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TECHNICAL REPORT

Embracing the Future

Embedding digital repositories in the University of London

Stijn Hoorens, Lidia Villalba van Dijk,
Christian van Stolk

Prepared for the SHERPA-LEAP Consortium

The research described in this report was prepared for the SHERPA-LEAP Consortium.

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Preface

Digital repositories can help Higher Education Institutions (HEIs) to develop coherent and coordinated approaches to capture, identify, store and retrieve intellectual assets such as datasets, course material and research papers. With the advances of technology, an increasing number of Higher Education Institutions are implementing digital repositories. The leadership of these institutions, however, has been concerned about the awareness of and commitment to repositories, and their sustainability in the future.

The SHERPA-LEAP (Securing a Hybrid Environment for Research Preservation and Access – London E-prints Access Project)¹ Consortium of London HEIs is one of the largest digital repository consortia in Europe. SHERPA-LEAP has been commissioned by the Joint Information Systems Committee (JISC) to conduct a study on aspects of the strategic commitment of institutions to repository sustainability. This project, labelled EMBRACE (EMBedding Repositories And Consortial Enhancement) is aimed at enhancing the functionality, inter-operability and extensibility of the SHERPA-LEAP repository service, which currently supports the repositories of thirteen University of London institutions.

As part of EMBRACE, this document informs the SHERPA-LEAP Consortium with an assessment of current awareness and attitudes of stakeholders regarding digital repositories in three case study institutions. The aim of this report is to identify drivers for, and barriers to, the embedding of digital repositories in institutional strategy.

Although this report is prepared for the SHERPA-LEAP Consortium it may be of interest to a wider audience. The findings may be applicable to other HEIs with digital repositories in early stages of operation. Furthermore, it may be of interest to university researchers, lecturers, library staff and senior management, or other stakeholders in the distribution of scholarly knowledge, including traditional and open-access publishers, learned societies and funders.

¹ For more information about SHERPA-LEAP, please see: <http://www.sherpa-leap.ac.uk/>

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Executive summary

For higher education institutions (HEIs) digital repositories are strategic instruments to develop coherent and coordinated approaches to the capture, identification, storage and retrieval of intellectual assets such as datasets, course material and research papers. Many HEIs have now set up digital repositories. SHERPA-LEAP, a consortium of 13 institutions, is one of the first networks of e-prints repositories in the UK to be fully functional and operating. The SHERPA-LEAP leadership has been concerned about the strategic commitment of HEIs to repository sustainability. This study informs the consortium with an assessment of current awareness and attitudes of stakeholders regarding digital repositories in three case study institutions.

The main purpose of this report was to complement the holistic *espida*³ approach by focusing on the customer and stakeholder perspective. The findings therefore should be of use to decision-makers involved in the development of digital repositories. Our approach was entirely based on consultations with specific groups of stakeholders in three institutions through interviews with specific individuals. We held two workshops with the EMBRACE project board to share our findings. In this study we have tried to answer four questions. We briefly summarise these here and delineate several higher level lessons for decision-makers in HEIs.

1. To what extent are the institutions strategically committed to repository sustainability, specifically considering the institutional stewardship of digital assets?

Overall, the interviews seemed to validate the hypothesis of the EMBRACE project board that digital repositories are currently underutilised, and that there are significant barriers to a strategic commitment. However, the findings revealed a complicated picture of disciplinary differences, departmental and institutional differences, and heterogeneity between and within stakeholder groups. This relative lack of a strategic commitment cannot be attributed to fundamental disapproval of the concept of digital repositories: there does not seem to be any stakeholder group that opposes the development of and investment in this infrastructure. Rather, as noted in the *espida* handbook (University of Glasgow/JISC 2007), the potential benefits are intangible, they will not be visible until a critical mass is reached, and there is as yet little (quantitative) evidence that the benefits will outweigh the costs.

³ *Espida* was a project funded by the JISC to make the business case for proposals that may not necessarily offer immediate financial benefits to an organisation, but may bring benefit in more intangible ways. See, for instance, <http://www.gla.ac.uk/espida/documentation.shtml>. Accessed: August 2008.

2. What are the motivations for different stakeholders to support digital repositories?

HEIs currently lack a coherent vision of how digital repositories can assist these organisations in accomplishing their mission. This is partly due to the notion that a digital repository is a multi-purpose technological utility that facilitates collecting, registering, archiving, linking, preserving and providing access to digital objects. The interviews revealed a range of different motivations for investing in digital repositories. Different groups of stakeholders seem to have a different picture of what a repository is and what it should or could do. Although the sample of interviewees was small, some tentative generalisations can be made:

- Library staff strongly supported the increased accessibility of research outcomes and having more control of the archiving and preservation of institutional intellectual assets.
- Senior management and department heads predominantly support the opportunities offered by digital repositories to facilitate collecting and organising (annual) research output as an input to research assessments for funding.
- Researchers tend to be more motivated by publishing their results in prestigious journals, not least for funding, tenure and promotion considerations. It is more common to disseminate unpublished papers in some disciplines (e.g., economics) than in others (e.g., biomedical sciences).

It seems to be mainly staff with externally facing functions (e.g. External Affairs) that are most motivated by the opportunities to showcase the institution's research in a centralised location.

3. What are the barriers, if any, to embedding digital repositories in institutional strategy?

Digital repositories may well be victims of their own success. Given their range of potential benefits, stakeholders have different views of how to use digital repositories. The absence of a shared understanding of these repositories may be one of the main barriers to embedding these systems in HEIs' daily operations. We consider that buy-in from the wider community is a crucial condition for achieving a sustainable digital repository with a critical mass. One factor in this is the dependence of the repository on the research community for its content. However, it is very difficult to provide evidence of all these benefits.

Even if most of the barriers identified in this report – e.g., the lack of awareness, a technology that is in its infancy, risks of reputation damage, or the administrative burden of depositing – can be overcome, one major challenge remains for digital repositories, namely the lack of incentives for the wider institutional community to provide content for these repositories. Funding, tenure and promotion are important drivers for researchers; digital repositories will be embedded in HEIs' daily operation when depositing research output contributes to any of the above-mentioned factors – in short, when the incentives of those depositing are aligned to the strategic objective of the repository.

4. Which measures are suitable for pursuing a strategic commitment to resourcing and sustaining repositories of digital assets in HEIs?

The interviewees identified a range of interventions that might overcome some of the barriers to embedding digital repositories and achieve the continuity of viable and sustainable repositories. In some cases these followed logically from the barriers that they identified earlier. For instance, given the lack of clarity among stakeholders about what a digital repository is or should be, several suggested targeted information campaigns to engage with the stakeholder community. In general, the interventions suggested by the interviewees could be categorised in two main areas: those related to developing a strategy and creating a shared vision of digital repositories across the institution; and those related to achieving buy-in and communicating with the key stakeholders. The first category consisted of recommendations about reconciling the competing visions of what a digital repository is, allocating dedicated resources to support the process of depositing, and aligning the incentives of the stakeholders with the strategic objectives of the repository. The second category consists of different ways of communicating with the stakeholders, informing them of what the digital repository is and seeking their views as to how to improve the repository strategy and the services offered by the repository.

5. Discussion

While undertaking this study, a clear theme emerged. There appears a misalignment between the objectives of the repository and the needs of different groups of stakeholders. It is hard to establish whether this problem arises from the lack of a clear repository strategy or because the stakeholders are unaware of the strategic objectives. The views of interviewees pointed in both directions. Certain mechanisms that could address this problem are undertaken to different degrees across institutions; for example: aligning the incentives of stakeholders with the objectives of the repository, informing the stakeholders of the repository and overcoming copyright constraints.

All this also has an important knock-on effect. As the digital repository depends on engagement from the stakeholders in order to achieve a critical mass and show its value to the institution, a lack of buy-in from the stakeholders could undermine the projects in the medium to long term.

While espida has proved a useful tool to support the development of repository projects and attract funding, this study indicates that stakeholder buy-in is a key factor in successfully embedding digital repositories in institutional strategies and their day-to-day operation. In short, the strategies of digital repositories need to reflect the needs of stakeholders and the repository objectives must be aligned with their incentives.

In this report we have given some indications of how the motivations of stakeholders differ (Chapter 2) and the different barriers to embedding digital repositories that stakeholders perceive (Chapter 3). Digital repository managers could map their potential objectives against the motivations of stakeholders and the barriers that they perceive. This would allow repository managers to adjust their strategy to specific motivations as they receive feedback from groups of stakeholders, to communicate clearly what they are trying to achieve and to devise specific and targeted interventions to overcome the barriers relevant to the stakeholder groups that they seek to engage. This, in turn, could lead to sustained support from the institution and the embedding of the repository in institutional strategy.

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We would like to thank a number of people who contributed to this report. In the first instance, we would like to thank the interviewees without whose cooperation this study would not have been possible. A full list of interviewees is provided in Appendix A. We also thank three members of the project board for this study who provided guidance and support in the workshops; Sally Rumsey, Richard Davis and Martin Moyle. In addition, we would like to acknowledge the contributions made by Nicola Wright, Phillip Payne and Paul Ayriss. Paul has been instrumental in promoting research in this area. Finally, we would like to acknowledge the contributions made by our quality assurance reviewers, Jeff Rothenberg and Constantijn van Oranje.

1.1 **Background**

Information management at HEIs has changed radically over the past two decades. The digital revolution and an increased emphasis on accountability and value-for-money have urged these institutions to manage their educational, research and associated assets more effectively and transparently than in the past. Digital repositories can help them to develop coherent and coordinated approaches to the capture, identification, storage and retrieval of their intellectual assets (JISC 2005). The digital assets that could be captured in such a repository include audiovisual objects, datasets, presentations, learning material and research papers.

There is no universally accepted definition of a digital repository, nor is there consensus of what it could or should do. Lynch (2003) defined a university-based institutional repository as “a set of services that a university offers to the members of its community for the management and dissemination of digital materials created by the institution and its community members”. He stated that investing in a digital repository shows institutional commitment to the stewardship of these digital materials, including long-term preservation where appropriate, as well as organisation and access or distribution.

Many HEIs have now implemented digital repositories. The Registry of Open Access Repositories has registered 73 institutional repositories in the UK. Most of these repositories mainly contain e-prints, which are electronic scholarly publications that the institution is allowed to publish. UK’s largest institutional repository is the D-Space archive at Cambridge University, which held 191,704 records in July 2008.

Hosted by University College London (UCL), SHERPA-LEAP is one of the first networks of repositories in the UK to be fully functional and operating. The consortium consists of 13 institutions, many of which have their own e-print repository (Box A).

Box A. The 12 digital repositories of the SHERPA-LEAP consortium

Birkbeck ePrints
Goldsmiths eprints
Spir@l Imperial College Digital Repository
IOE Eprints
King's ePrints
LSE Research Online
Pharmacy Eprints
Eprints@QMUL
Royal Holloway Research Online
SAS Space
SOAS Library Eprints Repository
UCL Eprints

The repositories at London School of Economics (LSE) and UCL are the largest among the consortium's institutions and, based on a snapshot taken at the beginning of the study, hold 10,430 and 5,113 records (mostly articles and datasets) respectively (see Figures 1 and 2). Despite continuous growth of the repositories since their inception, they still capture only a fraction of the total research of their institutions (Moyle, 2007a).⁴ Furthermore, although there are ambitions to extend the scope of the SHERPA-LEAP repositories, thus far, the London-based repositories have essentially been e-prints archives. The potential scope of digital repositories extends to e-theses, teaching and learning material and datasets.

⁴For example, it has been estimated that around 10,000 research outputs per year are within the collecting scope of UCL's repository (Moyle, 2007a), while only around 2,000 objects were deposited in its e-print archive in 2007 (Registry of Open Access Repositories 2008).

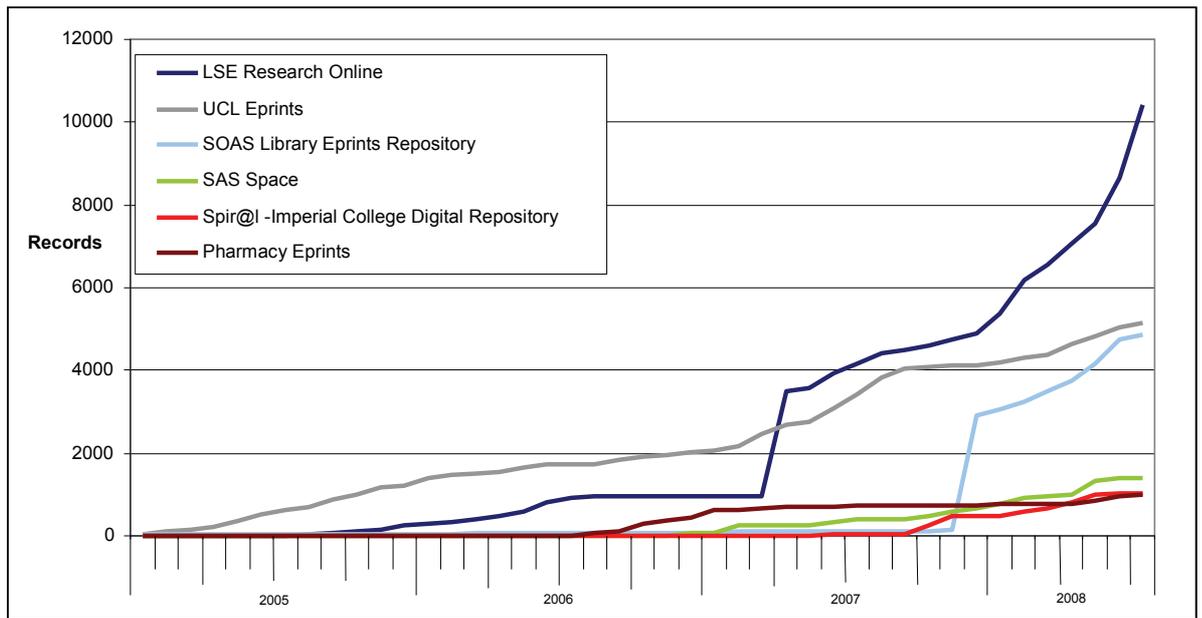


Figure 1. The evolution of the six largest (in number of deposited objects) SHERPA-LEAP repositories

Source: Registry of Open Access Repositories, accessed on July 25th 2008

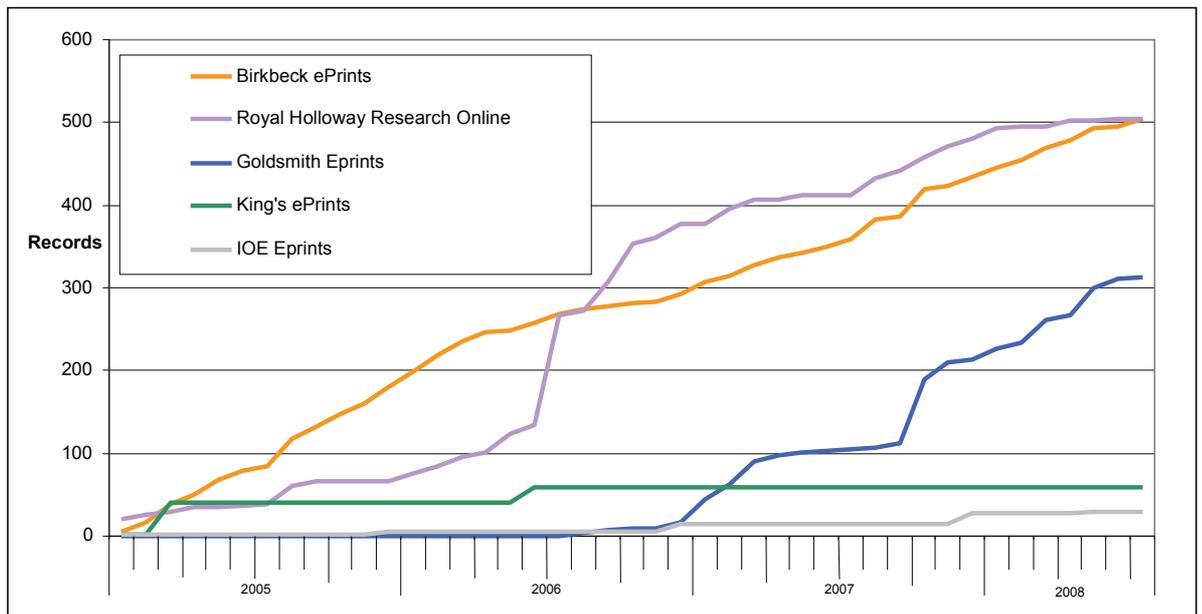


Figure 2. The evolution of the six smallest (in number of deposited objects) SHERPA-LEAP repositories⁵

Source: Registry of Open Access Repositories accessed on: July 25th 2008

SHERPA-LEAP has been concerned about the strategic commitment of HEIs to repository becoming embedded (or sustainable). It claims that “the responsibility for

⁵ Note: No data available on EPrints@QMUL

digital repositories is not yet widely recognised within UK higher education at a senior level, and information and IT strategies lack commitments to responsible management of digital assets” (Moyle 2007b). In order to reap their full potential, the consortium argues, the repositories need to become better embedded in the institutional strategic planning.

The SHERPA-LEAP consortium has therefore been commissioned by JISC to conduct a study, labelled EMBRACE, aimed at enhancing the functionality, interoperability and extensibility of the repository service. As part of EMBRACE, this study aims to inform the SHERPA-LEAP Consortium with an assessment of current awareness and attitudes of stakeholders regarding digital repositories in three case study institutions.

1.2 Scope of the study

In the UK HEIs are continuously competing with similar institutions for research funding, student numbers and high profile researchers. In this competitive environment HEIs often have to make decisions about funding projects or programmes for which the benefits are not generally measured by a financial return. These funding decisions are usually based on the ratio of costs and benefits for the organisation as portrayed in a business case or proposal. In not-for-profit organisations the benefits of these investments are often hard to quantify, and intangible outcomes are very hard to communicate effectively. This may lead to incomplete information upon which to make investment decisions.

Digital repositories typically require similar investment decisions, where the benefits are not immediately tangible or quantifiable. Based on Kaplan and Norton’s (1992) balanced scorecard approach, the University of Glasgow/JISC (2007) developed the espida framework, which helps recast the relationship between decision-maker and proposer as one of alignment and dialogue: delineation and communication of intangible outcomes. Amongst several other HEI investments, this handbook uses digital repositories as an example to delineate the costs and benefits to inform funding decisions.

Although initial investments have already been made in the SHERPA-LEAP institutions, digital repositories still require ongoing funding in order to secure their continued operation. The espida handbook has assessed the potential costs and benefits of digital repositories from the four balanced scorecard perspectives: the customer and stakeholder perspective; the business process perspective; the innovation and development perspective; and the financial perspective. This assessment has been provisional and based on the considerations of those involved in the development of the repositories.

In order to complement the initial espida findings, this study conducted a more in-depth assessment of the customer and stakeholder perspective. We identified the following stakeholder groups involved in digital repositories:

- lecturers
- researchers
- heads of department
- senior HEI management
- external relations

- library
- the IT department

In this study we have updated the potential benefits of digital repositories as outlined in the espida handbook by delineating the motivations of different stakeholder groups identified above to invest in this technology. Additionally, using a stakeholder-oriented approach we have investigated the reasons behind the fact that these investments have not yet had their desired outcomes. Finally, we have delineated the measures suggested by stakeholders to address the lag between potential and achieved benefits of digital repositories.

1.3 **Research objective and questions**

The overall aim of this study is to assess the hypothesis that digital repositories are underutilised, and if applicable, identify the barriers to a strategic commitment to them. Following from this objective four main research questions are addressed in this document:

1. To what extent are the institutions strategically committed to repository sustainability, specifically considering the institutional stewardship of digital assets?
2. What motivations do different stakeholders have to support digital repositories?
3. What, if any, are the barriers to embedding digital repositories in institutional strategy?
4. Which measures can be considered for pursuing a strategic commitment to resourcing and sustaining repositories of digital assets in a HEI institution?

This study provides a snapshot of the perceptions of stakeholders about their motivations and the barriers to embedding digital repositories in HEIs, and the measures needed to address them. Although technical infrastructure, skills and organisational structure are integrated aspects of the embedding of digital repositories in HE institutions, we have focused on commitment, drivers and barriers at the strategic level. Therefore, we have studied senior-level attitudes and practices at three SHERPA-LEAP institutions.

1.4 **Approach and methods**

We have delineated the perceptions of stakeholders through a set of interviews with respondents from different parts of three SHERPA-LEAP institutions of different sizes and with different missions. We have included UCL, the LSE and Birkbeck College, (University of London), in the analysis, based on their representation along two dimensions (see Figure 3):

1. research focus: emphasis on research versus emphasis on education.
2. disciplinary heterogeneity: single-discipline institutions versus those housing many different disciplines.

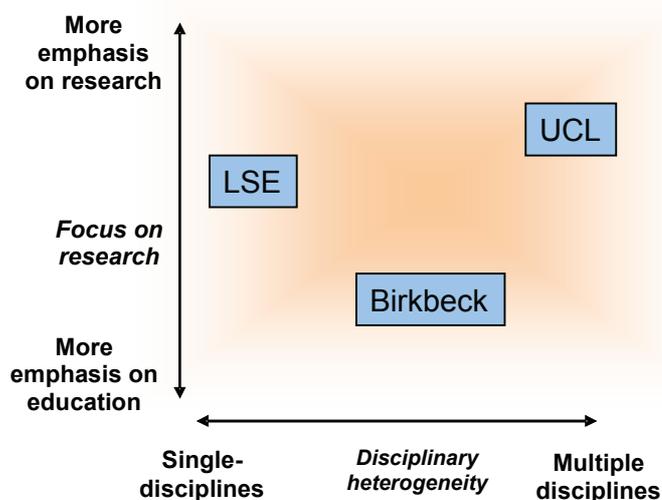


Figure 3. Selection of three case study institutions

We have structured our approach in three main stages: exploration; specification; and analysis and synthesis.

1. Exploration

We conducted three exploratory interviews with one key informant per selected case study institution. These informants had a good knowledge of the background and the aims of the SHERPA-LEAP repositories. We asked them to list the main issues around the strategic commitment of institutions to repository sustainability and to identify drivers for the adoption of strategic responsibility for digital repositories in the institutions, and highlight the existing barriers to the sustainable embedding of digital repositories in the institutional context.

The results of the exploratory interviews were used as input to an internal structuring workshop with project team members and project board members: Martin Moyle, Sally Rumsey and Richard Davis. The role of the project board was to provide guidance to the study. In several iterative rounds, the preliminary findings were clustered in aggregated lists of key issues, barriers, drivers and potential initiatives to overcome these.

2. Specification

The next round of interviews aimed at validating and adjusting the initial findings, and providing detail in the context of the different institutions. The list of interviewees is given in Appendix A.

The interviewees were selected to be reasonably representative of different stakeholder groups in the organisation (see Table 1). The interviews were semi-structured. In the first part the interviewees were asked to explain the extent to which they agree with the initial key issues, barriers and drivers and initiatives. They were also asked about how these aspects apply to their institution. In the second part the interviewees got the opportunity to identify gaps and discuss additional issues, barriers and drivers and suggest initiatives to embed the digital repositories in their institutional strategy.

Table 1. Selection of interviewees*

Stakeholder perspective	Interviewees
Lecturers	7
Researchers	7
Heads of department	4
Senior HEI management	3
External relations	2
Library	7
IT department	1

* Interviewees can have multiple perspectives.

3. Analysis and synthesis

The accumulated results of the preceding stages were analysed and synthesised. We organised a second working session with project team members and members from the project board. Prior to this working session we aggregated the benefits of digital repositories as seen from different stakeholder perspectives, and summarised the barriers and drivers identified in previous stages. During this working session we summarised the measures suggested by the interviewees and assessed their feasibility and acceptability. The workshops with the project board were used to support and strengthen the findings of the interviews. The results of this stage are documented in this report.

As explained above, this study relies exclusively on interviews and group working sessions. Where relevant the results have been supported by findings in the literature, but the literature review has been neither exhaustive nor systematic. It is therefore relevant to reiterate that this study merely presents a snapshot of stakeholder views. The conclusions are based on a qualitative interpretation of a small series of interviews. A more quantitative approach based on a large sample of respondents would be a logical follow up to this study. Given the small sample of interviewees and the limited number of case study institutions, it is impossible to extrapolate our findings to other institutions.

One potential caveat is that selection of interview respondents was based on initial suggestions by the project board. This may bear a selection bias towards individuals who are already familiar with digital repositories. Additionally, we identified and interviewed several individuals through references from the initial interviewees.

As explained in the Introduction, repositories can serve different purposes. Our interviewees, like the literature on open access and repositories, listed many potential benefits. Semple (2006), for instance, distinguishes between the short-term and long-term benefits of digital repositories (see Box B).

Box B. Short-term and long-term benefits of digital repositories (Semple 2006)

In the short term, a digital repository

- enables quick, easy, simultaneous and remote access to deposits
- allows institutions/organisations to efficiently retain and manage their own intellectual assets. Digital repositories are being increasingly seen as a valuable tool for the RAE
- facilitates re-using deposited materials for new research, education and learning
- minimises physical storage requirements while increasing the potential mass of deposits
- manages both metadata and intellectual objects in the same location
- enables the external validation of research results

Over the longer term, a digital repository

- can enable persistent access to deposits independently of external publishers
- can be used to store incremental deposits from unique observational data to spatially significant and new collections for developmental analysis
- increases institutional research visibility
- raises the potential return on investment from asset creation
- enables long-term proof of authorship or assurance of credibility for unpublished papers if the repository is certified/trusted

Given the diversity of these benefits, the motivations for investing in digital repositories can vary across institutions, departments and stakeholders. Our interviewees indicated that the stakeholders at the three HEIs do not have a coherent vision of the strategic role of digital repositories. In this chapter we explain, using findings from the literature and interviews, how stakeholder interests in digital repositories may deviate.

2.1 **Seven motivations for digital repositories**

We identified seven motivations for investing in digital repositories, listed below:

1. fear of missing the boat
2. providing a shop window for a HEI
3. enabling archiving and preserving institutional assets
4. facilitating the open access of scholarly outputs: democratising research
5. decreasing dependence on traditional cost model of publishing
6. providing an up-to-date overview of an institution's scholarly output
7. exploiting the added value of digital content: cross-fertilisation and knowledge management

Each of these motivations is specific to a subset of the stakeholders involved. In the following sections we discuss these in more detail.

2.1.1 **Fear of missing the boat**

The emergence of information technology, digital communication and, in particular, the rise of the Internet, has brought about a revolution in all aspects of HEIs. The consumption and production of education can increasingly take place at separate locations (e-learning), research has been internationalised with networks of researchers collaborating from different geographic locations, and research results are becoming more widely accessible. The activities of HEIs will be more and more represented, documented and shared in digital form, and it is a primary responsibility of HEIs to exercise stewardship over these riches.

HEIs operate in a competitive environment both nationally and internationally in a battle for attracting (lucrative foreign) students, high profile researchers and funding. HEIs therefore closely monitor each other's activities and positions on the various league tables, providing an overview of the activities of repositories. Viewed as organisations in a competitive environment, these institutions face various opportunities in this context that enable them to maintain pace or gain competitive advantage over other HEIs. Thus, they are forced to make investment decisions with inherent entrepreneurial risks.

The interviewees indicated that this environment works both as a race to the top, in which a small number of top institutions are constantly innovating, and a race to the bottom, where a large tail of institutions are constantly trying to catch up with the front runners. Investing in digital repositories can therefore be seen as a venture along a technological path that will become a necessity to all HEIs in the future. The opportunity costs of not investing in this technology (digital repositories) – expressed as the costs of falling out of step with the top institutions – could be higher than the investment costs (Dickson and Giglierano, 1986, p. 58). The amount of these opportunity costs, however, is still unclear. Some interviewees argued, “because everyone else is doing it, we cannot lag behind”. One interviewee called it the “Harvard effect”: “if a prestigious institution such as Harvard is taking a particular strategic direction, the bulk of the Anglo-Saxon HEIs have to follow

suit". Although this may be a rather defensive strategy for investing in digital repositories, it may not be an unusual one.

2.1.2 Providing a shop window for a HEI

Under the traditional system of scholarly communication, the institution's research output is diffused through a variety of subscription-based scholarly journals, book chapters or monographs. Furthermore, student theses or working papers often end up in the institution's print archives. Increasingly, these objects are produced in digital format and are published on personal websites or in disciplinary repositories. The interviewees indicated that digital repositories offered a central location to showcase the intellectual product of a HEI. Importantly, this can also increase the visibility of the research output.

A study by the Australian Government Department of Education, Science and Training (DEST) showed that, while many researchers operate in interdisciplinary, collaborative and team-focused contexts, their publication behaviour is still fairly traditional (Houghton *et al.*, 2003). They argue that publication is still largely driven by reputation, recognition and branding allied to future citations, rather than being a vehicle for the scholarly communication of that research. In this context, institutional repositories may not function primarily as a platform for open access research dissemination, but rather as an instrument to promote or highlight important publications. Institutional repositories may serve, as Crow (2002) puts it, "as tangible indicators of a university's quality and demonstrate the societal relevance of its research activities, thus increasing the university's visibility, status, and public value". Many interviewees emphasised that this shop window effect was an important motivation for investing in digital repositories.

Whether a centralised digital archive of research output actually has a positive impact on the reputation of the institute is open to debate. Some interviewees argued that an open access repository may catalyse the number of citations of papers that are also published in traditional journals. Empirical evidence for this effect and the drivers behind it has thus far been limited (Craig *et al.* 2007). Several interviewees indicated, however, that it is desirable to label the institution's collective intellectual output under the umbrella of the institution, rather than in journals or disciplinary repositories (e.g. arXiv or PubMed Central) where the papers appear next to those from competing institutions.

Finally, the issue of visibility is important. By providing research outputs in a digital format they can become more visible to the wider research community. The example of research theses is often cited.⁶ Thus, placing the institution's outputs in the shop window may have positive consequences for the visibility of specific research outputs.

⁶ There is some anecdotal evidence from UCL that suggests that electronic theses are downloaded more often than their paper equivalents are consulted. Furthermore, statistics from Virginia Polytechnic and State University (Virginia Tech.) and West Virginia University in the USA reveal a significant increase in the volume of use of theses once they are provided in electronic format. Furthermore, the ease with which theses and dissertations can be accessed on the web has also translated into higher levels of international access. For more information: http://ethostoolkit.cranfield.ac.uk/tiki-index.php?page_ref_id=15 (accessed August 2008).

2.1.3 **Enabling archiving and preserving institutional assets**

Aside from its human resources (such as students, lecturers, researchers, administrative and management staff) and fixed assets (including real estate, infrastructure and equipment), intellectual property is among HEIs' most important assets. The value of this intellectual property is generally determined by the research output on the one hand and teaching and learning material on the other. Traditionally, the research outputs are diffused by publication through a variety of scholarly dissemination channels, particular through several thousand academic journals. Furthermore, in many institutions there has been no systematic way of archiving valuable objects such as theses, course material and datasets.

The interviewees indicated that it is important to take better care of the institutional assets that are central to the core business of an HEI, or to any economic entity for that matter. This requires registration, archiving and preservation of research output and teaching and learning material. Such a comprehensive centralised archive has become feasible because the processes of access and retrieval and the use of space are much more efficient in a digital environment than in print. Issues of preservation, however, tend to be more complex for digital assets than for materials in print for reasons of digital decay, technical obsolescence (electronic standards, software and hardware) and perpetual access (Hoorens *et al.* 2007).

2.1.4 **Facilitating the open access of scholarly outputs: democratising research**

In recent years the open-access movement has claimed to be a reasonable alternative to the traditional publishing model. Proponents of open access argue that the traditional scientific publishing market is an imperfect one. It is an oligopoly in which a few large publishers dominate the market for scholarly publications. Additionally, consumers of research do not have substitutes for particular items (journal articles), as scholarly journals are not available through different channels (Hoorens *et al.* 2007). Finally, the costs incurred in scientific publishing online are mostly proportional to the number of articles published, and not necessarily to the number of readers.

Therefore, the open-access framework inverts the traditional business model and provides universal web-access to scholarly literature without charging a fee to readers. Instead, the costs of publication are covered by those funding the research: either through the "author pays" model of open access journals or through investing in self-archiving initiatives (for example, institutional repositories).⁷ Hence, open access claims to make better use of the underlying economics of digital communication by taking advantage of the near-zero cost of dissemination (Hoorens *et al.* 2007).

Additionally, those advocating this approach suggest that removing access barriers to scholarly outputs will

"accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge."
(Budapest Open Access Initiative 2002)

⁷ We need to differentiate between the science, technology and medicine and arts humanities and social sciences fields. In the former external funding is often available while it is absent in the latter.

It is argued that the establishment of access regimes for research outputs from public funding in particular should be “based on a set of objectives and principals including openness but also protection of intellectual property” (OECD 2007). In other words, taxpayers should have the right to access publicly funded research. This movement has recently gained momentum with the endorsement from the Research Councils UK (RCUK) and the Wellcome Trust, which have set open-access requirements for papers arising from research that they have funded (Wellcome Trust 2006). Academics indicated that if publishing work in an open access outlet was a condition of a research grant (and presumably also mandatory university policy) they would comply (Key Perspectives 2004).

In addition to open access journals and disciplinary repositories, depositing datasets and publications in institutional repositories is one way of providing open access to research output. Several interviewees, particularly those at library services, have indicated that the public good, and the interests of research funders is a strong motivation to support digital repositories at their HEI. Some also argued that open access will contribute to international development, as traditional subscription-based publications are often not accessible in developing countries for reasons of affordability.

2.1.5 **Decreasing dependence on traditional cost model of publishing**

With some differences between disciplines, research dissemination is dominated by publications in peer-reviewed journals. Since the funders of research generally evaluate the output of research by counting the number of peer-reviewed publications in which it is presented and the citations it receives, publishing represents a crucial component of the research cycle.

During the early years of the Internet revolution, several large publishers of academic journals pioneered the digital publication and distribution of their journal portfolio. The opportunities presented by the digital age have encouraged publishers to adopt digital delivery and to provide online access to their journals. Most journals are now available online, either in parallel with a print version or as e-only (i.e., “born digital”).

The market for academic publishing has become dominated by several large players (particularly for science, technology and medical journals) and it has been characterised by a trend towards consolidation through mergers over the past years (Kobrak and Luey 2002).

Electronic publishing has created a new business model for the publishing industry, called the “Big Deal” (Frazier 2001). Large publishers have introduced package deals to research libraries: instead of buying licenses for individual journal titles, libraries sign deals for an entire title portfolio, while accepting incremental increases in the license fee. The UK Chartered Institute of Library and Information Professionals (House of Commons, 2004)⁸ estimated that as a consequence of the Big Deal, research libraries have become more dependent on traditional academic publishers:

⁸ The UK House of Commons Science and Technology Committee Inquiry into Scientific Publications has reflected a diversity of views on the publishing framework of scholarly publishing (House of Commons 2004). Amongst other submissions, the UK Chartered Institute of Library and Information Professionals provided its evidence to this inquiry.

- Between 1998 and 2003 the average price of an academic journal rose by 58%, in comparison to an 11% increase in the UK retail price index over the same period.
- Between 1996/97 and 2000/01 the information resource budget of UK university libraries has decreased by 29% in real terms, while the average journal price over the same time period increased by 41%.
- The proportion of university library information resource expenditure on journals has increased from 47% to 52%, but this increase has failed to maintain the actual number of journal subscriptions.

Pressure on library journal acquisitions budgets has resulted in cancelled subscriptions and has also contributed to a decline in book purchasing, compromising the library's ability to provide the full range of services required by its user community (House of Commons 2003). Interviewees who are familiar with these developments argued that digital repositories can help to reduce the vulnerability of libraries to changes in subscription fees. Although it is difficult to see how libraries can reduce subscription costs, according to this rationale, open access to (a subset of the) academic research output could make them less dependent on subscription-based publications.

2.1.6 **Providing an up-to-date overview of an institution's scholarly output**

As one of the primary outputs of research, the body of scholarly publications is an important asset of research-focused HEIs. In addition to collecting, archiving and preserving these assets (see Section 2.1.3) it is useful to have an up-to-date overview of their production.

Monitoring research outputs within and across academic departments can inform management decisions. The volume of publication output is often used as an indicator for academic productivity. The academic standing of the journals in which these papers are accepted (measured in the journal impact factor), or the number of citations they receive, are often used to assess the quality of the research. A member of senior management interviewed for this study indicated that these indicators should be available for all research staff for the purpose of individual performance evaluation to determine tenure positions and inform promotion decisions or salary increases. Additionally, measuring research productivity and quality can inform management decisions about departmental or research unit funding.

Besides serving internal management, research output is also used for institutional funding decisions. The typical RAE (to be replaced by the Research Excellence Framework or REF) requires HEIs to submit four research outputs for each full-time member of staff selected for inclusion. The RAE is undertaken on behalf of the UK higher education funding councils to evaluate the quality of research undertaken in certain subject areas. RAE submissions are given a score by a subject specialist peer review panel. This score determines the allocation of "quality weighted research funding", which each HEI receives from their national funding council.

Harnad *et al.* (2003) argue that institutional repositories can be a tool to harvest the information required for these assessments. They suggest an online-only system with continuously updated and continuously accessible RAE-standardised online Curriculum Vitae (containing all potential performance indicators, such as publications, grants,

doctoral students and presentations) for every researcher, linked to the full digital text archived in the institution's e-print archive. Several interviewees cited this potential application of digital repositories, and emphasised that the cost reductions of not having to harvest publication information required for the RAE and bibliographic analysis from individuals may outweigh the investment costs.

2.1.7 **Exploiting the added value of digital content: cross-fertilisation and knowledge management**

The final motivation for digital repositories is the most ambitious one. The digital revolution has transformed the way research is conducted, and the way it is used. Broader access to information resources may accelerate the creation of scholarly knowledge (National Science Foundation, 2004). In a comprehensive report, the National Science Foundation recognises that our ability to generate and collect data currently exceeds our ability to organise, manage and effectively use it.

However, Shiffirin and Borner (2004) highlight the profound changes that are taking place in the interdisciplinary areas of science. Charting, mining, analysing, sorting, navigating and displaying knowledge involve the interaction of several professions and new techniques of analysis retrieval and visualisation (Shiffirin and Borner 2004). Research libraries have a potentially crucial role to play here as an intermediary between research production and consumption. A digital repository, as the central archive of an institution's digital assets may facilitate reaping the synergies between different types of digital resources, such as electronic teaching and learning material, publications, datasets and theses. The exact nature of these synergies is yet unclear. But interviewees with experience in information management recognise that there are opportunities for re-using or combining existing information (e.g. data mashing).

2.2 **Implications and discussion**

The sections above show that there are different motivations for investing in digital repositories. Although none of the stakeholders seem to oppose the development and implementation of digital repositories, they each seem to have a different picture of what a repository is, and what it should do. Additionally, the interviewees indicated that not all stakeholders are equally aware of the benefits that digital repositories could have. The lack of a common understanding of digital repositories may be one of the main barriers to embedding these systems in HEI's daily operations.

There is yet little evidence that these motivations will be met and that the benefits will outweigh the costs. Thus far, the debate has been dominated by anecdotal evidence. It is therefore difficult to make a business case with any of these motivations. As for any substantial investment decision, there is a need to show that the return on investment for digital repositories outweighs the cost. Several interviewees indicated that the evidence of these benefits is needed to create sufficient buy-in from different stakeholder groups. Some argued that this has created a catch-22 situation, as the benefits may not be evident until repository content has reached a critical mass and associated services (e.g. online researcher CVs with full-text links) are fully operational.

Table 2 visualises the different perceptions of stakeholders regarding digital repositories, and how motivations can be linked to a subset of stakeholders. This table is based on our interpretation of stakeholder perceptions and serves merely as an illustration of the heterogeneity amongst them. It would be inappropriate to link these to firm conclusions or recommendations. In Table 2 green indicates that the motivation was mentioned by a clear majority of members of a specific stakeholder group; amber indicates that some respondents of a stakeholder group mentioned it as a motivation; and red that this motivation was not mentioned by respondents from this stakeholder group. Note that we coded on the basis of the perceived importance as revealed to us in the interviews rather than the actual importance of the motivation (established through triangulation with other sources).

Table 2. Example of different motivations for different stakeholder groups

	Lecturers	Researchers	Heads of department	Publishing	Library	IT department	Senior HEI management	External relations
Fear of missing the boat	Red	Red	Amber	Red	Amber	Red	Green	Amber
Providing a shop window for a HEI	Red	Amber	Amber	Green	Amber	Red	Green	Green
Enabling archiving and preserving institutional assets	Amber	White	White	White	White	Amber	Green	Red
Facilitating open access of scholarly outputs	Amber	Amber	Amber	Red	Green	Red	Red	Red
Decreasing dependence on the traditional publishing model	Red	Red	Red	Red	Green	Red	Red	Red
Providing an up-to-date overview of the scholarly output	Red	Green	Green	Amber	Amber	Red	Green	Amber
Exploiting the added value of digital content: cross-fertilisation and knowledge management	Amber	White	Amber	White	Amber	Amber	Red	Red

	Motivation seems to be relevant for stakeholder group
	Motivation seems to apply to stakeholder group, but it is not imperative
	Motivation does not seem to apply to stakeholder group

CHAPTER 3 **Barriers to embedding digital repositories**

In this chapter we discuss the barriers to embedding digital repositories identified by the stakeholders in interviews. These barriers should be examined closely as it is these officials who develop the repository strategy, delineate the motivations for having a repository (see Chapter 2) and consider further specific policy levers to overcome these barriers (see Chapter 4). The barriers identified in this chapter are clustered in six themes:

1. the embryonic nature of repositories and the difficulty of making the case for a digital repository when a critical mass in terms of outputs has not yet been arrived at
2. the difficulty of introducing change in the academic context
3. the burden of the depositing process of digital material
4. the complicated HEI environment in which repositories exist
5. the problem of getting incentives right
6. the risk of damage to the HEI reputation associated with the content of a repository.

These themes are discussed in more detail below.

3.1 **Digital repositories are at an embryonic stage**

There is no common shared vision of what a digital repository is

Chapter 2 shows that it is crucial to define clear motivations or a strategy for digital repositories based on the potential uses of a repository. It highlights a number of motivations for developing a repository. The lack of clarity around this strategy can lead to different views of what a repository is and what it should be. The differences in views of these repositories were visible in the interviews that we conducted. For example, some of the librarians interviewed regard repositories as a potentially important part of the centralised functions of the institution and, indeed, the library itself. In contrast, some of the academics interviewed, especially those from science disciplines, tend to have a more limited view of repositories. One respondent thought of repositories as an effective way to store data, without necessarily thinking of other uses for repositories. Scientific, technological and medical disciplines often work with vast datasets that are stored at a department level and are not necessarily centrally shared. Such data could be increasingly transferred to digital repositories in the future. Furthermore, a member of senior

management of one of the London institutions identified the potential of using digital repositories as a management tool, for instance, to make decisions on promotions.

An important barrier for those interviewed is the lack of a shared understanding in the institution of what the purpose of a digital repository is or should be. Firstly, as seen in Chapter 2, one of the motivations for institutions to build a digital repository seems to be that they do not want to miss the boat or offer less than their competitor. Therefore, their approach has been to follow the tide and respond to a perceived need to follow changes in technology. One respondent mentioned that most institutions were reactive in their design of repositories and had a rather cautious approach to building a repository in terms of funding and technological development. In the opinion of this respondent, the lack of strategy and vision meant that repositories may well remain limited in terms of their content and use.

Secondly, following from the previous paragraph, one interviewee indicated that repositories will always be a half-way house between traditional practices in libraries and modern technologies such as social networking. This interviewee explained that the physical paradigm, where objects are stored in different compartments, is still uppermost in most stakeholders' minds; that is, the digital paradigm has not yet been fully embraced. In other words, despite the opportunities offered by alternative technologies to organise, manage, access and store information, the processes and the approach of information management are still traditional and are still based on the traditional functions of libraries.

Repositories have not yet achieved a critical mass

We found that repositories have not yet reached enough critical mass (content) to convince stakeholders about the benefits of digital repositories and their return on investment. The interviewees indicated that repositories are not yet considered as a supporting tool for researchers, students and other stakeholders. Although content had already been deposited in the repositories in the three case study institutions, the interviewees found that the repositories were not yet complete. The body of deposited e-prints was not up to date and was often not representative of the output produced by the institutions, limiting the usefulness of accessing the repository. While datasets are also planned to be part of an institutional digital repository, the interviewees were not yet clear how the datasets would relate to other types of content and how they could be mined. Many interviewees, including a mix of librarians and academics, saw the benefits of including e-theses in the digital repositories, as these materials were often not widely available in other forms. Many of the repositories studied in this study have plans to include such theses in the near or not too distant future. For instance, the LSE has a procedure to deposit current and future theses.

Furthermore, some interviewees argued that repositories do not yet fulfil their full potential because they do not always include a variety of new forms of digital media, such as video or audio objects. In this area, there are differences between the digital repositories of the different institutions that were part of this study. For instance, Birkbeck has included some teaching materials in its repository, while the repository at UCL contains images from its art collection. However, in general, these types of objects raise a variety of issues different from text-based objects. For example, video, audio and high resolution images require significant amounts of storage capacity, which has a direct effect on the

costs of repositories. In addition, such multi-media objects pose significant challenges for long-term preservation, since their digital formats are more likely to become obsolete and unreadable. The use of videos and photographs also operate under personal data protection clauses and copyrights that are different from text or data-based objects.

Finally, the priorities for content vary by discipline and institution. For example, as mentioned earlier, teaching and learning material is a priority for universities such as Birkbeck, with its emphasis on adult education and distance learning. As a consequence, the remote accessibility of teaching and learning material and sharing and re-use of material among lecturers is of interest and importance to Birkbeck.

Lack of critical mass makes it difficult to make the case for digital repositories

As explained in the Introduction, digital repositories often contain only a fraction of the total institution's output. This lack of critical mass of relevant content makes it difficult for librarians to make the case for digital repositories to the research community. Some referred to this as a "chicken and egg" problem. In order to achieve a critical mass of content, a repository manager needs to achieve buy-in from the research community and senior administration. This buy-in is easier to achieve if the repository manager can show the merits of the repository in terms of numbers of downloads and visits. Many respondents acknowledged the existence of this problem, though some viewed it as more severe than others. One interviewee thought that the problem would solve itself over time, as the repository may reach a critical mass by actively soliciting content. Other respondents saw a need for more focused action, such as using mandates or expanding library resources.

Senior stakeholders have little direct involvement in repository projects

As explained earlier, we did not identify opponents of digital repositories in our interviews with stakeholders. Most respondents supported the idea, although they also recognised that the removing the barriers needed to be given stronger support by senior management, such as heads of department and senior college administrators. The support required from senior management is relevant not only in terms of resources and funding. The senior management could also get more involved in endorsing advocacy initiatives to increase their impact. Finally, though the college administrators interviewed expressed support for the digital repository project, they seem to be less aware of the specifics of the project. They seem to consider it as a library project, indicating that their own direct involvement in the project is limited. This observation also means that they are less likely to act as champions for these projects.

Clear roles and responsibilities have not yet crystallised

Without a clear vision about what a digital repository should be, the main roles and responsibilities that exist around repositories are difficult to embed. For example, in all institutions the library was responsible for the development of the digital repository. However, a first question open to debate is whether libraries are the right department in HEIs to push forward repositories. The repository technology is affecting the roles and responsibilities of both library and IT services, and their relationship.

Moreover, repositories depend on academics and third parties to supply the content. Mostly, these stakeholders have no specific role or responsibility in the project, although they are expected to provide content. It was not entirely clear to all of the interview

respondents who was ultimately responsible for the process of depositing material and ensuring that the content is complete and up to date. So far, efforts to improve content have principally emanated from library services with some support from a small number of senior university staff who are strong believers in the concept of digital repositories. These champions have so far participated voluntarily because they believe in the benefits of repositories and because they feel they are morally responsible for making research publicly available (one interviewee noted that it is a matter of being a good citizen for the institution). However, their participation is intermittent, ad hoc, not remunerated, and attracts no extra administrative support.

Finally, the repositories may also play a pivotal role in, for example, submissions to the RAE. This means that senior college administrators might want to steer the design of the repository and be closely involved in how it is managed in order to use it more directly as a management tool. The interview, however, did not indicate that there was much sense of ownership among senior college administration respondents.

Insufficient awareness of the nature and potential of repositories exists

A recurrent problem identified during the interviews was the lack of specific awareness about the existence of digital repositories. Some interviewees admitted that they themselves or their colleagues had only recently become aware of the existence of a digital repository at their institution. Generally, interviewees believed that there could be greater awareness among faculty members and administrative staff of how to use and contribute to the repository. Moreover, some respondents mentioned that although they had engaged with the repository in the past by depositing materials, they did not remember the process and were more likely to get an administrative assistant to engage with the repositories on their behalf. Thus, maintaining awareness over time is also an issue. To raise awareness and the digital repository's profile, the library services of Birkbeck and LSE recently carried out information campaigns. These outreach events consisted of a publicity drive targeting academics by distributing information leaflets and making department presentations and demonstrations. Furthermore, one of the institutions publicised the top three papers downloaded from the repository. The various initiatives all together had a significant call effect. In the case of LSE the response rate appeared to be quite successful.

3.2 The difficulty of introducing change in the academic context

Academic departments are considered to be conservative by nature

Many interview respondents suggested that one of the reasons for the relative slow progress of embedding digital repositories in academic institutions is that academic departments are reluctant to undergo organisational change. Asking academics to abandon some of their old habits and participate in processes involving new technology can be met with resistance. The interviewees acknowledged that technology adoption may vary by discipline or by generation. Scientific, technological and medical disciplines are classified as more technology friendly than the humanities. Younger generations seem to feel more comfortable with more modern technologies. Librarians at the LSE reported that there are different groups of users: those who deposit regularly and comprehensively; those who deposit every so often (normally once every couple of years); and those who do not engage

at all with the repository. The regular providers of material tended to be younger and less well established.

Institution-wide initiatives prove hard, given the decentralised and horizontal organisation of institutions

The HEIs interviewed are characterised as being diverse and flat organisations with professionals at all organisational levels. These organisational structures make management and coordination of institution-wide initiatives such as embedding a digital repository more difficult. Top-down approaches may not be very effective in these organisations.⁹ This was echoed by some respondents who indicated that they did not expect that a mandate would get academics to deposit their work.¹⁰ The reason for this is that institutions may not have the capacity to enforce compliance or even the desire to enforce compliance. Nonetheless, several interviewees supported mandates as long as they are accompanied by other initiatives.

Academics use existing networks for communication and publication rather than digital repositories

Institutional repositories could be used as important communication tools and as instruments for exchanging ideas between academic peers. Several interviewees expected, however, that institutional repositories will not replace the existing communication networks used by academics. These consist of journal publications as well as information exchange through working papers, online forums, (inter-)departmental meetings or conferences. Such networks are mostly discipline-focused, and researchers tend to have closer links with their peers in their discipline than with colleagues from other departments. Unless there is an aim of encouraging more cross-disciplinary collaboration, institutional repositories do not seem to provide much value to such academic communication, particularly for researchers who have well-established networks.

3.3 Perceptions that the process is burdensome

The research community attaches a low priority to depositing in repositories compared to other work

Although interviewees supported depositing materials in repositories, they generally attached a low priority to depositing compared to other work. Time is an issue in this priority-setting. As put by one researcher: “I can hardly keep up with my research and administrative workload, so where will I find extra time to dedicate to a digital repository?” Given the lack of incentives for depositing, time spent on preparing publications for a digital repository and submitting them to it is considered an administrative burden.

Furthermore, researchers can often only deposit a final version of a paper or book in a repository once the publisher has lifted the embargo, often one or two years after the initial

⁹ No HEIs have adopted university-wide mandates. Most mandates used at present are voluntary arrangements at faculty level (e.g., Harvard) where academics have agreed that they will self-deposit.

¹⁰ There is some evidence from other studies that mandates would be effective (Swann and Brown, 2005).

publication date. At this point, many researchers forget about depositing the material or see it as a less urgent task.

Currently, researchers can deposit their publications roughly in two ways. First, they can deposit their research material through the software facilities provided by the institution. However, the interviews revealed this option is seldom used. Some argue that the software does not meet the specific requirements and publication practices of their discipline. For example, the interface features several compulsory fields that support only a limited selection of optional entries. These are perceived as incomplete and inaccurate, which may create some frustration among users. Furthermore, some respondents described the software as time-consuming and not sufficiently user-friendly.

Given the limited uptake of electronic services, library services often offer an alternative way to deposit work in the institutional repository. In the case of all the case study institutions, library staff offers to upload the required documentation and complete the required fields as long as researchers provide the bibliographical references (including or not including the full-text version) in any format. At the LSE in 95% of the cases the material is submitted in this way.

This second option aims to minimise the burden for researchers. However, it may only a short-term solution. If awareness and interest in depositing material in a digital repository increase, the workload for library services will also increase. Without additional resources, this process will become unsustainable. Already, the interviewees from the LSE library indicated that they are facing a backlog of material to be uploaded in the repository.

Lack of coordination may lead to redundancies

Without appropriate coordination, depositing material can raise concerns of redundancy. The various stakeholders at HEIs – researchers, librarians, senior management, and external relations – make different uses of digital repositories. For example, academics use repositories to support their research, and are therefore more interested in having full text articles. In contrast, the external relations department is interested in the digital repository as a shop window to attract funding, students and researchers. Consequently, it is interested in a database with appropriate metadata that is able to display the actual output of the institution. These different requirements with regards to the design and content of a digital repository need to be taken into account when organising, classifying and storing the information. It is not inconceivable that different stakeholders may design their own versions of a digital repository.

Efforts will also need to be coordinated to avoid approaching academics repeatedly about the same piece of work. In fact, this point was raised by one of the respondents from the library community, who said that an academic was often asked to provide different type of information by different stakeholders of the repository for the same research/ piece of work. If this is not avoided, there is a risk of damaging the reputation of repositories. Instead of being perceived as supporting institutions, they might be seen as containing redundant and not particularly useful information.

Repositories are not regarded as user-friendly tools that relieve people's workload

Repositories are not yet regarded as instruments that can save time and resources to the institution overall. The interviewees indicated that the technology should become more

user-friendly and easier to use. In theory, it should be possible to automate the process of depositing material and to make it seamless for the researcher to use. Some respondents indicated that only when they are fully integrated into the daily operations will repositories become part of the daily routine for stakeholders at HEIs. The respondents mentioned that this could be done through a variety of ways, such as mandates and through familiarity, as repositories become more embedded.

3.4 The complexity of the HEI environment

One size does not fit all: HEIs are heterogeneous

Institutional, disciplinary and to a lesser extent, personal differences, were identified by interviewees as important barriers to developing digital repositories. The heterogeneity of stakeholders poses significant barriers to embedding institution-wide initiatives such as repositories. Heterogeneity across stakeholders makes coordination tougher and administration more complex. Furthermore, the fact that interests, requirements and incentives for repositories are not aligned across departments undermines the formation of pooled constituencies to support repositories.

For example, science, technological and medical disciplines deem that the timeliness of the dissemination of research was critical. In fact, one interviewee mentioned that research scientists see their manuscripts as ephemeral, and consequently value the timeliness of dissemination of a particular piece of work. In contrast, one respondent noted that new ideas and innovations in the humanities disciplines generally complement, rather than substitute for, past work. As a result, science, technological and medical disciplines are particularly concerned with having a repository that is up to date. One senior administration respondent did not see how a repository that does not have the latest material could compete with a subscription-based repository to which more than 90% of the science, technological and medical community has access.

Disciplines also differ in their scholarly dissemination practices. The humanities tend to produce more monographs and books. Social science disciplines, such as economics, tend to release more working papers to share ideas about a topic and elicit feedback before submitting it to a peer-reviewed conference or journal. Furthermore, some disciplines are more prone to disseminating other forms of grey literature, for example scientific reports containing scientific and technical information that generally does not undergo independent peer review before publication. Disciplines also differ in their approach to open access. Disciplines in science, technology and medicine tend to have a higher proportion of open-access publishing than the social sciences or humanities.¹¹

These disciplinary differences are only some examples of how discipline-specific characteristics may determine the requirements of a repository.

¹¹ Following a survey among 780 UK research academics in a wide variety of institutions and departments, Sparks (2005) reported that 8.0% and 8.1% of respondents in the medical and biological sciences and physical sciences and engineering reported to prefer publishing in open access journals. This is marginally higher than the proportion of respondents in social sciences (6.3%) and arts and humanities (6.8%).

The development of repositories is hindered by legal constraints

Copyrights are a particular concern for senior management and academics. One interviewee even described HEIs as being schizophrenic about copyrights. Whereas publishers are concerned about their sales, academics are driven by the desire to increase their prestige by publishing their work in high impact journals. Furthermore, important sources of funding for the institution depend on the results of the RAE. The RAE assesses the quality of research to enable the higher education funding bodies to distribute public funds on the basis of research quality ratings. These ratings are determined by how much of the work is judged by a peer panel and how much is published in high impact journals. Thus, academics and institutions treat their relationships with the publisher with great sensitivity.

Dealing with intellectual property rights, particularly copyright, is perceived by one senior member of a college as being increasingly complex.¹² Different copyright rules apply depending on the country, the discipline and the type of document that is being publicly disseminated. Different rules apply to the dissemination of working papers, pre-publication material, published work and material for teaching and learning. An effort undertaken by SHERPA called ROMEO¹³ aims to provide the users of repositories with a clear reference guide on the specifics of the copyright per publisher with the aim of informing academics of their rights in making material freely available. In the interviews several respondents said they knew about this tool, though few had actually used it to check their copyright and rather relied on information from their publishers. Complicated copyright laws act as a barrier to depositing material by instilling a certain level of confusion about what may be publicly disseminated and what may not. Therefore, researchers adopt a cautious stance when it comes to depositing material. This undermines the full potential of a repository.

The embargo periods determined in each copyright contract establish when a piece of research can be publicly disseminated and thus uploaded in a repository. This time span is typically around one to two years. To avoid the delay caused by embargo periods, a number of publishers allow depositing the non peer-reviewed pre-publication version in the repository. However, several interviewees indicated that researchers are reluctant to make a version available publicly that is not the final version. The respondents mentioned that pre-publication versions are often confusing and raise concerns about the quality of the material deposited in a repository. Additionally, there is no systematic way of filing pre-publication versions of papers, and therefore, many researchers may have difficulties tracing them in a repository.

¹² The complexity exists in several dimensions. The overarching legislation is the Copyright, Designs and Patents Act and the EC Copyright Directive. As interpreted in the UK, many universities waive their rights to copyright and grant them back to the individual academic. The difficulty comes when individual publishers ask academics to sign away their copyright to the publisher as a condition of publication; so that the agreement with the publisher can override statute law. A number of pieces of legislation cover intellectual property in different type of material – printed materials and software are governed by copyright, legislation exists for patents, the Database Directive covers databases and so on.

¹³ See <http://www.sherpa.ac.uk/romeo.php?all=yes>, accessed July 2008.

A number of interviewees thought that embargo periods are not necessarily justified when research is funded with public money. Some believe there is a mismatch between the funders of the research projects, the holders of the copyright, and the beneficiaries of the final research output. Furthermore, they argue that publicly funded research should be publicly available to all taxpayers, or at least to those who fund the research, through open access publishing or digital repositories. However, other respondents supported the role of publishers and saw publishers and copyright as an essential part of the research process.

3.5 Incentives need to be appropriate

Repositories are not embedded in the current performance structures

To understand what drives academics to deposit material in a digital repository, we must first understand their incentives and motivations. For academics the main incentives are those that determine their tenure and promotion. As a consequence, researchers are heavily influenced by the drivers of the RAE, In fact, their performance at HEI, and their subsequent promotion and salary increases, are driven by the volume of their publications and the relative significance of these publications (usually measured by the journal impact factor). At the same time, academics' performance is built into the performance of HEI, which receives an important portion of their funding based on the results of the RAE. In 2008 the RAE will be replaced by the REF. The REF will be different from RAE in two main ways. Firstly, there will no longer be such a clear distinction between the arrangements for science-based subjects and all other subjects. Secondly, REF will not only work with input from expert panels, but unlike the RAE, it will assess the quality of the output of an institution based on a combination of additional indicators, including bibliometrics where appropriate (HERO, 2008).

The changes in the REF are thus likely to have an impact on the use and uptake of repositories. At this point it is too early to predict how and to which extent they will affect them. Depending on the type of metrics that the REF will use, repositories may favour or oppose researchers' interests. For example, if the REF includes metrics such as the number of downloads from only subscription-based journals, but not from other sources, researchers are unlikely to have much interest in depositing their publications in repositories, unless it will drive up their citations or the downloads of their traditional publications. In contrast, repositories could also positively add to researchers' performance measurement. By creating more than one route to information repositories could quantitatively capture a wider dissemination of research material. In fact, for several interviewees, a repository is another way of producing information, and another knowledge management exercise. It helps to increase the possibilities of finding information and the chances of being cited. One interviewee suggested the possibility that downloads or citation statistics of repository material could be monitored and shared with the authors on a regular basis. The information the researcher/lecturer would receive would include information such as the number of hits, the geographical location from which material was accessed, online comments that people have made, and so on.

Quality assessment exercises have a big impact on academic institutional and individual behaviour. We need to understand how incentive structures are related to behavioural

change, and thus how they can affect behaviour vis-à-vis repositories. Identifying the way the quality assessment exercise can help promote repositories is also relevant to increase the buy-in for repositories.

In these paragraphs, we have spoken mostly about external quality mechanisms such as RAE and REF. However, as mentioned by respondents, HEIs are increasingly interested in assessing their own output and evaluating the performance of their academics. Though respondents offered mixed views on how effective mandates would be, some of the HEIs in our sample are increasingly examining ways to capture this output. One respondent mentioned that linking promotions to what is available in the repository would solve the problem of the research community depositing quite quickly. This is one example of a clear incentive to do so.

Incentives by age structure have not been taken into account

The interviewees mentioned that the level of experience in academia may affect the degree to which people embrace repositories. Researchers at the outset of their academic career are thought to have not yet established a firm track record and network of contacts and they may be more familiar with forms of electronic dissemination. They may therefore be more prone to making their work more accessible to a wider audience. Academics with a longstanding track record, on the other hand, have well-developed contact networks and reputations.

Sustainable resources have not yet been devoted to repositories

So far, repositories have mainly evolved with the support of ad hoc project funding. The interviewees involved in the development and implementation of repositories argued that, although this funding has been essential to their establishment, repositories can only survive with a long-term, sustainable commitment of resources. They say that these repositories require a long-term investment for their maintenance, and for continuous innovation to accommodate the emerging needs of departments and faculties. Although most respondents in the library community were optimistic that funding would be found or made available through the library, the ad hoc nature of funding hitherto has also made it difficult to adequately resource work associated with the repository and to maintain staffing. In some institutions a respondent mentioned that repository managers often have a part-time assignment, and they get approximately seven papers per week into the repositories. This point highlights the direct relationship between resources and achieving a critical mass of content in the repository.

3.6 Possibilities of reputation damage

Concerns about the quality of the repository affects the willingness to deposit material

The interviewees repeatedly expressed concern about the difficulty of monitoring and guaranteeing the quality of a digital repository's content. They argued that some academics may not want to be associated with a repository that has no formal quality assurance mechanism, such as peer review. There is some concern that their publications may appear alongside material that is politically contentious, confidential, of dubious quality, or uses controversial methods (such as animal testing). In the end, repositories are part of the

institutional assets and, as such, carry an implicit stamp of approval from the institution. In other words, they contribute to shaping the brand of the organisation. Consequently, decisions to deposit and use repositories will depend on the confidence instilled in the research body by the repository.

The interviews confirm that, so far, the repositories in the three case study institutions have not yet attained the widespread confidence among researchers needed to become accepted means of research dissemination. The explanation for this lack of confidence may lie in scholars' relatively low level of awareness of and knowledge about repositories. In fact, some interviewees expressed concern that repositories could become "a rattle bag of everything". Content managers, on the other hand, argue that this concern does not reflect the quality processes that repositories undergo. Library services can label content in some cases: for instance the LSE labels documents as drafts. They also have tools to track the document's status and its compliance with copyright.

3.7 Implications and discussion

Understanding the barriers to embedding digital repositories is needed by those wishing to pursue a successful strategy to develop a digital repository. The barriers discussed above were raised by some of the key stakeholders involved in the interviews. In this study, we limited ourselves to interviews with a sample of interviewees per institution, rather than consulting more widely through the use of surveys and focus groups. The list of barriers above is therefore a reflection of some perceptions in the wider community. It is therefore likely to fall short of any exhaustive or comprehensive list of what decision-makers developing digital repositories need to consider when developing their strategy. Moreover, the importance of some of these barriers might vary and indeed they might not all be appropriate and actionable in all contexts.¹⁴

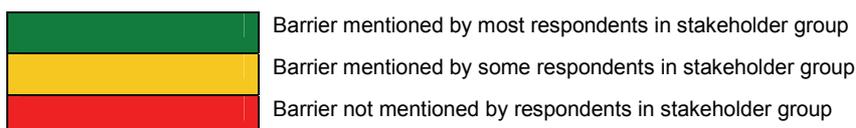
Nonetheless, the exercise offers an interesting overview of what some of the stakeholders perceive to be the main problems in embedding digital repositories. The first important finding in this report is that getting buy-in from the wider community (outside the library world) is necessary to achieve a sustainable digital repository with a critical mass and which is relevant to specific groups of stakeholders. The second is that many institutions lack a clear vision of what a digital repository is or ought to be. Mapping stakeholders' motivations for a digital repository (Chapter 2) and the barriers perceived by stakeholders seem relevant to developing a shared vision for the institution. In this report, as we were limited to a small sample of respondents per institution, we decided against mapping the specific barriers per stakeholder group. However, Table 3 shows how one could start developing such a stakeholder analysis. In Table 3, green indicates whether the barrier was mentioned by a clear majority of members of a specific stakeholder group; amber indicates that some respondents of a stakeholder group mentioned the barrier; and red that barrier was not mentioned by the stakeholder group. We coded on the basis of the perceived

¹⁴ We consulted the EMBRACE project board in two meetings on the appropriateness and relevance of the barriers that we identified. This, together with the repeated patterns in responses from the interviewees, gives us some confidence that the barriers are relevant to the problem of embedding digital repositories in general.

importance of these items, as revealed to us in the interviews rather than their actual importance (established through triangulation with other sources). This table is based on our interpretation of stakeholder perceptions, and serves merely as an illustration of the heterogeneity amongst them. It would be inappropriate to link these to firm conclusions or recommendations.

Table 3. Example of a stakeholder analysis on the basis of the sample of interviewees

		Lecturers/researchers	Heads of department	Library	IT	HEI management	External relations
Digital repositories are at an embryonic stage	There is no common shared definition or vision	Green	Yellow	Red	insufficient observations	Red	insufficient observations
	Repositories have not yet achieved a critical mass	Red	Red	Yellow		Red	
	The lack of critical mass makes it difficult to put the case for digital repositories	Red	Red	Yellow		Red	
	There is little direct involvement from senior stakeholders to develop the repositories	Red	Yellow	Yellow		Red	
	Clear roles and responsibilities have not yet crystallised	Yellow	Yellow	Yellow		Yellow	
	There is insufficient awareness about the nature and potential of repositories	Green	Green	Green		Green	
Introducing change in the academic context	Academics are considered to be technologically conservative	Yellow	Yellow	Yellow		Red	
	Institution-wide initiatives prove hard, given their decentralised and horizontal organisation	Yellow	Yellow	Yellow		Yellow	
	Academics use existing networks rather than digital repositories for disseminating their work	Green	Green	Green		Yellow	
Perceptions of a burdensome process	The research community attaches a low priority to depositing in repositories compared	Green	Green	Yellow		Green	
	Lack of coordination may lead to redundancies	Red	Red	Yellow		Red	
	Repositories are not regarded as user-friendly tools that relieve people's workload	Green	Green	Yellow		Red	
Complicated environment	One size does not fit all: HEIs are heterogeneous	Red	Red	Yellow		Red	
	The development of repositories is slowed down by legal constraints	Yellow	Green	Yellow	Yellow		
Getting incentives right	The repositories are not yet built into the current performance structures	Red	Yellow	Red	Green		
	Incentives by age structure have not been taken into account	Red	Red	Green	Red		
	Sustainable resources have not yet been devoted to repositories	Red	Red	Yellow	Yellow		
Concerns of reputation damage	Green	Green	Red	Red	Yellow		



In this chapter we give an overview of some of the interventions suggested by the interviewees on how to support the embedding of digital repositories. In some cases there are some obvious links between the barriers identified in Chapter 3 and the interventions suggested here. We have not tried to develop these links for two important reasons. Firstly, as there are differences between the strategies pursued by digital repositories, not all barriers and interventions will be applicable and relevant to all. Secondly, some of the institutions are already using some or part of these interventions. So the list here represents a suite of interventions suggested by the interviewees that could be of use to repository managers and could be used in due course to exchange ideas about best practice among those involved in the development of digital repositories.

We identified two main areas of interventions: those related to coming up with the right strategy (design) for digital repositories and creating a shared vision on digital repositories across the organisation; and those related to achieving buy-in and communicating with the key stakeholders. It is clear that engagement with the stakeholders feeds back into the strategy as it evolves.

4.1 **Developing a strategy and a shared vision across the institution**

Clarity on the institutional vision on digital repositories is required

The importance of a shared understanding of what a digital repository is and should do has been discussed above. Several respondents presented their own visions of repositories in response to questions of how a digital repository could become embedded. In one sense, they were arguing that repositories should take a specific form or be deployed for a specific use in order to become a part of the institution. These views also reflect the absence of a shared institutional vision on digital repositories in the institutions that were part of the report. The development of this vision appears to be the key element of any successful strategy.

There were broadly three visions. One respondent saw the digital repository as a development tool. This respondent felt that in due course a digital repository should assist HEIs to move away from the idea of static resources towards dynamic resources. Under the new paradigm material should be stored and linked in terms of the way a researcher thinks, which would link ideas and authors together by packaging them for the researcher. Users could also create linkages between materials. Another interviewee saw a digital repository as a management tool through which, for instance, the performance of researchers could be

assessed or which would function as a search engine for the institution. Finally, several interviewees focused on what the repository should contain. Some advocated a skinny version, including only working papers, opening out to a wider version including published material (after the publication embargo elapses).

A clear vision would also establish the value-added of a digital repository in the eyes of the research community. For instance, several respondents felt that publishers are better placed than institutions to preserve or keep research output over time. If archiving and preservation is one of the motivations for having a digital repository, then such views show the lack of a shared understanding over the whole institution.

The strategy must be embedded in the wider institutional strategy

Many respondents pointed to the fact that digital repositories are in an early stage of development. They receive mostly project funding. Moreover, many of the repositories do not yet have dedicated staff resources (or, at least, sufficient resources to build up a critical mass) and the roles and responsibilities of those involved in digital repositories are as yet unclear. Several respondents said that short-term or partial investment plans should be built into the overall long-term investment plan for the institution. Others commented on the fact that fixed resources would also help to embed the roles and responsibilities of those involved in the development of digital repositories and further assist in the development of ownership over the repository from senior management, the research community and departmental administrators. Some commented on the fact that it was difficult to draw up a detailed plan (or roadmap) on how to develop the repository in the absence of a long-term funding. Finally, in the absence of long-term resources it was also difficult to find resources to support the research community in depositing materials in the digital repository.

Dedicated resources are needed to support the repository

Following from the previous point, respondents had various ideas on how dedicated resources could support the functions of a repository. In particular, the issue of depositing by the research community appears the main area of concern. One respondent suggested that more resources should be spent on making the electronic tool for submitting documents very user-friendly, in order to decrease the workload of those depositing and those receiving the information in the repositories. Another respondent advocated having dedicated library staff who would deposit materials on behalf of the research community. A further respondent pointed out that subject librarians could sit in the academic departments and work more closely with academics. By developing a closer relationship with their lecturers, the library would be aware of the latest research output produced by the department and the most recent developments in the relevant discipline. They would also better understand the needs and requirements of the department, thus facilitating the customisation of a digital repository. A final suggestion was to make resources (administrative assistants) available to academic departments to assist researchers in depositing. In summary, the interviewees focused particularly on freeing up dedicated resources to help to obtain content for the digital repository.

Branding the repository needs care

In most institutions, the repository is a library service. The LSE has taken great care to brand the repository not as a library service but as an institution-wide initiative. Given the departmental nature of many colleges and the entrenched relationships between the research communities and the administration of the college, branding the repository as an institutional initiative might improve the buy-in of the various communities and also give senior management more direct involvement.

Closer links between the strategy and incentives are needed

Several respondents pointed out that a successful strategy for embedding digital repository should be linked to incentives. However, they were less clear on which form the incentives would take. Some advocated the use of mandates, if complemented with other incentives. Some institutions are moving in this direction. A mandate could require all research outputs funded by bodies employing public money, such as the Economic and Social Research Council, and all other output that forms part of the RAE/REF would have to be deposited by default in the digital repository. Others saw a mandate in which what is deposited in the repository is linked to academic promotions as a way forward. In this case, the mandate would also have to be closely linked to the capacity of the institution to gather management information and to satisfy the needs of the RAE and REF.

4.2 **Communicating with stakeholders**

The development of a communications strategy appears to be useful

An adequate communication and marketing campaign appears to be important for the success of digital repositories. In fact, regular information campaigns and outreach events have proved to be successful in some of the institutions studied, for instance the LSE. As a result several respondents advocated establishing stronger communication lines between the central department leading the repository and the academic departments, which are important given their role as the ultimate depositors of content. These regular communication lines could serve several purposes. The first and most important is to inform stakeholders of the existence of the repository and its benefits, and how it can help the different stakeholder groups. This is important, considering that many people in the institutions seemed to be unaware of the existence of digital repositories. Additionally, communication lines can be used to exchange information and consequently shape the future vision and requirements for an institutional repository.

Stakeholders could be consulted in developing the digital repository

One respondent pointed out that the development of a digital repository should be aligned with the needs of the research community. As is clear from this report, we believe that regular stakeholder feedback would be helpful in further developing the digital repository. Stakeholders who are consulted are more prone to engage in projects because of the inclusive nature of the exercise. Furthermore, through consultation, the institution might be able to collect relevant information that can be fed back into the overall strategy of the organisation. In fact, a stakeholder consultation for repositories might cover important

aspects of embedding institutional repositories. These may include some of the following research questions:

- What is your definition of a digital repository?
- How do you think repositories will serve your interests?
- What (benefits) would you expect to get from a digital repository? What is your vision of a (useful) digital repository?
- What are your requirements for a digital repository?
- How are repositories currently serving your interests?
- What do you consider are the (current) barriers, drivers and issues of digital repositories?
- What incentives would you have to use digital repositories?
- How do you believe repositories could be best embedded, through top-down approaches (mandates), bottom-up approaches or both?

Any strategy should take into account the disciplinary differences in an institution and differences in the research community

It appears from several interviews that different academic departments might have different needs or face different hurdles in using digital repositories. This would affect the interaction between the repository and the respective academic department. Moreover, some staff involved in repositories mentioned that different types of researchers found it easier to interact with the repository than others. Age appears to be a factor here as well. Some respondents therefore advocated targeting information campaigns on certain departments or certain groups of the research community. An example is the advocacy and information campaign run by the LSE in connection with the Economics Department. Another suggestion to familiarise young researchers with the repository was through early and continued exposure. For example, academics and students can increase their involvement in repositories by using its teaching and learning content (if such content is available). In parallel, developing and promoting repositories with e-theses will contribute to younger generation's greater involvement. In fact, this option is considered to be especially attractive compared to the recent past, where theses often remained in the basement of an archive, and were consulted only some years later.

Clarity over copyrights is needed

Though ROME0 appears to be a useful tool to the research community, there still remains some lack of clarity on the legal constraints of depositing in the research community. In short, the research community remains poorly informed. Copyright ignorance or apathy is one of the main structural issues that impact on repository deposit and thus on changes in scholarly communication. Many authors, as identified in the ROME0 studies, revealed that they lacked knowledge of their rights in publication frameworks: for instance, whether they were permitted to deposit material in an institutional repository (Steele 2005). Information campaigns could address this particular issue. For instance, the LSE has produced leaflets on what type of material can be deposited in the digital repository. Campaigns to support education for authors on

issues around IPR assignments could also contribute to increasing knowledge on copyrights. For example, UCL has a clear IPR policy for staff. The policy recommends not to assign the IPR to the publisher, but to seek licensing agreement for publication¹⁵. Furthermore, authors are encouraged to generate an addendum which can be attached to the journal publisher's copyright agreements to ensure necessary rights are retained.

Champions could be identified in each department

Several interviewees suggested that champions could be identified in each department. These champions would liaise with the repository on specific departmental issues, be a point of contact for colleagues who have specific questions or requests, and in a general sense become an advocate for digital repositories in the department.

4.3 Discussion

In places the list of interventions identified by the interviewees lacks specificity or is self-evident. For instance, increased resources would solve many problems that digital repositories face. Indeed, the example of the LSE suggests that with additional funding (an external grant) the digital repository could be developed more quickly and content captured more extensively compared to other institutions (see, for instance, Figure 2). In other areas the interventions appear too vague or general. For instance, creating champions seems a good idea. However, few respondents were clear on how these champions would be identified or given incentives.

Finally, in places the interventions appear evident. A well-developed strategy and a business plan are important prerequisites for embedding a digital repository. However, herein also lies some of the value added in what the stakeholders identified as useful interventions. The lack of clarity of what the digital repository is trying to be and the lack of clarity in the research community in how to engage with the repository would appear to be two areas where repository managers can make a real difference without requiring large amounts of resources. In addition, many respondents mentioned the importance of incentives for the digital repository to achieve a critical mass and become embedded in the institution. It appears logical that incentives should be aligned with or integrated within the strategic objectives of the digital repository. However, the lack of clarity on the digital repository among the stakeholders and the absence in many cases of specific incentives for the stakeholders to engage with the repository, as mentioned in Chapter 3, appear to be substantial obstacles to embedding digital repositories.

¹⁵ <http://www.ucl.ac.uk/Library/scholarly-communication/ipr.shtml> (accessed August 2008)

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APPENDICES

Appendix A: List of interviewees

Name	Function	Institution	Stakeholder perspective
Paul Ayris	Director Library Services	UCL	Library
Suzanne Beeke	Head of Research Department, Language and Communication	UCL	Research Lecturer Head of Department
Stuart Corbridge	Human Geography and Head of Development Studies	LSE	Research Lecturer Head of Department
Barbara Cumbers	Electronic Projects Librarian	Birkbeck	Library
Jane Fenoulhet	Executive Dean, Faculty of Arts and Humanities	UCL	Research Lecturer Senior HEI Management
David Flanders	Project Manager, Source, Fedorazon, and WoCRIG	Birkbeck	IT department Library
Beverley Friedgood	Head of Academic Publications	LSE	External Relations
Sandra Jovchelovitch	Reader in Social Psychology and Head of Institute of Social Psychology	LSE	Research Lecturer Head of Department
Fiona McMillan	Vice-Master of Research	Birkbeck	Research Lecturer Senior HEI Management
Philip Payne	Head Librarian	Birkbeck	Library
David Price	Vice-Provost for Research	UCL	Research Lecturer Senior HEI Management
Richard C. Rayne	Lecturer in Biology and Head of School	Birkbeck	Research Lecturer Head of Department
Frances Shipsey	eServices Librarian	LSE	Library
Gus Stewart	Director Research and Project Development Division	LSE	External Relations
Maureen Wade	Head of Library Services	LSE	Library
Nicola Wright	Information Services Manager	LSE	Library