important activity-theoretical construct which helps us to analysis how communities use LORs is the ‘activity system’ (Engestroem 1987). Activity systems are sociocultural settings where community members (subjects) have a shared goal (outcome), set of actions to achieve the goal (object) and set of tools (instruments). These tools (instruments) are used to act on the object to achieve the outcome. This tool-mediated action maybe constrained or enabled by implicit and explicit rules (rules); the broader context (community) within which the activity takes place. Labour is divided among the community members (roles). When the community members carry out a learning task (object) to achieve a shared goal (outcome), using a repository (instrument), their interactions can be described as an activity system. For example, students in a product design course (subjects) may undertake a product design project (object) in order to learn the principles of product design (outcome). These students may use a repository (instrument) to share information and resources to support their design projects. These relationships are illustrated in Fig 1.

Therefore, Activity Theory is a holistic framework that allows us to study LORs and communities as a single system, rather than as a loose set of instruments, subjects, objects and outcomes. Rather than being a prescriptive theory, it provides an analytic lens to understand the complex relationships within each system. Activity Theory can also be used to identify ‘contradictions’ (Engestroem 1987), or mismatches within and between the elements of the system.

In the next section, three specific LORs are analysed as activity systems in order to identify how they are being used by communities to support learning. These activity systems are compared to identify contradictions which may affect the use of repositories. A range of barriers and enablers to effective use of repositories are identified through this analysis.

3. Methodology and data collection and analysis procedure

To analyse how repositories can support learning within communities, it is crucial to understand the role of repositories and their relationship with other components of the community, from the perspective of the main ‘actors’. In this case, the main actors are the community members/repository users and the repository curators. This focus on the experience of individuals requires a phenomenographic approach (Marton & Booth 1997). However, rather than being interested in studying the individuals’ experiences of repositories in isolation, we want to know how these experiences are related to the key components of the broader context in which they take place (i.e. the activity system). This requires a phenomenographic analysis of activity system (Berglund 2004). Coupled with Activity Theory, this analysis can elicit investigation of individuals’ perceptions of a phenomenon – in other words, it allows us to analyse the interplay between a repository system and a community (activity system).
The analysis involves two steps. First, selected curators’ and users’ experiences of repositories are elicited via in-depth interviews following the phenomenographic methodology. The interviews elicited the following key aspects:

1. individuals’ perspectives of the key dimensions of the repositories and communities, reflected in the components of activity system;
2. tools (other than the repository under consideration) users employ to communicate with others in the community and to manage their personal information;
3. barriers and enablers individuals experienced when using repositories and the perceived impact of the use of repositories on practice;
4. general information related to their experience of repositories (for example, users’ awareness of individual repository systems, the bases of their decision to use a particular system, etc.).

Second, the findings are analysed using the construct of the activity system, and variations in and contradictions between the experiences of these two groups of actors are identified.

It must be noted that factors 3 and 4 – barriers and enablers, as well as general aspects of repository use – were a slightly different aspect of the analysis, although they were identified using the same methodology, through the phenomenographic interviews. Factors 1 and 2 where used to compare the activity systems of users and curators and to identify the contradictions arising between these different activity systems (Section 4). Barriers and enablers, in contrast, primarily arise from gaps between or within the components and subcomponents of a single activity system (whether that of users’ or curators’). These gaps are mentioned, whenever applicable, within the individual activity systems discussed in Section 4. However, because of the limitation of space within the diagrams, we discuss the barriers in more detail in Section 5.

This study is informed by three repository systems. These systems were selected because of their diversity and because they were all in a relatively advanced stage of implementation (each had a small group of relatively active users). The three systems are:

- Jorum – a UK national repository for sharing resources in a range of different formats across higher and further education;
- Spoken Word – an international repository for higher education containing audio recordings from the BBC archives;
- DIDET – a classroom-based repository for resources created by students.

Interviews with three curators and six users were conducted face to face or by phone. Each interview lasted an average 1 to 1.5 h. Each was audio-recorded and transcribed. An overview of the respondents is shown in Table 1.

### 4. Results

This section provides an overview of the findings for each repository and community alongside an analysis of the contradictions in perceptions of the repository curators and users.

<table>
<thead>
<tr>
<th>Respondents</th>
<th>LOR</th>
<th>Role</th>
<th>Experience with LOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1</td>
<td>DIDET/LauLima</td>
<td>Student</td>
<td>Advanced: 3 years</td>
</tr>
<tr>
<td>R2</td>
<td>DIDET/LauLima</td>
<td>Researcher</td>
<td>Intermediate: less than a year</td>
</tr>
<tr>
<td>R3</td>
<td>Jorum</td>
<td>Educational developer</td>
<td>Beginner: just started using it</td>
</tr>
<tr>
<td>R4</td>
<td>Spoken Word Services</td>
<td>Teacher (English)</td>
<td>Advanced: 3 years</td>
</tr>
<tr>
<td>R5</td>
<td>Spoken Word Services</td>
<td>Teacher (Economics)</td>
<td>Advanced: 3 years</td>
</tr>
<tr>
<td>R6</td>
<td>Spoken Word Services</td>
<td>Teacher (Social Work)</td>
<td>Advanced: 3 years</td>
</tr>
<tr>
<td>R7</td>
<td>DIDET</td>
<td>Curator</td>
<td>Expert</td>
</tr>
<tr>
<td>R8</td>
<td>Jorum</td>
<td>Curator</td>
<td>Expert</td>
</tr>
<tr>
<td>R9</td>
<td>Spoken Word Services</td>
<td>Curator</td>
<td>Expert</td>
</tr>
</tbody>
</table>

LOR, learning object repository.
Jorum

Jorum (http://www.jorum.ac.uk) is a UK-based, national, interdisciplinary repository available to all teachers (but not learners) within UK higher and vocational education institutions. Jorum’s aim is to make learning and teaching materials in all disciplines available to teachers in every UK University. Jorum has two interrelated services. The ‘Jorum Contributor’ service collects, gathers and uploads resources created by individual teachers or nationally funded initiatives. These resources are uploaded by nominated contributors from each institution or initiative. The ‘Jorum User’ service provides teachers from all UK institutions access to all resources within Jorum. Users can source, preview, download, repurpose and reuse materials. The key dimensions of Jorum are outlined in Table 2.

Contradictions in perspectives of a curator and a user were analysed through interviews. These contradictions are illustrated in Figs 2 and 3.

One major contradiction within the Jorum system is the way in which the actors – the curator and the user – perceive the ‘object’ of the activity systems (C1 and U1 in Figs 2 and 3). The curator has a long-term perspective, aiming to encourage sharing of resources across institutions and disciplines. Conversely, the user is

Table 2. Key dimensions of Jorum.

| Purpose of the repository and types of resources: | To collect and make available learning and teaching materials to all UK higher and further education institutions. A wide variety of resources are available, ranging from single files, images and documents to IMS content or SCORM packages |
| Disciplines: | All disciplines |
| Scope: | National |
| Sector: | Higher and Further education |
| Contributors: | Designated contributors in each institution collect resources from tutors; JISC-funded projects contribute resources arising from these projects |
| Business model: | Trading model and incentives critical within and across disciplines; requires separate organization (for example, JISC) or consortium to manage LOR, workflow and digital rights |
| Purpose of the community: | To share resources across institutions and disciplines |
| Dialogue: | None at present |
| Roles: | Designated contributors collect and submit resources; curators provide training and technical support, as well as curatorial services |
| Coherence: | Loosely knit |
| Context: | National, multi-institutional |
| Rules: | IPR and curricular differences across different sectors and disciplines |
| Pedagogical approaches: | Focus on content; possibly distant from learning culture of individual institutions |

JISC, Joint Information Systems Committee; LOR, learning object repository; IPR, Intellectual Property Rights.
focused on short-term tasks such as sourcing digital content for the institutional virtual learning environment (content management systems) and finding self-study resources for students. Subsequently, the main outcome that the curator wants to achieve is improved teaching and learning, whereas the user’s goals focus on the administrative functions (C2 and U2 in Figs 2 and 3).

Another misalignment is in curator’s and user’s view of the ‘instrument’ of the activity system (C3 and U3 in Figs 2 and 3). The curator focuses on the repository, and does not appear to be aware of the range of other tools that may be used by the community members. The user employs a number of tools alongside the repository system.

Finally, there are contradictions over what constitutes a community (C4 and U4, Figs 2 and 3). The curator views the community in broad terms, whereas the user identifies primarily with institutional, departmental and professional communities, and explicitly stated that she does not feel part of the community of repository users.

**Spoken Word Services**

Spoken Word Services (http://www.spokenword.ac.uk) positions itself as an international repository, and is based at Glasgow Caledonian University in the UK. The purpose of this repository is to share authentic audio resources across UK and US higher education institutions. These resources are BBC radio archives, such as interviews, features, documentaries and news coverage of key events. These audio resources are supplemented by text-based materials including journal papers, reports, legislation documents and relevant websites. The audio resources are prepared from BBC archives by repository curators and then assessed for relevance by subject-matter experts. Teachers can search the Spoken Word archives for resources they can use in class. The teachers download these resources and make them available to students, as streaming audio, mostly from their personal websites or from the institutional virtual learning environment. Students listen to the audio files to help them carry out learning tasks. Students have opportunity to share ideas, comments, queries and reflections on the audio material via online discussions or other interactive features. Key dimensions of Spoken Word Services are summarized in Table 3. The findings, illustrated in Figs 4, 5 and 6, highlight the main contradictions in the activity system.

The analysis shows major misalignments in the perceptions of the ‘object’ and the ‘outcome’, similar to the major misalignment within the Jorum investigation. In this case, the curator’s aim is to enhance and transform the educational experience, but the users focus on providing students with authentic content resources that they hope students will find interesting and motivating (C5 and Ua/b5 in Figs 4–6). In terms of the object, curators aim to enable sharing of resources across institu-
Table 3. Key dimensions of Spoken Word.

**Purpose of the repository and types of resources:** Integration of digitized audio into courses  
**Disciplines:** All disciplines  
**Scope:** International  
**Sector:** Higher education  
**Contributors:** BBC archives; teachers and students within UK and US higher education institutions  
**Business model:** Sources provided and made freely available by the BBC; this model requires staff commitment and incentives for use within the institutions  
**Purpose of the community:** To share audio resources across institutions and disciplines  
**Dialogue:** Local face-to-face dialogue among teachers; rudimentary community of practice currently coalescing  
**Roles:** BBC provides sound clips. Curators expand these sound files with other resources (transcripts, URLs, etc.); teachers source, annotate and make resources available to students  
**Coherence:** Loosely knit  
**Context:** International, multi-institutional  
**Rules:** IPR; learning objectives  
**Pedagogical approaches:** Content can be incorporated into a variety of pedagogic approaches; possibly distant from learning culture of institutions

|---|

![Diagram](image)

**Fig 4** Spoken Word: curator’s perspective.

...tions, while the users simply want to source materials for use within their courses (C6 and Ua/b6, Figs 4–6).

With regard to the community affiliation, two user respondents indicated that a rudimentary but coherent community was forming around the community. However, this perception was not shared by the third user respondent who felt no affinity with the repository community (C7 and Ua/b7, Figs 4–6). These findings reflect the relationship between the coherence of a community and its scope: the former two users are based in the same university in the UK, while the latter user works in a university outside the UK.

**Digital libraries for Global Distributed Innovative Design (DIDET)**

DIDET ([http://dnem1.ds.strath.ac.uk/didet/](http://dnem1.ds.strath.ac.uk/didet/)) is a repository system supporting engineering design education at the Universities of Strathclyde (UK) and Stanford (USA), funded by JISC (UK) and the National Science Foundation (USA). DIDET is used to support classroom-based communities within these two institutions. For example, DIDET supports a number of learning activities in a product design course at Strathclyde. In this course, students are given an assign-
ment for designing and developing a domestic product. External companies set the design briefs and assign coaches to guide students in carrying out the designs. Product design involves three phases: (1) information gathering, storing and structuring; (2) concept generation; and (3) development and prototyping (McGill et al. 2005). Over 6 weeks, the students work in small teams of four, meeting face to face several times per week. Tasks and assessments are designed to encourage students to store and share information online. Resource sharing is supported through the repository system where students can store, share and manage materials. During an initial storing and structuring phase, students collect, evaluate and store materials from a variety of sources to supplement resources created by other students. In the concept generation phase, students are required to collaboratively construct concept maps to justify their design concept. The design phase involves the students populating these maps with information resources. During these two phases, an information
specialist guides students in selecting, evaluating, organizing and storing information. By organizing and structuring information in this way, the students justify and capture their design decisions. Key dimensions of DIDET are summarized in Table 4.

The analysis of DIDET as an activity system, both from curator’s and users’ perspective, is summarized in Figs 7–9.

In contrast to the previous examples, no major contradictions were identified. However, there was crossover of perspectives in relation to the object and the outcome of the activity system (C8 and Ua/b/c8, Figs 7–9). According to the curator, the goal was for students to learn about product design principles through collecting, sharing and reusing resources. According to the users, the main goal was to be supported in managing

Table 4. Key dimensions of the DIDET repository and community.

| Purpose of the repository and types of resources: | Support engineering students’ group design projects; contains student- and teacher-created resources, links to external resources, including external discipline-specific repositories |
| Disciplines: | Design and manufacturing engineering |
| Scope: | Classroom-based |
| Sector: | Higher education |
| Contributors: | Students, tutors, industry-based coaches and information specialists |
| Business model: | Trading model is not applicable, but commitment from academic staff is necessary; incentives might be required at departmental level to motivate all staff to participate |
| Purpose of the community: | Learning about product design principles through applied projects |
| Dialogue: | Communication face to face, as well as via blogs, wikis, chat and discussion tools available within the electronic environment |
| Roles: | Coaches define project brief and give students feedback; students in groups progress their product designs by sourcing, evaluating, sharing and integrating resources; tutors guide students and assess the project outcomes; information specialists provide guidance and skills training in resource management, and maintain the digital learning environment |
| Coherence: | Tightly knit community; classroom facilitation important; small group learning |
| Context: | Institutional and subject-specific (engineering), with links to industry |
| Rules: | Curricular aims and learning objectives of the course; learning assessment |
| Pedagogical approaches: | Wide range of resources; learning task design critical; different pedagogies possible although focus on social constructivist pedagogies (collaborative and project-based learning) |
the information resources necessary to carry out design/ research projects. Essentially, these perspectives are the same; however, the users and curator have a different emphasis in their outlook.

This lack of major mismatches is in contrast to Jorum and Spoken Word. One explanation is that DIDET has a narrower scope than the other two systems: it is classroom-based, which means that the user community is tighter-knit. Interestingly, both users indicated that they did not perceive themselves as members of a ’repository community’, but they did feel part of a departmental research or student community. Another explanation for this alignment of perspectives is due to system integration (that is, integration of the repository with the learning environment). In contrast to the previous examples, DIDET users could not distinguish between the repository system and the electronic learning environment they used.
5. Discussion

Our analysis of these three repository systems revealed two major mismatches in the perceptions of repository curators and users. First, curators focus on repository-centric factors, while users spotlight a wide range of contextual factors. Second, curators are concerned with the long-term goals of the repository, while users tend to consider short-term outcomes. This analysis identified several barriers in the effective use of repository systems in relation to each of these issues.

In terms of issue 1, the conflict between curators’ narrow focus and the users’ wide perspective can result in mismatches between the types of resources in a repository and those required by teachers for their courses. This barrier also relates to contradiction 2 outlined below. This was illustrated by a user who responded:

I have not been able to find much material that is directly relevant to the syllabuses we teach here. I was also slightly disappointed by the text-based nature of some of the resources that did look relevant . . . I was expecting more interactive content.

This mismatch is exacerbated by the broad scope of the repository being discussed by this user (Jorum). Another contributing factor could be that many Jorum materials are developed by technologists (rather than users) as generic ‘learning objects’.

Second, poor interoperability between existing institutional technology systems and the repository systems led to further problems. According to the users, access to repositories is sometimes restricted and, furthermore, users may not receive support in using these systems. One teacher commented on their experience of restricted access and lack of technological support:

We had firewall problems . . . I know a colleague was really interested in using (repository) and he couldn’t get round the firewall problem . . . I solved the problem because (N) [a curator of the repository] was here and actually did a proxy IP, but our technical staff are not into solving this particular problem . . . I know there is a lot of interest but, you know, if you come across this sort of problem once you just kind of leave it . . .

There were further illustrations of the limitations imposed by poor integration with existing systems:

[We need] to move away from us being the agents between the students and the resources so that they are in a situation that’s broadly equivalent to their situation in relation to a library catalogue. . . . just including maybe possibilities of integration of these things in multimedia collections of various sorts for them to search.

It’s always a mistake to treat this kind of things [technology] as if it’s a discrete thing. Ultimately it’s really a part of web-based learning, so if the institution is adequately resourcing the development and the deploying of web-based resources, of all kinds, worth for the teachers and students within the institution then there is no reason why repositories shouldn’t be part of that.

. . . make a much more definitive interaction with what’s already in (repository) and what exists within the University in the form of other collections . . . So making clearer links between what’s in, for example, the Museum of (Discipline P) or the (Charitable Organisation Q) archive and (repository) and a much closer interface between them, but part of that is, what do you do with it and how do you use it and why do you use it and where do you use it, all those things.

Some users were concerned that their attempts at introducing innovation did not fit with the institutions’ view of legitimate activity:

I sometimes sit at my machine with the headphones on and I am listening to audio resources that have been collected for me. And people walk past the door and they make remarks about, you know, what I might or might not be doing. But if I were sitting with a journal open on my desk it wouldn’t be the same comment. So I think there is still a bit of an issue about the perception of where, any form of new technology fits . . . it’s not real academic study.

If you are in a department that doesn’t have a particular commitment to e-learning . . . then all they see is the ‘E’ and not the ‘learning’ and so the focus becomes on the technology rather than actually the pedagogy and the understanding.

Another important contextual factor that is frequently ignored during repository implementation is the tension between the perceived high status of research and (lower) status of teaching. Institutional rewards for academics often depend on their research outputs (measured by publications in highly impact-rated peer-reviewed journals) rather than teaching activities. Consequently, teachers may be unwilling to invest time in adopting new teaching methods and technologies, as they are seldom rewarded or recognized for introducing innovative approaches to their courses:

. . . It’s not considered to be equal to proper linguistic research. I mean I do fool around with technology such a lot and it takes all my time. And it doesn’t turn up in a
publication...there isn’t the kind of recognition that doing something practical has the same academic value as spouting lots of quotations and doing a thick bibliography.

Finally, a repository-centric perspective creates a mismatch between the users’ view of their community affiliation and curators’ efforts in developing communities around repositories. While curators aim to create multidisciplinary global community around their repositories, users identify with their discipline, course, department or institution. Only two of the respondents from the user group indicated that they felt some affinity or interacted with other users of the same repository—and these were from the same institution:

...it is a community, but I still wouldn’t primarily identify myself in that community ahead of the disciplinary or broader institution...That community, apart from occasional contacts with people like [name of another user], certainly doesn’t really extend much beyond, and [another colleague] I suppose, it’s within this group, it doesn’t really extend much into other institutions.

...I wouldn’t underplay the kind of importance of what that small community is. I think that certainly for me, it’s been a lifeline at all sorts of levels...it’s something to do with validation I think, of actually feeling that you’re not some kind of real weird oddball but there actually are people who say, when you say something ‘yeah actually that’s really interesting

Most respondent-users indicated that they would like to establish contacts with other users of the repository:

I don’t feel I am part of the repository community, but I’d like to speak to people using the same audio. I’d like to speak to people who want to listen to the same things that I’ve got.

Issue 2, the conflict between long term and short-term goals, was illustrated through curators’ focus on the strategic vision underlying the use of repository, which may be inevitable because of their role. The curators’ objectives range from: ‘supporting engineering students’ design projects’ and ‘collecting and sharing resources for learning’ to ‘enhancing and transforming educational experience’. In contrast, users tend to cite narrower objectives, such as storing resources or sourcing learning materials. From this analysis, sourcing content appears to be the main type of task for the user, with accessibility of information as a key driver.

The curators’ visions may be grand, but they cannot be implemented without understanding the needs, histories and local contexts of the users whom the repositories are to support. From our analysis, we have synthesized a number of key implications important for the effective implementation of LOR systems.

Implication 1. If repositories were better aligned with community dimensions, they would be more likely to achieve their goals

Repositories are frequently introduced to users as standalone tools. However, from the users’ perspective, a repository is simply one component within an entire activity system. It is not enough to consider the ways different system components might fit together. From our analysis, it is clear that curators and users have to think through the ways in which individual components interrelate.

Implication 2. For better alignment (Implication 1), curators should develop a keen awareness of their communities

It is clear that curators are not always aware of users’ expectations of the repository, their view of the communities they belong to, the implicit and explicit rules that govern these communities and the tools they use in conjunction with the repository. Users often feel affiliation with local (departmental or institutional) communities and may be less willing to share with peers in other, broader, communities. Our study reveals that the farther removed the curator is from the users in terms of shared goals and understanding of users practice and needs, the more difficult it is to achieve alignment across communities.

Implication 3. Curators should be aware that there could potentially be mismatches in perspectives of different actors operating at different levels

Users are likely to adopt short-term goals, while curators may focus on longer-term outcomes. Lack of alignment between the vision and the day to day implementation has been cited as an issue affecting transformational change in many organizations (Hammond & Karran 1998; Collis & Moonen 2001).
Effective implementation of LOR systems requires careful alignment of these diverse perspectives. The following section outlines the development of a framework that can be used to bring different viewpoints into line.

6. Framework for development of LORs

There are a number of key dimensions of repositories and communities that may impact upon the adoption and use of LORs. Using the construct of ‘activity system’, we identified a range of barriers affecting use of repositories within learning communities and outlined potential solutions. We have illustrated how these issues arise from misalignment of the technological systems and the needs and contexts of people who are expected to use these systems, as well as from contradictions between the perspectives of two different groups of actors involved (curators and users).

While such an activity-theoretical analysis can be useful to examine the problem space, it is not useful or practical for repository curators, managers, or those involved in repository implementation. We need a simple technique to make sure diverse perspectives are aligned and contradictions, issues and barriers are avoided. One way we can achieve this goal is by use of a framework that integrates repository and community dimensions.

In this section, we present a framework that can be used to systematically examine contradictions and issues that span across dimensions and components of activity systems. The framework operationalizes the components of the activity system of a community using a repository by combining the community and repository dimensions discussed earlier in this paper. The components are expressed as a series of questions to guide curators in thinking through how to align their goals with those of the users:

1. Why are you setting up an LO repository?
2. How many communities do you serve?
3. What is the purpose of the community that the repository will serve?
4. Who are the key actors in the community and who, of these, will contribute to the repository?
5. What is the pedagogic approach of the community?
6. How coherent is the community?
7. What are the modes of participation and communication within the community?
8. What are the key factors in the ecology of the community?
9. What is the business model of the repository?
10. How do you envision the evolution of your LOR?

This framework was further developed into a set of structured guidelines for repository implementation (Margaryan et al. 2007). These guidelines offer specific advice, resources and examples from practice, as well as recommendations.

More research is needed to determine the potential impact of this framework in developing effective repository systems that better support learning. The breadth of this study was limited by the relative infancy of these repositories: few repository systems have sufficient numbers of users for data collection. However, it is important to consider why repositories have few users. Is it due to the fact that these systems are in the early stages of development or is because systems largely do not take into account user needs, current practice, organizational realities and cultural preferences? The use of the framework can help unravel this mystery.

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