
Strategies for Institutional Repository Development: A Case Study of Three Evolving Initiatives

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ABSTRACT

As an evolving part of the profession of librarianship, institutional repository development is still in the process of establishing guiding principles and best practices. There is no one path to follow and few established cases from which to learn about development options and risks. This case study presents a close examination of the approaches taken at three university libraries, comparing choices, strategies, and conditions driving development activities. The most pronounced differences stem from how the initiatives are balancing content acquisition and service provision. Across cases, intellectual property concerns are prevalent, and repository goals and policies are often implicit, with the value of the repository for faculty and the university emerging in multiple ways. The complex planning, management, and technical work of repository developers is increasingly dependent on coordination with liaison librarians and their existing relationships with faculty. The three cases suggest a range of productive responses to the many challenges facing institutional repositories, as they mature, expand, and integrate further with library operations, and continue their important contribution to the ever-changing enterprise of scholarly communication.

INTRODUCTION

An increasing number of academic institutions in the United States and abroad are developing institutional repositories (IRs) in a bid to retain the intellectual output of their scholars and support open access trends in scholarly communication. University IR initiatives are working to collect, preserve, and make persistently accessible a variety of scholarly materials. To this end, IR development teams strive to realize economies of scale

through technologies that support scholarly communication across fields but also need to respond to the differing content and service needs across scholarly communities (Kling, McKim, & King, 2003; Fry & Talja, 2004; Palmer, 2005). As this paper will illustrate, the demands of IR development are varied and still evolving, and there is no existing roadmap for how best to make progress. The work is highly technical, requiring design and implementation of robust information infrastructure and functional systems, but it is also highly managerial, requiring continual planning, prioritizing, and coordinating with respect to the expectations of various stakeholders, including faculty, university administration, and publishers, as well as academic librarians already serving in established professional roles.

With funding from the Andrew W. Mellon Foundation, the project presented here investigated IR initiatives at three large public research universities in the United States. It is a close examination of the development strategies undertaken at IRs in similar academic environments, to compare the directions pursued, choices made, and points of progress within their local organizational context. The results aim to inform IR practitioners, and academic librarians and administrators more generally, of the many challenges faced in the development of IRs and to suggest a range of potentially productive responses to those challenges. The background provided in the next section draws on the literature directly related to the findings of this study, which corroborate but also extend and detail what we know about building successful IRs at research universities.

BACKGROUND

The rising cost of serial subscriptions, rapid changes in technology and document delivery, and the open access movement have brought new challenges and opportunities to libraries as participants in the scholarly communication process.¹ One response has been to begin building IRs to collect and preserve digital scholarly output, help faculty reclaim their intellectual property (IP) rights long lost to publishers, and presumably curb collection development costs over time. In 2005, Lynch and Lippincott reported that 40 percent of doctoral institutions in the United States had an operational IR; and over 47 percent of respondents to a 2007 census of institutions at all levels reported either planning, piloting, or administering an active IR (Rieh, Markey, St. Jean, Yakel, & Kim, 2007). The emergence of repository management software, such as DSpace (<http://www.dspace.org/>), EPrints (<http://www.eprints.org/>), Digital Commons (<http://www.bepress.com/ir/>), and Fedora (<http://www.fedora-commons.org/>) has facilitated the technical aspects of repository implementation, making it a reasonable prospect for many institutions.

According to a 2005 content analysis of the literature on institutional repositories, a third of the reviewed articles did not discuss libraries, lead-

ing the authors to conclude that “librarian involvement is not seen as a defining feature of IRs by everyone involved in the early stages of IR development” (Allard, Mack, & Feltner-Reichert, 2005, p. 332). At the same time, advocates have suggested that libraries are uniquely positioned to manage IR development and sustainability, because of their existing information infrastructure and professional expertise (Crow, 2002; Lynch, 2003; Chan, 2004; Gibbons, 2004; Walters, 2007). As Crow (2002) states:

In the long-term, organizing and maintaining digital content—as well as supporting faculty as information contributors and end users—should remain the responsibility of the library. Libraries are best-suited to provide much of the document preparation expertise . . . to help authors contribute their research to the institution’s repository. Similarly, libraries can most effectively provide much of the expertise in terms of metadata tagging, authority controls, and the other content management requirements that increase access to, and the usability of, the data itself (p. 20).

Academic librarians have always adapted to the evolving needs of faculty and students while navigating the changes in technology and the information landscape at large. This trend has continued as library professionals, who were originally “focused on reference services, liaison activities, and collection development,” are taking on responsibilities for IR development (Phillips, Carr, & Teal, 2005, p. 308). They have become influential in software implementation, and their skills and knowledge are effective in IR project management and planning overall (Allard et al., 2005; Walters, 2007). Given their traditional competencies, librarians are particularly well positioned to direct collection development and preservation activities (Crow, 2002; Horwood, Sullivan, Young, & Garner, 2004; Allard et al., 2005; Bailey Jr., 2005; Jenkins, Breakstone, & Hixson, 2005; Phillips et al., 2005).

Advocacy and promotion are also essential IR development activities for librarians (Horwood et al., 2004; Bailey, 2005; Bell, Foster, & Gibbons, 2005; Jenkins et al., 2005; Phillips et al., 2005). “It falls to librarians to develop IR collections, both by recruiting content and by making IRs as attractive as possible to faculty members” (Bell et al., 2005, p. 284). In the literature, librarians are portrayed as “change agents” (Bailey, 2005; Buehler & Boateng, 2005; Phillips et al., 2005), exploiting the preexisting relationships they have developed with faculty through their work as subject bibliographers, reference librarians, and “library liaisons” (Gibbons, 2004; Foster & Gibbons, 2005; Jenkins et al., 2005). In academic libraries, liaison librarians have traditionally served as intermediaries between faculty and the library, with responsibilities traditionally ranging across collection development, user instruction, reference, and current awareness (Reitz, 2007). Unfortunately, the base of literature is not yet “providing libraries with the resources to prepare to provide services that address the new dimension” of work with faculty and their intellectual property (Allard et

al., 2005, pp. 332–333). As suggested by Gibbons (2004), more customized instruction and assistance for faculty on contributing to and using IRs may prove important for extending the legitimacy, credibility, and trust that the library has traditionally enjoyed in their relationship with faculty.

While open access principles are frequently at the heart of the professional library discourse on IRs, faculty are not uniformly accepting of open access ideals (Park & Qin, 2007). They are also not always easily convinced of the personal benefits of contributing to an IR (Crow, 2002; Bell et al., 2005). To make progress on populating their repositories, some libraries have focused on cultivating library liaison programs with faculty (Bell et al., 2005; Jenkins et al., 2005; Phillips et al., 2005), while others have decided to take on the responsibility of submitting content on behalf of their faculty (Jenkins et al., 2005; Devakos, 2006). With limited incentives in place to encourage faculty to contribute their scholarly output, deposit mandates from funding agencies, universities, or departments are considered by some to be an attractive strategy for fostering growth of IRs (Harnad et al., 2004; Pinfield, 2004; Harnad, 2005; Sale, 2007). Given the recent faculty-approved deposit mandates at Harvard University, and the reaction among open access and IR advocates (Guterman, 2008), such requirements may be gaining some traction in the academy.

One recent report ties the success of repository building to meeting the needs of various stakeholder groups (Jones, 2007, pp. 13–23), which consist of the users, providers, and mediators of scholarly information. In the cases examined in this study, faculty stakeholders were the primary focus of attention for IR developers, but the interests of the university, academic publishers, and, of course, librarians were also influential in the overall process of IR development. The literature asserts that libraries are actively moving beyond a custodial role with scholarly publications to the management of various kinds of digital content and fuller participation in the evolution of the scholarly communication process (Horwood et al., 2004, p. 170). This is true of the libraries studied in this project, but there were important differences in how the three IRs were conceived and how they are making progress. All IRs host digital content and provide services that facilitate the deposit and use of that content, but a library's approach to goal-setting and policymaking impacts its perspective and potential (Lynch & Lippincott, 2005). Although receiving little attention in the literature to date, this study clearly shows the inherent tension in fulfilling both content and service-oriented goals and how the identity and trajectory of an IR is intertwined with its investment in these two core library operations. The study also illustrates an interesting shift in the nature of librarian liaison roles. Librarians in these intermediary positions are accustomed to working to represent the interests of faculty and departments to inform library decisions about content and services. At this point in the evolution of IRs, however, they are also involved in communicating IR

development interests with faculty to influence their scholarly communication practices.

METHODS

The objective of the study was to identify strategies and conditions that are advancing and influencing IR development. Three progressing IR initiatives were studied using the comparative case study method, a technique well-suited to capturing deep data on IR activities within a local context. The sites were purposefully selected to represent varying approaches to IR development undertaken at research libraries with similar missions and users. Thus the analysis emphasizes the different priorities, strategies, and activities carried out by those involved in the IR initiatives, not specific institutional factors. The aim was to learn about successes and challenges from the perspective of experienced repository developers and other librarians associated with IR efforts, balanced with the views of faculty who had some understanding of the local repository efforts. The three institutions were at different stages of development, but all had made substantive commitments to their IR initiative as evidenced by dedicated IR staff and a relatively high level of ongoing IR-related activities. The three cases were not intended to be representative of repository initiatives in general. Instead, the study was designed to be illustrative and to capture a range of development approaches and experiences that could help inform other institutions as they make decisions about their own IR activities.

To capture evolving IR strategies and develop well-rounded cases during the course of the one-year pilot project, the research team visited each site multiple times over a nine-month data collection period. The cases were developed primarily through semi-structured interviews, with other contextual data derived from examination of repository collections and online documentation, as well as supporting materials provided by interview respondents. Interviews were conducted between March and December 2007 with most respondents representing one of three primary roles: lead IR developer, liaison librarian, or faculty. Table 1 outlines the respondents and number of interviews conducted at each of the three sites. Lead developers and other key respondents were interviewed twice to monitor progress and to build depth in the cases, and because of scheduling constraints, a single session was sometimes used to interview two participants. IR developers and liaison librarians made up the largest number of respondents, with a smaller number of faculty, administrators, and other campus representatives included at each of the three institutions.

As the project progressed, a few respondents were added to the pool to build specific cases and expand the context for analysis. Specifically, lead repository developers at two peer institutions were included to provide additional institutional points of comparison. In addition, a graduate student depositor from Institution A and a data archivist from Institution B

Table 1. Interviews Conducted at Each Site

| Role of Respondents | No. of Respondents | No. of Interviews |
|-------------------------|--------------------|-------------------|
| Institution A | | |
| Developer | 3 | 6 |
| Liaison | 2 | 2 |
| Faculty | 3 | 3 |
| Administrator | 3 | 3 |
| Recent Graduate | 1 | 1 |
| Total | 12 | 15 |
| Institution B | | |
| Developer | 2 | 3 |
| Liaison | 5 | 5 |
| Faculty | 3 | 3 |
| Administrator | 2 | 2 |
| Data Archivist | 1 | 1 |
| Total | 13 | 14 |
| Institution C | | |
| Developer | 4 | 6 |
| Liaison | 5 | 5 |
| Faculty | 5 | 5 |
| Total | 14 | 16 |
| Supplemental Interviews | | |
| Developer | 2 | 2 |
| Total | 41 | 47 |

were brought into their respective cases to represent important dimensions of IR development that emerged during the course of the study.

The difference between a developer and a liaison librarian was not always distinct, since developers can also serve as liaisons to departments, faculty, and other repository contributors. For this study, IR developers were defined as librarians with a substantial percent of their time committed to IR development and related matters as indicated in an official position description. The liaison librarian group included selectors and subject reference librarians whose main responsibility is to coordinate with university departments and support faculty research pursuits, and who may also have some lesser yet formalized role in repository development. The research team relied on the lead developer at each institution to help identify the pool of potential liaison librarians and other IR related positions, which resulted in full participation from all key IR personnel. For faculty respondents, the research team began with a group referred by the IR developers at each site and then supplemented the pool with additional faculty who had contributed IR content. Although all respondents were aware of or participating in their local IR, it is important to note that there was considerable variation in the level of general understanding of IR activities and concepts.

When possible, the research team conducted in-person interviews, but five sessions were held over the telephone to accommodate respondents' schedules and preferences. Separate interview guides were created for the

developer, liaison, and faculty/administrator groups of respondents. The 45 to 60 minute interviews were fully transcribed. In this report, every effort has been made to keep the participants' identities anonymous. All verbatim excerpts from the interview transcripts are referenced with a participant code and the date of the interview. In addition, expressions used by respondents and retained as descriptive concepts in the narrative are presented in quotes.

Iterative coding was conducted using ATLAS.ti qualitative analysis software. Analysis began with an initial conceptual framework developed from the literature on IR development and trends in scholarly communication. This framework was useful in preliminary interpretation of the interview data, yet flexible enough to allow inclusion of new, emergent themes to augment understanding and to help shape the course of investigation. To ensure intercoder reliability, the authors met regularly to interpret the transcripts in a constant comparative approach and to merge, weed, and build consensus on the definition of codes to be applied by the two research team members performing the coding. To assure consistency in application of codes throughout the project, the team used free-text memos to document coding decisions and rationale.

The results presented below are structured in three sections. The first section identifies three approaches to IR development derived from case-based analysis of the three initiatives. The two sections that follow cover prominent themes that emerged from cross-case analysis in two focal areas: the balance of content and service in IR development and the changing roles of academic librarians at these institutions in support of their IR initiatives.

PROFILES OF IR DEVELOPMENT APPROACHES

Aligned with the comparative case study method used, the profiles presented here emphasize distinct aspects of IR development at each institution. Each profile represents a composite view drawn from the full set of data for the given case. Table 2 introduces basic descriptive characteristics of each IR, followed by a fuller narrative that distinguishes key development strategies. As indicated in the methods section, the aim throughout is not to elaborate on specific institutional factors but to present accounts of IR development from the perspectives of IR developers, while providing context for interpretation and understanding of the rationales for given priorities and choices. Our intent is not to provide full case studies laden with local history and nuance but to document a range of development options that can be weighed by readers for applicability to other situations.

Approach A

Guided by a strong service orientation, the repository activities of Approach A are part of a larger, recent campaign to involve librarians in fac-

Table 2. Basic Repository Characteristics

| | Approach A | Approach B | Approach C |
|---|--|--|--|
| Primary goal | build collaborative relationships between librarians and researchers | provide persistent access to digital scholarship and develop related services output | provide access to the university's research output |
| Repository software type | commercial | open source | open source |
| Length of pilot development phase | none | 15 months | 18 months |
| Funding sources | library/grants | library/provost/campus IT | library/provost |
| Current number of repository documents* | 7,847 | 3,207 | 41,897 |
| Primary personnel | document repository coordinator; data research librarians | primary developer; research programmer | primary developer; research programmer |
| Auxiliary personnel | faculty liaisons | a faculty liaison | intellectual property specialists |
| Initial content scope | data & information related to faculty and research center projects | research output from selected early adopter departments | peer-reviewed literature from all university units |
| Initial service activities | collaborations with faculty to solve information management problems | open-source software development and value-added applications | enhanced intellectual property support |

*As of February 22, 2008, from the Registry of Open Access Repositories

ulty research projects and increase the profile of library services on campus. To this end, research librarians interact directly with departments and faculty, offering skills, resources, and repository services to assist in solving researchers' information management and data curation problems. The approach acknowledges the heterogeneous and distributed nature of contemporary research and aims to respond to researchers' needs with innovative collaborations and customized solutions. One developer summed up their perspective as such: "Let's talk with people to find out how this will help them solve problems. . . . [R]ather than taking what probably would have been more of a top-down approach, we're sort of bottom-up" (Developer 05, March 12). Another explained:

I think right now we're slowly building off of smaller projects that are getting us in that direction, as opposed to being able to pinpoint and say: "There it is. There's that spot. Here's how we're moving towards it. I think it's starting to, through this formative process, show itself."

. . . It's because we've never really worked with the researchers on campus other than in that more service-oriented way. (Developer 04, November 7)

With service provision as a priority, formal policy has assumed secondary importance after user needs: "I guess one of the artifacts of this kind of development-in-production is that we're kind of backtracking now to formalize processes and policies" (Developer 05, March 12). Content acquisition has been uneven but diverse in material types, which include data sets, grey literature, and archival collections, which is managed in a "distributed" repository structure with separate software packages (and access points) for digital data, literature, and special collections. The retroactive approach to policymaking also resulted, in part, from a push to launch the repository quickly once an early technical advisory group identified suitable software. Following implementation, technical queries have been directed to the library's in-house applications administrator and the software vendor, allowing the technology lead to redirect attention to specific data-related repository projects.

In working on data activities, the IR developers have been involved with information further "upstream" in the real-time research process and therefore have been less burdened by the IP constraints associated with scholarly papers. With their research initiatives and collaborations falling into place, developers have turned attention to bolstering the document repository in response to a growing service need in that area. Responsibility for document acquisition now rests with a faculty librarian under a newly appointed associate dean in an effort to streamline repository workflow and keep research librarians focused on data curation activities.

To encourage broader support and generate awareness both inside and outside of the library, the repository was uniquely branded and then promoted internally and externally. Repository developers held meetings within the library and alerted the campus through press releases. Library administrators performed further outreach through presentations to department heads, while developers entered into extensive discussions with multidisciplinary research centers to investigate how to use the repository to solve information problems encountered in those units. More broadly on campus, developers have functioned as "embedded librarians" to identify how campus researchers can benefit from the library's initiatives.

This is like going to call outs and seminars [to] really find out what the research thing is and listening with your ear for things that relate to data problems, curation problems, archiving problems, and then seeing if there are ways to follow up. (Developer 04, November 7)

Anticipating a broader rollout of repository services across campus, developers are installing tools to support use of the document repository. A Search/Retrieval via URL (SRU) (Library of Congress, 2007) interface,

which uses custom hyperlinks to query the repository, has been implemented to facilitate transparent limited searches of repository content. For example, some faculty can use the repository to add a link to their departmental Web page that returns a list of accessible “dissertations advised.” Still, not all people and departments that have expressed interest in repository services are convinced of its value. Therefore, developers continue to focus on the “fruits of consultation” that result from their collaborative approach.

Approach B

Development Approach B has been aimed at achieving near-term goals for building content and services in close consultation with academic departments and faculty. Developers, in collaboration with a small set of liaison librarians, interact with department administrators and individual faculty on a case-by-case basis to assess needs and recruit content. The organization of the university library is complex, with strong departmental branches that do not lend themselves to uniform library operations. These conditions have contributed to steady and methodical IR development informed by best practices in the repository community and at peer institutions. To enable technical flexibility, the development team includes a full-time repository software specialist who leads repository design customizations and functionality enhancements that complement the team’s work monitoring the needs and interests of faculty.

Advisory groups, composed of members from the library, university administration, and the campus IT unit, have played an important role in the development goals and priorities, and policy refinement is ongoing. Based on several years of coordination work, policies in the areas of content acquisition and retention, preservation, and access have been developed, and the criteria and parameters for inclusion of content have been specified and made available to the public. The development team has taken steps to acquire the various kinds of content supported by policy guidelines and infrastructure.

We’ve put a lot of effort into scrambling to get back files. We’re analyzing people’s CVs and trying to contact them. . . . And one of the things that we’ve also tried to do is to focus on the grey literature that’s being published by departments: . . . occasional papers, technical reports, and working papers, and other sorts of reports. (Developer 02, April 5)

Commitment to the preservation role of IRs is represented in part by ongoing work on trustworthy repository audit certification (TRAC) (<http://bibpurl.oclc.org/web/16712>), which demands considerable time and expertise to assure adherence to adequate technical architecture, processes, and capabilities, and takes account of an extensive list of necessary organizational factors. Once conferred, however, TRAC asserts the IR has the protections and procedures in place to preserve digital content and adhere to acceptable standards and best practices in the field.

Many of the librarians in departmental liaison roles have been informed about the IR activities, and the development team, in collaboration with other library units, is planning to broaden internal library communication about repository and scholarly communication issues. External promotion of the repository has been limited to small-scale announcements on librarian and faculty e-mail lists and more direct contact with departments and individuals identified by liaisons as potential early depositors. Developers have worked closely with these selected groups, nurturing new collections in preparation for an impending general marketing campaign. Further promotion hinges on forthcoming IR software upgrades that will include cosmetic changes to the interface. In the meantime, the developers continue to foster their relationships with liaison librarians and advance value-added development activities.

To encourage contribution of content by faculty, developers have concentrated on removing obstacles to deposit and adding value for users. For example, based on usability testing of the repository's Web interface, software modifications were implemented to move the copyright clearance stage from the end of the submission process to the beginning. Moreover, developers have observed that in some cases "the open access piece doesn't fly with faculty" (Developer 02, April 5). More proactive, value-added measures are needed to encourage them to deposit. One effort of note is a collaborative arrangement with an IR at another university to build a citation analysis tool that uses the SHERPA/RoMEO copyright clearinghouse (<http://www.sherpa.ac.uk/romeo/>) to streamline identification of eligible content and rights clearance. The intent is to eventually support publication analysis, visualization tools, and social networking, with the tool potentially serving as a high-functioning "front end" in the future.

Approach C

This approach evolved within an academic library with a history of involvement in innovative digital publishing and scholarly communication projects. Following this line of activity, IR development has focused largely on content recruitment, with an emphasis on managing IP issues and interactions with publishers. Branding of the repository and furthering awareness of the IR across campus have also been priorities. Strong campus level commitment to the IR initiative resulted in funding for IP specialist positions designed to manage copyright problems and encourage deposit through outreach to faculty. The IP specialists, one with a law degree and IP interests, help field many of the copyright inquiries previously routed through the university general counsel office.

Content acquisition was a primary aim of the pilot development phase. The university brokered arrangements directly with publishers to acquire copyrighted, peer-reviewed journal papers written by their faculty. A flexible collection policy and interactions with individual faculty members and

campus units afforded opportunities to collect a range of other materials, including preprints, postprints, grey literature, and nontextual materials. When possible, developers have coordinated with departments for bulk ingests. Additionally, the provost actively encouraged faculty to send their curricula vitae to IR developers for them to determine which materials were eligible for deposit. This experimental strategy proved unsustainable, as one developer clearly stated: "Doing it person by person is just not cost effective. It's just hopeless" (Developer 09, March 19). But, the experience was informative and spurred plans to negotiate further with publishers for agreements to allow authors to deposit their work freely into the repository, superseding copyright transfer agreements signed by authors. To assist publishers in assessing the potential impact of IR access on the use of their formally published products, repository usage statistics have been shared with some publishers for the IR content they provided. The next stage may be to take up negotiation of authors' deposit rights when renewing serial subscription packages, with the university acting as an agent on behalf of its authors' IP rights.

Developers also conducted focus groups with both faculty and doctoral students to examine awareness of copyright and IP issues on campus. The results prompted the IP specialists to conduct campus seminars and to create a website for copyright resources. It has become routine for the repository developer to speak on request to campus units about the IR initiative, and a major promotional campaign featuring brochures and postcards also helped build awareness among campus faculty. The postcard mailing introduced a distinct logo and repository brand name and advertised the copyright resources made available by the IP specialists. Multiple waves of promotion were successful in reaching faculty and staff beyond the direct contacts made by liaison outreach and other awareness efforts.

Recognizing the important role of subject librarians, developers conducted interviews with approximately ninety library liaisons, prior to developing the initial repository prototype, to identify possible repository content, the range of formats needing support, and preservation requirements. This process captured librarian interest early on and fostered crucial relationships between the development team and liaisons. Since then, liaisons have served on taskforces, helped with policy development, and have become especially influential in identifying potential early depositors among the faculty across the local and branch campuses.

CONCLUSIONS ON IR DEVELOPMENT APPROACHES

In closing this section profiling the three IR development approaches, it is important to stress that each institution tackled IR development with a unique set of activities and that these activities worked together in complementary and often contingent ways to achieve local aims and respond to institutional priorities. The primary strategies associated with Approach A

were a bottom-up collection method based on collaboration and problem solving with faculty and a distributed architecture for storage and access to different kinds of materials. The strategies undertaken by Approach B included stakeholder-driven policymaking, targeted relationships with liaisons and departments for content recruitment, and cross-institutional collaboration on value-added technical components. The strategies differentiating Approach C related to their investment in addressing IP problems, which included direct interactions with publishers combined with IP specialists to work with faculty, and extended liaison and marketing campaigns. These approaches do not represent all, or necessarily the most promising, designs for IR development, but they are illustrative of a range of strategies being applied successfully and of how synergies among activities contribute to a development effort. In the sections that follow, we move from case-based analysis to cross-case analysis, reporting on two key, cross-cutting themes: the tension between content and service development and the changing role of librarians.

BALANCING CONTENT ACQUISITION AND SERVICE PROVISION

Libraries of all kinds are continually balancing collection and service demands, and academic libraries in particular have experienced a greater challenge in recent decades in allocating resources to both of these necessary library operations. Approach A is distinguished by a strong service emphasis that takes a proactive approach in working with researchers to solve their information management and data curation problems. Approach B represents a balance of policy-driven content development with selective service initiatives that have implications beyond the local campus. In Approach C, developers concentrated on building a strong base of content by directly confronting IP challenges. Within this larger theme of balancing content and service demands, three dimensions of IR development were prominent in the interview data—goals and policy, intellectual property, and value. We discuss each dimension below from the perspective of developers, liaisons, and faculty. While a limited number of faculty members were included in the case studies, they all had some level of awareness of IR related matters, and they often spoke of their experiences and perceptions as a reflection of their discipline or research area more generally.

Goals and Policies

The approaches vary in how goals have been prioritized, and policy activities relate to these differences. Goals have been informed, to some degree, by the state-of-knowledge in the IR development community. For Approaches B and C, the literature helped shape repository development proposals. For Approach A, the current discourse in the field influenced their service approach, as noted by one developer: “Our view of repository-

ries I really think reflects what Clifford Lynch and others have said—not a piece of software and a system, but a set of services” (Developer 05, March 12). Local institutional priorities, circumstances, and library cultures, however, have had a greater impact on goals and policies. For example, institutional interests are evident in how Approach A promotes collaboration with researchers, in the efforts of Approach B to make advances consistent with the aims of departmental libraries, and in Approach C’s extension of the library’s previous research on and development of digital content in collaboration with publishers.

Approach A’s proactive work with researchers led to a focus on designing infrastructure for data sets in parallel with more generalized repository services. In line with the institutions’ greater scholarly communication goals, Approaches B and C have concentrated on designing a single repository system that can support a wide array of digital objects. These different priorities emphasize activities at different stages of the research lifecycle, with Approach A concentrating on the process of conducting research, Approach C working to enhance research dissemination, and Approach B primarily supporting dissemination with attention to the preservation role of IRs.

The emphasis on data and research needs in Approach A resulted in fewer policy decisions than Approaches B and C. However, policy taskforces have been assembled with the recent shift of attention to strengthening their document repository. Both Approaches B and C incorporate policies covering areas from deposit mechanics to copyright concerns. In Approach B, policies were implemented early on to be responsive to stakeholders and define working relationships. As articulated in its official mission statement, the repository assumes responsibilities related to both content and service and has policies on each. As the repository has transitioned from the planning to the pilot stage, the policies have evolved further to reflect lessons learned from early depositors.

The more general collection policies developed in Approach C are consistent with their emphasis on providing access to faculty content. The repository has been promoted as a way for researchers to supply their own “director’s cut” of their work and to provide “context” for their materials. This might mean providing access to supplementary data or charts not included in the published journal article, or to slides for a conference presentation to ease access while a faculty member is on the road. In this respect, the repository collection policy is not prescriptive, opting instead “to have decisions on what it should contain and offer be made mainly by [the individual] and the other members of the [university] community at large.” The collection policy allows developers to cast a wide net in their search for content as they recruit potential depositors. It also allows developers to adapt to changing faculty needs and institutional priorities over time.

While each approach has enjoyed advocacy from key campus administrators, there have been no deposit mandates imposed. Repository developers have informed perspectives on the utility and feasibility of mandates, influenced by the culture of their institution and the academic departments they work with, as well as the numerous arguments—both for and against mandates—voiced by the larger IR development community. One developer explained, “We’re not an innovator in terms of doing things like that. I think if we see other peer institutions beginning to do that, we might follow” (Developer 02, April 05). This developer believed that mandates could do more harm than good and that depositor buy-in is more important than the guarantee of content in establishing the repository on campus.

[W]e are trying to make some connections outside of just the deposit of faculty publications; so it’s a larger set of services. And I think that’s going to be key, because I think that the mandate piece—unless faculty really see the value of that and want to do that—it’s not going to make the IR popular. (Developer 02, April 5)

Some faculty, particularly those who are eager to see the potential of repositories realized, are not concerned with the prospect of deposit mandates. Others are more measured. As one faculty member in the sciences stated, “[I]f they make it mandatory, then I guess I will have to do it. It’s one of those things that’s an extra piece of effort, and if you are not required to do it, then typically you are not going to do it” (Faculty 24, May 22). Another science faculty member suggested that mandates are meaningless: “There are lots of things that are mandated and don’t happen on campus” (Faculty 01, April 4).

Intellectual Property

Intellectual property concerns were pervasive for developers and liaisons across cases. Even in Approach A, where IP problems have been less pronounced because of the emphasis on data activities, one developer exclaimed, “Copyright just affects every single thing. It has affected every job I’ve been on, and it has not been getting simpler or easier or cheaper” (Developer 06, March 12). Approaches A and B have tended to engage in copyright problems as a matter of course. Content strategies employed by Approach C, in particular, have required concerted efforts to tackle IP obstacles, with IP responsibilities effectively distributed across personnel. The IP specialist positions have concentrated on educational efforts—the provision of training and online resources—that assist in the short term, allowing the developer to work on negotiations with publishers and other systemic solutions to opening up avenues of deposit. Without a direct arrangement with publishers, developers of Approach B turned their efforts to services that can diminish copyright obstacles, by modifying the placement of copyright information in the deposit sequence to improve

the submission flow and by providing software that assists with identifying material eligible for deposit.

IP issues were high on the list of concerns of liaison librarians who often serve as the primary intermediary between faculty and the IR. Some liaisons felt they did not have enough knowledge of the legal aspects of copyright or were generally uncomfortable responding to IP inquiries. As one liaison stated, “[T]he only thing that I’m concerned about is things like copyright, and I don’t feel like I personally want to be making those decisions” (Liaison 14, April 5). Approach B has responded to the problem with future plans to secure services of a copyright lawyer for the institution. More generally, development teams realized the importance of aligning the repository with other scholarly communication activities in the library, to raise the profile of IP and related issues more widely on their campuses. In all three cases, the lack of understanding of IP options and implications among faculty was a serious barrier to progress. While Approach C had made considerable investment in assessing the situation and providing resources to faculty with the help of campus resources, the other approaches have been less systematic, relying primarily on interactions with faculty in the process of recruiting material for deposit.

Faculty who had strong publishing records and editorial experience tended to be highly cognizant of IP issues, but that knowledge did not necessarily keep them from following traditional dissemination practices and freely giving up full copyright to their publishers. At the same time, some faculty members were not deterred by copyright restrictions. One social scientist noted, “If I break a law just posting a paper that I wrote, . . . I don’t feel I am doing anything wrong, so I feel very comfortable with that” (Faculty 40, October 26). The utility and the associated benefits of self-archiving can override concerns about legality. An engineering faculty member explained that it was common practice for junior faculty to post their papers electronically, regardless of copyright restrictions, to increase their visibility leading up to and during the tenure process. The IR was one of several good options for making those papers accessible (Faculty 39, October 25). These practices raise the question of how closely developers need to monitor repository content for adherence to existing copyright agreements.

Value

While developers were confident of the value IRs can offer their institutions, the principles and potentials that drive development are not easily communicated to those outside the core initiative. Developers have found that fostering faculty self-archiving takes more than a trumpeting of the benefits of open access. Likewise, value is not always evident to library personnel and administration. One developer framed the issue succinctly: “Institutional repositories are in trouble because not only are they not

proving their value to faculty, they're not proving their value to the libraries that are sponsoring them" (Developer 36, October 16).

Some value is relatively explicit, as when previously inaccessible grey literature becomes freely available on the Web. Such is the view from the content-focused perspective: value is generated for the library, faculty member, and the university alike through open access dissemination of an ever-larger corpus of scholarship. Other types of value are less visible, such as that inherent in IRs as part of an alternative to the business model dictated by commercial publishing. Above all else, the value of faculty time and convenience was acknowledged by all IR developers, but each approach has responded with differing strategies. Value for Approach A is linked to the commitment to foster collaboration and support information management needs through extended library service. Approach B strives to be responsive to how value propositions differ across departments and disciplines while providing basic value-added services for depositors. Approach C's multidimensional investment in resolving IP problems underscores the high value of faculty scholarship to the university.

However value is defined, some faculty suggested that it had yet to be demonstrated. Many acknowledged the value of open access repositories to other people and institutions without the means to access costly scholarly publications. But others were concerned that the integrity of their work could be compromised or "scooped" if it became openly accessible too early in the scholarly process. One humanities researcher confided, "I'm more careful now because I've had ideas . . . I've had stuff taken" (Faculty 35, September 18). Another social science faculty member stated, "I want to make sure that our research team is able to use the material first" (Faculty 32, June 11), indicating the importance of staged, strategic timing in releasing materials. Developers and library liaisons reported difficulties securing participation because copyright agreements often prohibit depositing the final published version of a paper. One liaison recounted a conversation with a senior science faculty member: "Basically what he said was, 'Why put things there? They're not the version of record?' . . . And to me that almost tolled the death knell for it" (Liaison 23, May 29). Not surprisingly, many of the faculty members questioned the authoritativeness of repository content that has not been through a peer review or vetting process. There was also concern that presence of material in an IR might imply institutional endorsement of the scholarship.

Individual work practices and the disciplinary culture of scholarly dissemination appear to be outweighing the institutional value of IRs at this point. Scholars may agree with many of the ideals that repositories embody, but what often brings them to the door of the repository are their individualized needs when their standard methods fail. Faculty found great value, for example, in the ability to make nontraditional scholarly works available, to provide access to conference presentation slides or supple-

mentary materials excised from a publication, and to use the repository as a content management system. They also recognized the potential of the repository submission process for streamlining annual reporting, identifying potential collaborators across disciplines, and serving as the technical infrastructure for research projects.

CHANGING LIBRARIAN ROLES

Professional academic librarians are taking on numerous roles in support of IR development at their institutions. IR planning, management, and technical development are, in most respects, new responsibilities that have required some newly defined positions. In the cases examined in this study, these positions included: repository coordinator, research programmer, intellectual property specialist, documents repository coordinator, and data research librarian. Liaison librarians, on the other hand, are established positions in many academic libraries that are now taking on added responsibilities as intermediaries between faculty and IR development activities. The nature of liaison relationships, marketing activities, and technical proficiency were central to the new roles discussed by respondents.

Liaison Relationships

Liaisons have been essential to the progress made in all approaches in this study. The level of engagement of liaisons varied, in part, based on the coordination methods used by an IR team but also due to liaisons' own views on IR outreach as a core part of their duties. Many considered the work of representing repository initiatives and working with faculty to recruit content to be consistent with their long-standing faculty support roles. In fact, some liaisons have actively volunteered to be part of their library's IR initiative, motivated by their personal beliefs in open access principles. On the whole, liaisons expressed enthusiasm about being involved and recognized that it would take some time before the purpose and benefits of IRs could be fully clarified. Still, IR liaison duties can seem like a significant shift in professional orientation.

Their traditional role of matching collections and services to research needs has been stretched to include more intermediation "between the needs and wants of the people who are depositing and the possibilities of what the software and what the technical support can do behind the scenes" (Liaison 07, March 30). In Approach A, for example, the repository serves as a stimulus for exploring the faculty-liaison relationship and an opportunity to expand librarians' roles.

[We are] seeing unprecedented numbers of librarians as co-PIs on research proposals, where scientists recognize the value of these skills of classification, description, preservation, access, and use of the research outputs and the support of the research process. (Developer 05, March 12)

Moreover, librarians who assume roles as collaborators are much closer to the front lines of research and thus better positioned to demonstrate the value of a repository at different stages of the research process, as well as provide more direct support for workflow issues that may be involved in the deposit of data or documents.

Approach C involved liaisons early on, relying on them not only to identify potential depositors but also to identify faculty needs and disseminate information about the repository. This approach preserved the traditional mode of interaction with faculty and resulted in faculty receiving information about the IR tailored to their fields of research. Approach B is still transitioning out of the pilot stage and has thus far relied on a small segment of selected liaisons to help recruit target departments. Broader liaison involvement will follow in tandem with more outreach activities to build awareness of pertinent scholarly communication issues and the value that an IR can bring to faculty.

Marketing

In the absence of deposit mandates or other strong external motivators, librarians are trying to find ways to encourage faculty to contribute their scholarship. The role of promoter is familiar to librarians with a public service orientation. As one liaison stated, “librarian as marketer has always been a part of the duties. . . . To reach out to [users] and make them aware of the services you provide is sort of fundamentally a job requirement” (Liaison 08, March 12). Part of this new outreach, however, aims to publicize not just the IR services but the new, emergent roles of the library within the university:

[I] guess that’s what library marketing is all about, because we are changing and we have to let them know how we’re changing. [The] institutional repository is definitely one of the new identities for academic libraries, but people don’t know it. (Liaison 26, June 13)

Other librarians were less comfortable with the kind of hard sell that may be required to gain attention for the IR. “I feel a little bit more like a salesperson. . . . We’ve been really marketing the library somewhat effectively, but I feel like I go, ‘Hey, have I got a deal for you’” (Liaison 15, April 12). Moreover, a few librarians were particularly mindful that IR services are inherently different from other library offerings—they require action, input, and risk on the part of the user. “It’s all on the shoulders of the individual faculty member. . . . It’s no risk to us, and it’s all risk to them” (Developer 00, March 01). For some liaisons, making the case for the IR is not easy or straightforward. They have built professional, trust-based relationships with their faculty and are reluctant to promote an activity for which the need is ambiguous and benefits unproven.

Some of my closest colleagues, biggest supporters, and people I’m the biggest supporter of have said to me in very polite ways, “We’re just left

perplexed. We just don't understand what problem you're trying to solve." . . . So having an answer to that . . . I still don't have one actually. (Developer 00, March 01)

Thus, while most librarians can make the case for the IR in terms of its value to the institution, some have less confidence pushing its worth to the faculty they support, making it difficult to tune the message and highlight aspects of IR development their constituencies will find attractive. Both developers and liaisons work to present the institutional goals of repository development in balance with the scholarly communication practices and needs of scholarly communities. On one end of the disciplinary range, fields like biomedicine are already getting directives from funding agencies, as with the recent NIH policy (<http://publicaccess.nih.gov/>) requiring scientists to utilize PubMed Central for dissemination of publicly funded research. For other fields, especially in the humanities, there may be little or no motivation for researchers to make their scholarship available in an IR.

[S]ome of the most ardent, active digital library scholars we have have said to me, "I would never, ever advise a student in my discipline to put their dissertation in an open access repository. It would kill their career." And so, you know, that's an informed response—a very informed response about both the service and the scholarly communication environment in that discipline. (Developer 00, March 01)

Many of the developers commented on the difficulties of promoting the IR in relation to the domain-specific needs and expertise of faculty, reinforcing the importance of liaisons who understand preferred work habits and how to communicate and share information with their constituencies. In one case, a fine arts liaison stated, "artists are a little bit different than researchers" because, for example, they require different format support and already have different avenues for disseminating their works (Liaison 38, October 26). Even within a given department, there are often fundamentally different ways of conducting research and disseminating the results, as a physics faculty member described: "Everybody here is sort of like a freelance entrepreneur that does everything differently than the person in the lab next door" (Faculty 21, May 16).

In some ways, IR marketing is very similar to engagement with faculty around other library activities. There is a continual need for careful and productive communication: "I don't want it to get to the point where they just press delete when they see an email coming from me" (Liaison 23, May 29). That communication must also be clear and meaningful. "There's an awful lot of librarian language that's used in talking about an institutional repository. . . . And being able to translate the librarian words, the librarian language, to people who are not in the library is important" (Developer 06, March 12).

[The] talking points of institutional repository will mean nothing to them. So don't go into librarian-speak about IR and other things. Try to bring it down to a level that they will understand. And I think that that's something that too was a big education point and still is for librarian liaisons—how to present this without getting into too much jargon. (Developer 30, June 11)

The library with the longest operating IR, Approach C, has done the broadest marketing to date, with campus announcements and two postcard campaigns heralding the repository and related services. It is worth noting that such PR campaigns appear to be having some impact. Two out of the five faculty members interviewed at that institution indicated that they first found out about the repository through the postcard campaign. Limited marketing has been undertaken in Approach A, primarily because its specialized data focus would not necessarily benefit from wider outreach efforts, and for Approach B, a process of determining next steps is underway, after using targeted e-mail lists as the primary, overt marketing approach with faculty.

Technical Proficiency

The IR initiatives have expanded the need for technical competencies within the library in areas such as Web development, database management, and computer programming. Across the cases these skills were covered by one or more technology support positions. Some operations are necessarily reactive, such as solving individual document ingest issues; some are more proactive, as with the development of a customized repository interface. Developers noted the need for ongoing technical support for current and future initiatives. In one case, a backup, part-time technology support librarian was added to the team to upgrade the repository to a production-level system, and similar demands are arising across cases. "There's a lot of software development that's taking place . . . as we identify those data sets and what services we want to be able to extend to them" (Developer 05, November 7). "I think we could use another full-time programmer, honestly, particularly if we're shifting from a repository approach to looking at sort of a wider set of services approach" (Developer 02, December 5).

IR team members' technical expertise was generally acquired after completion of their professional library education. "I'm working on re-designing the repository . . . that's CSS, HTML, and XSLT. All of that I learned on my own, and not in library school" (Developer 36, October 16). One librarian had spent several years working as an IT specialist in the library. Another repository programmer was not a professionally trained librarian, yet had an extensive career in working on scholarly publishing programming projects. In all cases, successful implementation within the library required some internal professional staff to handle technical functions. The experience of one repository manager exemplified the need for

these additional competencies, “Well, I wish that there were more time to learn about the technical aspects of [repository building]. I’m struggling with the whole technical thing” (Developer 06, March 12). One liaison expressed a more optimistic view, suggesting that the technical hurdles present an opportunity for personal growth.

I tend to be a little bit more of the traditional librarian, because I don’t know TEI, and I don’t know SHTML. I don’t know XML. But, it’s pushed me to try to understand that a little bit better. . . . But what I see happening is . . . and actually over at the library itself, is this beautiful combination of understanding the structure of information, and understanding the code that goes behind it, and how to make it usable to the people who want to access it. I think that we used to talk about blended, or the hybrid librarian—now that’s the librarian. Usually the librarian can’t be disassociated from technology because we realize more and more how important that is to us, to get our message out, to get the information out there to the people who use it. (Liaison 15, April 12)

CONCLUSIONS

The objective of this study was to identify strategies and conditions that are influencing and advancing IR development. As discussed above, the approaches taken at the three institutions were quite different in their content and service orientations, with an innovative service model driving one, an equally innovative content model at play at another, and the third functioning as a more mixed model, with a greater emphasis on policy and best practices. The individual strategies pursued by the development teams have stemmed from institutional strengths and different interpretations of the needs and interests of faculty and the larger university. As a whole, these strategies demonstrate a strong, implicit goal to extend the traditional position of the university library as the center of scholarly collections and provision of related services. The IR initiatives are enlarging the purview of library activities to include collections and services related to data sets and numerous other kinds of scholarly products, only some of which are variations of the traditional published journal paper or book. For instance, developers have been quick to capture collections not encumbered by copyright constraints, offering access to a growing local base of technical reports, grey literature, and theses and dissertations produced by departments and other research units.

None of the three IR approaches had clearly specified long-term goals or success targets for their initiative. Without specific benchmarks mapped out, developers have remained agile, able to respond to local conditions, and collection strategies have remained responsive to interactions with early depositors and recommendations from advisory boards. Such mutability is possible, even necessary, when success is yet to be defined. The cases are highly illustrative of the kinds of progress, but also the tradeoffs,

involved in active development without explicit guidelines and goals. For example, on the one hand, a well-articulated collection policy gives developers and liaison librarians a way to express a clear IR rationale to potential depositors and users. At the same time, it might also unnecessarily inhibit deposit activity. In another possible scenario, if content is systematically acquired directly from publishers without authors' involvement, some of the very important, and less obvious, solutions that the IR can provide for faculty might never be uncovered. Negotiating such tradeoffs and evaluating the outcomes will become increasingly necessary to justify the resources needed for continued advancement of IR capability.

Repository managers are well aware that the open access benefit of IRs, in and of itself, will not change faculty behavior. Scholarly practices and academic reward systems are deeply entrenched, and some fields still favor dissemination in predominately print, subscription-based publications. Development strategies are being molded to reflect this complicated scholarly communication landscape. Across the cases we see IRs ambitiously striving to do it all—offer alternatives to publisher-controlled access to scholarship, while also enhancing dissemination of grey literature, student-produced materials, and sets of raw data, then building tools and services to better exploit that content. Prioritizing value-added functions for faculty and other stakeholders seems imperative. Real impact has been demonstrated in the instances where IRs helped solve specific dissemination, visibility, or access problems experienced by faculty. Moreover, creative IP strategies that directly involve publishers can make substantive progress on these seemingly intractable problems that face all universities. In this area, in particular, however, institutions will need to work together to secure long-term solutions. It is not yet clear what the isolated successes suggest as strategic next steps for the IR community at large.

The diverging interests of stakeholders feed into the problem of “trying to do it all.” Faculty are focused on their independent careers and their fields of research, the university is concerned with keeping and controlling its scholarly assets, and publishers are invested in producing content and services that will continue to have a scholarly market. But arguably the library as an institution, and the IR developers in particular, have the most to gain or lose in the short-term with this risky and unprecedented enterprise. From the library perspective there are presently too many constituencies to consider, too many new duties to delegate, too much indefinite-term infrastructure to fund, and too little known about the consequences of failed sustainability. All of these unknowns make it extremely complicated to set firm goals or assess concrete outcomes at this time. The approaches presented here, however, provide a detailed view of the issues that will emerge in any comprehensive IR building program and how they can be addressed with different strategies and under various institutional

conditions. That understanding gives developers a baseline for weighing their options and assessing how best to prioritize activities.

Core challenges in the near future will be implementing systematic techniques for populating repositories, perhaps with mediated deposit workflows, and developing value-added service layers. The repositories in this study demonstrated readiness for these challenges in numerous ways. They are applying problem-solving approaches with their faculty, building collaborative technical solutions that can be shared with the IR community, and professionalizing IP specialists. These kinds of advances are critical if IRs are going to function as more than basic storage and access to ad hoc digital materials. For smooth integration of IRs into current academic library operations, librarian positions will need refinement to accommodate IR activities, liaison librarian roles will need to be updated, and adequate technical training will need to be offered by library education programs.

Opportunities for IR librarians to actively work on solving scholarly information problems are present at all universities and are a logical extension of the mission of research libraries. In the larger framework of scholarly communication, there is still much to learn about the viability of the university repository as a publishing entity and about the effect of open access on the scholarly communication paradigm. These dynamics will continue to play out in the academy and drive how IR trends unfold. At the same time, local repository viability hinges not only on the need for expanded and integrated library activities, as demonstrated in the cases of this study, but also on greater recognition of IRs as an integral part of university scholarship, ideally with fuller facilitation at the level of the faculty, while librarians, hopefully, continue to build and advocate to stay ahead of the ever-changing curve of scholarly communication.

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NOTES

1. Refer to Correia & Teixeira (2005) for an overview of the recent issues in scholarly communication.

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