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# Perceptions and Experiences of Staff in the Planning and Implementation of Institutional Repositories

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## ABSTRACT

The MIRACLE (Making Institutional Repositories a Collaborative Learning Environment) Project team investigated issues and trends related to institutional repository planning and implementation, such as the purposes and roles of an institutional repository (IR), system selection criteria, system features, policies, services, and sustainability. Data were collected through telephone interviews with thirty-six IR staff and individuals who played important roles in the development of IRs at their respective institutions. Interviewees came not only from academic institutions where an IR had been implemented but also from those planning, pilot-testing, or having no plans to launch an IR. Regardless of the phase of IR development, interviewees consistently expressed enthusiasm for deploying IRs to provide access to and to preserve digital materials. The findings indicate that IR staff view the IR as the infrastructure for their university's participation in the open access movement and are confident about IR's long-term sustainability. Because branding and the scope of IRs have evolved over the years, IRs are increasingly being perceived in terms of this overarching goal or purpose, rather than as a set of specific functions, features, or services. Based on these results, it is suggested that IRs need to design value-added service models that would allow IR staff to better serve their learning communities.

## INTRODUCTION

In the *Census of Institutional Repositories in the United States* (Markey, Rieh, St. Jean, Kim, & Yakel, 2007; Rieh, Markey, St. Jean, Yakel, & Kim, 2007), the authors found that institutional repositories (IRs) are increasingly de-

ployed in research universities in order to collect, organize, preserve, and facilitate access to digital content produced by members of their communities. The Census revealed that library directors and librarians are largely taking the lead in terms of planning, implementing, and maintaining IRs and these individuals rate the importance of a wide array of both anticipated and actual benefits of the IR quite highly. Furthermore, the majority of the survey respondents indicated that the establishment of the IR will have a positive effect on the ability of the institution to form strong relationships with other on-campus repositories and information systems (such as archives, library systems, and digital asset management systems).

In addition, the Census addressed a number of significant issues associated with IRs, such as the positions of the people involved, budgeting, technical systems, investigative activities conducted prior to establishing IRs, decisions about what digital document types to include in the IR, contributors, beneficiaries, evaluation methods, and policies that need to be considered or decided upon during the process of planning and implementation. However, our survey methodology had the inherent problems of not being able to probe deeply into the perceptions and experiences of various IR staff members or to allow respondents to express their thoughts about IRs in their own terms. Thus, we conducted follow-up telephone interviews in order to elicit more in-depth information behind IR planning and implementation from staff members directly involved in IRs.

This article reports on the results of these telephone interviews by focusing on the following research questions:

1. How do IR staff members describe the purposes of institutional repositories?
2. What infrastructure and system features are required to implement institutional repositories?
3. To what extent do IR staff members perceive the importance of policy development during the process of institutional repository implementation?
4. What are the potential value-added services that institutional repositories can offer to contributors and end-users?
5. What are the perceived challenges and barriers for sustainable institutional repositories?

## RELATED LITERATURE

This review covers literature relevant to the five research questions: (1) motivations and purposes, (2) system selection, (3) policies, (4) services offered to contributors and end-users, and (5) challenges and barriers to sustainability. The final section of this literature review discusses long-term issues identified through the Census (Markey, Rieh, St. Jean, Kim, & Yakel, 2007).

*Motivations and Purposes*

Several previous studies have attempted to identify potential motivations for IR establishment. An institution's decision to establish an IR may be motivated by desires to guarantee the long-term preservation of content produced by members of the institution, improve the accessibility and potential research impact of this content, offer a place where faculty and students can share and "showcase" their work, and provide a way for members of the institution to respond to the scholarly communication crisis (Chan, 2004; Gibbons, 2004).

An institution's motivation to establish an IR may also spring from a desire to maintain control over its own intellectual output, thereby potentially deriving economic benefits (Branin, 2005). Another possible motivation is the capacity of the IR to bring together the diverse intellectual output of an institution, enabling both researchers and campus leaders to more effectively and efficiently assess the total value of that output (Goodyear & Fyffe, 2006). However, all of the aforementioned motivations may hold little relevance for smaller institutions, as they may be more interested in the potential of IRs to support their more central concern of supporting teaching and learning activities (Rogers-Urbaneck, 2008).

From the literature, it is apparent that the motivations for establishing an IR vary among a continuum of beneficiaries—from contributors (e.g., ensuring preservation and putting their research in the hands of interested readers) to end-users (e.g., accessibility to research and teaching materials) to the institution as a whole (e.g., enhancing an institution's reputation). Each institution needs to define its own IR and design the services that will be offered based on its own community's needs (Gibbons, 2004; Walters, 2006). These can be identified by conducting a local needs assessment, which has been recommended as the very first step to be undertaken in the processes of defining the IR for the institution and deciding what services the IR will offer (Barton & Waters, 2004–2005). The diverse factors to consider in the course of conducting a needs assessment include content characteristics, user needs, and both the human and technological resources available (Rieger, 2007).

*Institutional Repository System*

The features and functionalities of IR systems vary a great deal. When deciding on an IR system, institutions take many diverse factors into consideration, such as how difficult it is to use the interface, what file formats the system can accept, and whether the system is compatible with the institution's existing technological infrastructure and staff expertise (Gibbons, 2004).

Over the past few years, several articles have described and compared the various open-source and commercial IR software systems that have

become available (Barton & Waters, 2004-2005; Gibbons, 2004; Prudlo, 2005). Piorun, Palmer, and Comes (2007) take this a step further and developed a score card to evaluate and compare three IR software products (DSpace, ProQuest Digital Commons, and Open Repository). In addition to many of the factors mentioned by Gibbons, this score card also incorporates factors related to specific services that they would like to offer (such as data feeds and alerting services) and to the software company itself (e.g., economic viability and customer references).

The importance of considering these diverse system selection factors in light of each institution's distinct academic community, research culture, and technological infrastructure is underscored in several case studies (Hey 2004; Hughes, 2004). For example, Hughes (2004) indicates that the infrastructure of the University of California's eScholarship program was specifically developed in order to meet the needs of the university, its faculty, and the scholarly community at large.

### *Policies*

The development and maintenance of an IR requires the creation and continual revisiting of a broad set of IR-related policies. Based on an analysis of the documentation of seven different IRs, Probets and Jenkins (2006) identified a wide array of IR policies, including policies relating to start-up and submission/deposit procedures, metadata standards, and preservation. These authors emphasize that policy formulation must take into account stakeholders' needs, concerns, and existing research practices.

In their case study about implementing DSpace at MIT, Baudoin and Branschofsky (2003) point out that the process of devising policies is one of the most complex parts of setting up an IR. Some of their policy-related decisions were made based on the needs and culture of the MIT community, while others were made based on MIT's and MIT Libraries' missions and commitments. At MIT, policies were iteratively developed incorporating feedback from both faculty members and the libraries' administrators and staff in order to ensure a close fit between the IR and MIT's culture. At times, the missions and/or needs of these three groups of people conflicted, making the process of drawing up policies quite difficult. Baudoin and Branschofsky (2003) emphasize that policies will need to be continually refined as new questions arise.

In fact, several authors warn against attempting to formulate and finalize policies too early in the IR implementation process (Gibbons, 2004; Probets & Jenkins, 2006; Markey, Rieh, St. Jean, Kim, & Yakel, 2007). Probets and Jenkins (2006) point out that "there appears to be a process of progression, as an IR moves through stages in its development. The documentation must reflect this and should develop alongside the IRs themselves" (p. 67).

*Services Offered to Contributors and End-Users*

Lynch (2003) defines an IR 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” (p. 2). To Lynch (2003), the IR is fundamentally about the services it offers rather than the content it houses or the technology upon which it rests. At the core of IR services are the twin goals of preserving the intellectual output of the institution and making it widely accessible to members of the general public.

Several other authors have built on Lynch’s (2003) definition, describing additional services that IRs can or should offer. For example, Gibbons (2004) suggests that potential contributors’ willingness to submit content to the IR can be augmented by offering them ancillary services, such as digitization, metadata enhancement, and proxy submission. However, it is important to select and tailor these services to the specific needs of the community (Barton & Waters, 2004–2005; Hey, 2004). In discussing the University of Southampton’s IR (“e-Prints Soton”), for example, Hey (2004) suggests the possibility of offering value-added services specifically designed to meet faculty needs as an additional incentive for contributing their materials to the IR.

Focusing more on end-users, Chavez, Crane, Sauer, Babeu, Packel, and Weaver (2007) assert that IRs should also offer services that enhance the usefulness of IR content. These authors distinguish between two unique layers of IR services: high-level (or infrastructure) services and low-level (or content-based) services. High-level services include ingesting, sharing, and harvesting repository content. Low-level services (such as annotation services, citation linking, and vocabulary lookup) facilitate people’s use of the various types of content housed in IRs. With few exceptions (e.g., Barton & Waters, 2004–2005; Chavez, Crane, Sauer, Babeu, Packel, & Weaver, 2007), it appears that the vast majority of the actual services that have been suggested and/or developed are for the benefit of IR contributors rather than end-users (Gadd, Oppenheim, & Proberts, 2003; Markey, Rieh, St. Jean, Kim, & Yakel, 2007; McKay, 2007).

*Challenges and Barriers to Sustainability*

One of the central concerns about the future of IRs is that institutions will establish IRs without realizing they are committing to long-term stewardship of digital content that is both challenging and expensive (Lynch, 2003). Lynch (2003) states, “Stewardship is easy and inexpensive to claim; it is expensive and difficult to honor” (p. 9). The short-term nature of the funding to support many institutional repositories and the difficulty of foreseeing all of the expenses that will be incurred have been recognized as potential threats to the long-term sustainability of IRs (Hockx-Yu, 2006).

Some specific methods for reducing costs have been mentioned in the literature. Lynch and Lippincott (2005), for instance, predict that we will see an increase in the number of “consortial repositories,” which enable multiple institutions to share an IR and its associated fixed costs; however, the long-term sustainability of an IR requires not only close attention to minimizing costs, but also the garnering of institutional commitment to the IR. The consortial approach runs the risk that no one institution develops the sense of ownership and commitment necessary to sustain the IR over time. Emphasizing the importance of gaining institutional support for the IR, Lynch (2003) states, “It’s vital that institutions recognize institutional repositories as a serious and long-lasting commitment to the campus community (and to the scholarly world, and the public at large) that should not be made lightly.” The central importance of garnering institutional commitment to the IR is echoed by Crow (2002), who points out the crucial importance of securing provosts and deans as proponents for the IR. Several researchers have emphasized that the ability to garner this institutional commitment relies fundamentally on securing a sustained faculty commitment to contribute content to the IR (Carr & Brody, 2007; Foster & Gibbons, 2005).

#### *Long-Term Issues*

The MIRACLE Project Census (Markey, Rieh, St. Jean, Kim, & Yakel, 2007) identified seven long-term issues associated with IRs that are closely tied with the questions addressed in the present study: perceived benefits, impact on the current scholarly publishing model, relationship to discipline-based repositories, mandatory contribution of scholarly articles and scientific data, use and users, metadata, and IR system configuration and design. In terms of perceived benefits, Census respondents gave very high ratings to fourteen of the sixteen reasons provided, but no one benefit clearly rose to the top as being the most salient. Several Census respondents noted in write-in comment forms that specific stories and evidence about the benefits of IRs would be extremely helpful for them in gaining institutional support. In the Census, the responses about the IR’s ability to derail the current scholarly publishing model were mixed. Although respondents were generally positive about this possibility, they also thought that faculty were less enthusiastic and do not wish to upset their long-established relationships with publishers.

Our Census also uncovered several other important issues that we probed in the interviews: Will IRs and discipline-based repositories co-exist or will one of them eventually take over and the other cease to exist? Can institutions implement policies regarding mandatory contribution of scholarly articles and/or scientific data to IRs? What makes content recruitment strategies or IR policies successful? How can IR systems better support metadata creation and maintenance adequately? Another impor-

tant area identified pertaining to IR use was related to the method of gathering evaluation data. Although nearly half of our respondents indicated that they employ user counts as one of the metrics to measure their IRs success, only 10 percent indicated that they have interviewed their users and only 4 percent indicated that they have conducted surveys of their users.

## METHODS

### *Sample*

Project investigators culled names and e-mail addresses of prospective telephone interview subjects from the Census, asking respondents who volunteered their name and e-mail address if they would be willing to complete a follow-up phone interview. Of the 176 Census respondents who volunteered, we created a purposive sample of 40 people. The factors we took into account were the stage of development of the IR (from no planning, only planning, planning and and pilot testing, or implementation), the size and Carnegie classifications of parent institutions (from small colleges to research universities), the extent of materials in the IR, and the position of respondents. We contacted 40 potential volunteers by e-mail and received responses from 22 people. In the second round, we contacted 36 more volunteers and heard from 14. Therefore, our final sample was composed of 36 volunteers.

The interviewees were from various positions including library staff (N=11), library directors (N=9), assistant-associate library directors (N=4), archivists or directors of archives (N=4), heads or directors in libraries (N=4), CIOs (N=3), and associate deans for research (N=1). Of the 36 interviewees, 17 were from research universities, 8 from master's colleges and universities, and 11 from baccalaureate colleges (Carnegie Foundation for the Advancement of Teaching, 2006). Interviewees were also geographically dispersed: six from New England, six from the Mid-Atlantic, ten from the Midwest, six from the South, three from the Southwest, two from the Rocky Mountains, and three from the West Coast.

### *Data Collection*

The semi-structured phone interviews were conducted from October to December 2006. Four different sets of interview questions were prepared in order to ask appropriate questions depending on the phase of IR deployment: (1) Implementation (IMP), (2) Planning and Pilot Testing (PPT), (3) Only Planning (OP), and (4) No Planning (NP). Those institutions that had already implemented IRs or completed pilot testing of IR systems were asked to discuss a variety of issues, such as objectives of their IR, people involved in the IR, planning and implementing experience, content recruitment and contributions, preservation, policy, service, values and benefits of the IR, intellectual property rights, evaluation/suc-

cess, budget, relationships with other people and systems, and long-term perspectives. Those institutions that were engaged in only planning had opportunities to discuss the impetus for their IR, planning issues along with the potential values and benefits of the IR, policy and preservation, user studies, and any evaluation plans. The institutions that had done no IR planning to date were asked to make comments about their institution's interest in IRs, their relationships with other people and systems, and any barriers to IR development at their institutions.

Each interview took approximately sixty minutes. All the interviews were recorded using a digital voice recorder and a telephone adapter.

#### *Data Analysis*

Audio files of all thirty-six interviews were transcribed for data analysis. We developed a coding scheme through several iterations of revisions. The following categories were eventually identified: general characteristics of interviewee's IR, people involved with institution's IR, perceptions of IRs, content and content recruitment, interviewee's IR system, end-users and uses of IRs, evaluation, financial issues, institutional commitment, intellectual property rights, limitations and weaknesses, marketing, metadata, policies and access, preservation, and services. In order to verify the reliability of our final coding scheme, three transcripts were selected at random and were each coded by two coders independently. Holsti's (1969) Coefficient of Reliability formula yielded a figure of 0.65. We considered this to be acceptable given the coding scheme's large number of categories, that is, twenty-four major categories and thirty-one subcategories.

The interview transcripts were imported to NVivo 7, qualitative data analysis software. The method of content analysis was then used as a technique to inductively identify and categorize the perceptions and experiences participants mentioned during the interviews. Content analysis is a method "that uses a set of procedures to make valid inferences from text" (Weber, 1990, p. 9). The content analysis presumes that words, phrases, or other units of text classified in the same category are presumed to have similar meanings. We examined the transcripts line by line using NVivo 7, and assigned one or multiple categories to the text manually whenever we found appropriate categories for phrases, sentences, and paragraphs.

Finally, once the coding was completed, we printed out the text for each category, and read it carefully to identify specific incident statements. Identification of exemplary quotes is an important step for content analysis because good representations of statements could show "things happening, perhaps feel things that the actors in this situation feel" (Spradley, 1979, p. 210). In the case of our study, quotes from the interview transcripts can show the staff's perceptions and experiences in their own terms. The selections were judgmental. We chose the quotes that could provide evidence and support the findings.



## RESULTS

This section reports on findings that are closely related to the five research questions delineated above: the purposes of IRs, system selection and features, policies, services, and challenges and barriers to long-term sustainability of the IR.

### *Purposes of Institutional Repositories*

The impetus for starting an IR did not vary dramatically across institutions. Interviewees mentioned that they started working on an IR because it could (1) centralize difficult to locate digital documents kept on an individual department's website, individual faculty member's personal homepage, or not available online at all; (2) create an environment for preservation and permanent availability of content produced by the institution; (3) provide open access to digital content; and (4) advance a new scholarly communication model. In fact, all of these motivations for IR development have already been noted in the previous literature (e.g., Chan, 2004; Gibbons, 2004).

Data analysis of interviews, however, revealed more specific contexts surrounding the purposes of IR establishment. First, IRs were referred to by different names, which often indicated how the IR was perceived and being branded within an institution. At one site, it was called a "distributed institutional repository" or DIR (PPT4). In fact, in interviewee PPT4's institution, the DIR initiative entailed creating a data repository as well as a document repository so that "people could put their preprints or post-prints in the IR and then point to their datasets in the data repository." In another interviewee's (OP15) institution, the term "digital repository" was used instead of institutional repository. Interviewee OP15 realized that most faculty members and other researchers did not consider their research materials as "institutional" property. In fact, in the thirty-six institutions represented by the interviewees, we discovered a variety of names that were used to brand the IR and reflect the unique characteristics and different foci of the repositories.

Institution-specific branding of IRs also indicates that IRs have been established with a more goal-driven rather than a function-driven purpose. For instance, PPT4 pointed out that an IR was ultimately for helping academic researchers solve their problems with respect to the organization, access, and dissemination of their own information and data. As an associate dean of research, PPT4 inferred that researchers needed this help after listening to descriptions of their problems, such as: "I have a dataset, I don't know if I should be saving, I don't know how I would describe, I don't know where I could archive it, I don't know if I should be sharing it, or how I could share it, could you help me figure this out?" Besides datasets, interviewees cited other types of scholarly materials that might be placed in the IR. For instance, IMP19 emphasized the importance of

capturing “academic writings that are not necessarily peer reviewed or even published but are white papers, reports, and committee meeting papers.” IMP19’s institution intended to gather the history of the university by collecting various materials. PPT7 also emphasized a need to capture the “fugitive documents” which he defined as what an institution produces as a part of its intellectual activities, but did not appear in a permanent published form. A university librarian in PPT7’s institution wanted to set up an outlet for these fugitive documents and provide stewardship for that content.

Under the goals established, strategies aimed toward particular user groups were mentioned across institutions. Several participants noted that an IR was useful for retired faculty who felt the “IR provided permanence of documents that might have been fugitive or stored only in the department” (IMP10). OP15 shared a story of a recently retired faculty member in the English Department who wanted a place to put the materials that were stored on his computer’s hard drive. OP15 said that “he was just so pleased to have this as a resource to put his book chapters, to put his articles, he’s gone out and actively worked with the publishers to make sure that he has the rights to put this material in the repository, this particular one, it’s phenomenal, it’s very rewarding to talk with him.” Preserving emeriti faculty members’ materials was a traditional function of university archives, so here is an area in which the roles of IRs and archives overlap.

On the other hand, not every institution had thought about clear purposes for their IR. Even some of the institutions that had already implemented an IR were unable to define its objectives clearly. Some interviewees simply referred to the IR as “an exploration or an experiment.” IMP13 revealed uncertainty about how the IR would evolve in the future: “I don’t think we have, at least I don’t have a clear notion of what it will become. So we are talking to people here on campus about it as a service that is available to them and asking them to help us define what it can do for them within the context of their own discipline. . . .” Some interviewees mentioned that they are committed to developing IRs simply because their peer institutions are already in the process of implementing an IR (PPT9), or they approached IRs initially as “a trend we should explore” (IMP17).

#### *Institutional Repository System: Selection and Features*

Selecting a system for the IR is one of the significant decisions that staff and managers make. In the Census, we identified three different technological approaches for IR systems: using open source software, purchasing a commercial product, and developing an in-house system (Rieh, Markey, St. Jean, Yakel, & Kim, 2007). Thus, in this study, we were interested in identifying the reasons IR staff chose a certain application.

Open source software has advantages in institutions that have technical expertise and an infrastructure to implement and maintain these ap-

plications. Here are some explicit reasons mentioned by the interviewees whose institutions chose open source software:

- “Because it had been widely adopted and it was as close to an out of the box solution as there was” (IMP16).
- “Although it might not be quite as flexible it worked very fast and that was one of the big reasons we selected it” (IMP10).
- “The campus is trying to move towards more open source and we have no out of pocket money to speak of to devote to a project. What we do have is the desire on the part of the staff to do this. We kind of regard it as a staff development project for the systems staff” (IMP18).
- “Definitely the fact that it is open source and I think the way it’s set up. It seemed to offer the most flexibility on our end as well as being able to handle lots of different formats. And the interface . . . while there were still things that need to be improved, it’s still pretty good for where we see things going with it” (PPT18).
- “We exist in an environment where we have a very mature and pretty highly developed digital library program that has many grant funded projects going and quite a bit of infrastructure in place for other digital library projects so that our institutional repository had to fit into that context . . . And so when we evaluated the software applications, we decided we wanted an open source software because we wanted local control because we have pretty rich, deep, technical infrastructure to support without a big new investment” (IMP13).

Purchasing a commercial product appealed to smaller institutions because they could use technical support from the company in the absence of having local technical staff to do the job. Some examples include:

- “[The IR system] did most of the things that we needed it to do and that the technical support was there for the product because it was a license product and the other two products were open source systems and at that time we really didn’t have the staff resources to devote to customizing it the way that we would need it to behave” (IMP20).
- “[The IR system] had to be something that I and my non-technical colleagues could do without having to be constantly calling our tech people. So this is the one that fit the bill. DSpace and the others often require considerable amount of dedicated staff and we just don’t have it and there’s no possibility that we are going to get that” (IMP2).
- “[The IR system] can handle text but is also designed to display images and zoom in and zoom out and things like that” (PPT13).
- “[We chose this IR] because [IR staff] felt it had the most flexibility of any of these systems. In other words, you could put good text, you could put good metadata, and you could put video and audio as well” (PPT6).

- “Because we didn’t necessarily think that was going to be our long term solution but we wanted to get going and we thought we could get off the ground and going the quickest with licensing that software so that was why we did it” (IMP21).

Institutions that have developed an in-house system worked closely with their IT divisions. They liked the control especially with respect to implementing their own standards, but they also expressed concerns about “overdependence of internal staff and services [on the IT division]” (IMP6). IMP3 commented on the advantages of developing an in-house system in terms of flexibility and control:

“[Our IR system] is home grown . . . the stuff [commercial products] I found [were] just too much for what we needed. I knew that I could not get my dear academic colleagues to use anything that was complex. So I built something that was as simple as it could be” (IMP3).

During the interviews, IR staff mentioned the satisfactory or unsatisfactory nature of specific features of IR systems. Here are their comments about open source software. IMP16 said, “[IRs are] just another content management, application, or tool, and not even a very good one at that [because] there [are] not a lot of bells and whistles.” IMP10 called IRs “very utilitarian functional software” and felt that they were easy to use.

Creating and controlling metadata with ease was considered to be one of the primary features of IR systems. IMP8 was satisfied with her current IR system because “the metadata business is relatively easy which I thought was going to be very difficult.” IMP6 also found that the feature in which they could customize sets of metadata was helpful. He liked the fact that they could have a good amount of control over metadata. PPT9 said that she liked how she could set up a collection for a group of faculty members that included her choices of subject headings leaving it to faculty contributors to be responsible for adding abstracts, author names, and document titles. On the other hand, PPT13 wanted richer metadata than depositors contributed, including preservation information. She felt that Dublin Core was “too sparse” for their IR system. IMP17 also stated the need for better metadata, such as controlled vocabulary for certain data elements.

One of the major concerns that IR staff experienced with respect to some commercial software was the challenge of dealing with multimedia files. IMP2 explicitly mentioned that uploading a video or audio file was “problematic” in her institution’s IR. IMP21, whose institution used a commercial IR system, said that there was a problem with the system’s handling of mathematical notation. In addition, some institutions in the pilot-testing phase were already discussing how and why they would feel

confident that the system they selected could migrate data and deal with the file format problems over time.

Many interviewees cited the inadequacy of their IR system's search features. According to IMP3, his IR system offers "not a very robust search" because the keywords entered do not search across metadata (e.g., title and description) and documents. Instead, people have to search on each field. PPT18 described how searching was currently limited to a few items such as title, department, and keywords, and suggested the need for an advanced search capability. Interviewees PPT2, IMP7, and IMP17 stated that they liked the flexibility which allowed them to set up discipline-specific communities within an IR so that users can easily browse.

User interface issues were discussed frequently as the one area that their IRs could improve the most. For instance, IMP13 pointed out that the submission feature was "acceptable" for the staff members when they did submissions on behalf of contributors, but it was "still not easy enough" for people to self-archive materials. IMP13 made this strong comment: "The submission process . . . if we ever hope to have a decentralized model where authors and departments do their own submission, we've got a long way to go to make it a lot easier and cleaner than it is. We've kind of given up on that . . . we just tell people we'll do it for you." This quote reflected several similar comments including "it's too many pages really for self-submitters" (IMP7), and "the self-submission interface is lacking" (PPT7). Other interviewees seemed to have either low expectations of their IR system in this regard or felt that they were too early in the process to make specific comments. Since most IRs still have little content, many interviewees may not have experienced a critical mass of self-archivers who had complained about the process.

### *Policies*

Depending on the IR stage of deployment (from no planning or only planning to implementation or planning and pilot testing), the IR staff we interviewed had different perceptions and experiences about policy development. Those interviewees at institutions with operating IRs emphasized the importance of establishing policies. Those affiliated with IRs in the planning or pilot testing stages seemed to think that policy development was not a priority. They agreed, however, that policies needed to be lenient and flexible in order to make changes as the IR moved along.

When we asked the interviewees whether they would agree on the statement of "our policy is to have no policy," (as claimed in one of the open-ended responses to the Census) their reactions were mixed. IMP6 responded that "So I don't know that it's totally wait and see but we're certainly watching as we're going along." IMP18 also agreed saying that "from my perspective policy is stuff you make up that as you go along describes what you want to have done and when that doesn't work anymore you just

change it.” OP1 believed that it “does not make a whole lot of sense to me” because “without a policy you have no way to enforce it and if you have a policy which the university administration has signed off on then we have the ability to go to faculty and say we need to have this and you have to give it to us.” PPT18’s comments were similar to OP1, “We certainly have a policy geared towards people who will be contributing to it and the policy will include things like acceptable formats, acceptable types of work in the sense that I don’t think we want to have contributions of things that are for instance things that the person doesn’t own the copyright. . . .”

A number of interviewees used the term “framework,” “guidelines for people,” or “strong advice” referring to policies as a way of moving forward with an IR. IMP20 summarized the importance of establishing policies clearly in the following quote: “I think policies need to be updated on a regular basis but I think that they’re good because you may be at a certain point in developing your IR and your policies help you to achieve that. If you try to do something that you can’t possibly do then in the end. . . . your user rejects the IR altogether. So I think that our policies are a good litmus test for what we’re able to do at this particular point in time.” OP16 also said that policies “don’t necessarily have to be overly strict but I do think that you do at least need a few policies as far as your labeling for your files and content and what formats are going to be put in because otherwise I just think that you could lose some of your most important content if you don’t have policies.” In PPT9’s words, having policies is “a good tool as a vehicle for discussions among faculty and librarians about what this is going to be used for.”

Several interviewees also mentioned that they made policies as simple as possible so that contributors and users could easily understand them. IMP13’s institution initially had long pages of policies, but IR staff realized that the more policies they had, the more faculty members fell away. Thus, they reduced their policies after discussions with numerous departments. OP6 also said that he wanted to have an open system because he believed that the “more restrictions that we place on it the less buy in we’re going to have.”

Three areas of policies emerged as most prominent: content contribution (who is entitled to submit and what can be accepted), copyright issues (what could be included and who is responsible), and access (who can access the material). Further, policies could deal with questions, such as under what circumstances it would be permissible to withdraw material. Most interviewees were concerned about copyright issues, but they did not have good answers, policies, or plans yet. They also advocated open access as far as “copyright is allowed.” In order to create critical mass early and easily, a majority of the institutions started with electronic theses and dissertations, that is, materials that the library had traditionally collected and which many universities require students to deposit in the library already.

While some interviewees clearly had confidence in the IR as an alternative to the traditional scholarly publishing model, most were more cautious. IMP6's comments seemed to reflect the dilemma that most IR staff members experienced: "Ideally we would like to have everything open access but given the reality of the publishing arena, the scholarly publishing is still quite a bit in the monopoly of the commercial and we're trying to protect that too and certainly the tradition of the promotion and tenure system and how people advance themselves in academia itself."

### *Services*

The interviews revealed that developing a good service model was not a priority for most IR staff. When asked about the kinds of services IRs offer, some interviewees reacted with answers such as "services?" or "what do you mean by services?" A library director at PPT8 interpreted services in terms of user support, such as digitization of their materials prior to inclusion in the IR. IMP6 began to discuss the technical support in terms of dealing with multimedia files, authentication, or system access problems. PPT18 understood that supplying a good interface in IRs is a part of services. In general, there seems to be little consensus among the IR staff about what they perceive and define as service components of IRs.

However, there were indeed a range of services from assisting the self-submission process to digitization services offered within IRs. It was noted that IR staff did not characterize these as a comprehensive service model, and accordingly, simply did not recognize the value that they have added to the IR through the services. Taylor (1986) presented six categories that users consciously use as criteria for recognizing the value of information systems: ease of use, noise reduction, quality, adaptability, time-savings, and cost-savings. Ease of use tends to reduce the difficulty of using the system including the ease of access to information in a physical sense. Noise reduction relates to selection issues. Quality criteria are related to the reliability of the information, the services, or the assumptions made in the selection of data. Adaptability is made up of those components of the system that will strengthen the responsiveness of the system to problems that users have in their working/living environments. Time-savings is related to services that are intended to reduce the time and effort a client needs to make. Cost savings relate to the ability of the system to either provide economical services or information delivered to add value.

Based on Taylor's six categories, the following six types of IR-related services were identified.

#### (1) Ease of Use and Access

- Making it easy for people to contribute objects (PPT18)
- Teaching contributors how to submit digital documents to repositories (PPT4, PPT2)

- Assisting contributors with initial set up, mounting, and work flow (OP6, IMP10)
  - Consulting with faculty members and encouraging them to create communities (PPT4, PPT13, IMP17)
  - Informing contributors about copyright issues (IMP13)
- (2) Noise Reduction
- Helping contributors to select content and metadata creation (PPT2, IMP20)
- (3) Quality Control
- Offering preservation services for selected high-quality objects (PPT13)
  - Providing a permanent URL (IMP18, PPT18)
- (4) Adaptability
- Making digital content available 24 hours a day (PPT13)
  - Providing a vehicle to publish papers (IMP2)
  - Creating a means for publishing online journals (OP15)
  - Offering a toolkit for publishing theses (PPT4)
- (5) Time-Savings
- Submitting content on behalf of contributors (IMP20, IMP7, IMP13)
  - Contacting publishers or doing some research for contributors so that they could deposit their materials (IMP17)
  - Digitizing materials for people (IMP13)
  - Providing the functionality for people to use RSS feeds (OP15)
- (6) Cost-Savings
- Sending out email notification for contributors when their works are viewed and downloaded (PPT18, OP15)
  - Providing statistics for usage on monthly basis (PPT18)

Even though IRs offer various services as characterized above, these are not often based on any comprehensive service model. Most IR staff members lacked an understanding of the range of services that might constitute a comprehensive service model for IRs. This is surprising since most IRs are developed and maintained by libraries that have traditionally put the service components up front.

PPT4's institution is one of few places where there are ongoing discussions to develop new service models. He mentioned that his IR team is currently working to find ways to repurpose metadata or take advantage of the distributed repository to come up with new services. Most IR staff, however, approach services in an ad-hoc manner. As pointed out by IMP13: "We digitize materials for people, we submit for people, we get permissions for people pretty much do whatever they will ask us to do if they'll give us the stuff to put in."



*Sustainability*

Overall most interviewees were confident about the sustainability of their IRs. They said they felt that they were on a good path and their administrations on campus were supportive. Confidence levels were higher at institutions that already implemented IRs than at those in which IRs were being planned and pilot tested. IMP20 responded that even though an IR might look different in five years or people might access it differently, "it's not going anywhere . . . I'm very confident that it will continue and service a really important purpose." IMP3 asserted that he was confident about the IR's sustainability in the "immediate future," but he would need to redesign the "technical stuff" for the databases in the long term. IMP10 also stated that in the long run another new technology might emerge to which they would have to migrate. Thus, IMP10 did not think that it would be difficult for an IR to be sustained.

The interviewees at OP and PPT institutions were more circumspect about IR sustainability issues, but they were still positive about their future plans for the IR. As OP1 articulated, his institution's stance was that "we would not enter this [IR] without feeling that we had the resources both financial and personnel that we needed to make this happen." OP16 was also confident; she believed that her university had commitment "from the powers" for the long-term funding. She expected that once they launched the IR, it would become more of a campus-wide commitment.

Budget and content recruitment issues were discussed as primary factors influencing IR sustainability directly. Again, most respondents were positive that there would be sufficient funds and that content recruitment would not be problematic. Still, a few interviewees stressed the importance of a funding model. For instance, IMP18 mentioned that the budget model at her institution looked fine right now, but that the library might need to justify the functions of an IR should the budget situation change or worsen in a significant way. OP8 who also said that she was "pretty optimistic [the IR] would be sustainable" made a direct connection between content recruitment and sustainability saying "if it's used, people want to be putting things in there, it's not going to go away. . . ." When she was asked to elaborate, she responded that "if you give us the money and tell us to do it we'll do it. And then I guess one thing would be faculty buy-in because they'll be encouraging their students to do it and themselves." IMP21's comments were similar, "it's significant dollars that are going into this and what will be important is that as we go along that an increasing amount of content is added to justify the dollars."

We also noted that a number of interviewees responded that they were in the "development stage" or their IR was still a project, rather than a program, so sustainability did not appear to be their major concern. However, most interviewees were well aware of the risks they were taking and challenges that they were facing. Specifically, they consistently pointed out that

getting the faculty on board (OP1), trying to convince the faculty to start depositing their papers (IMP18), and getting and maintaining the participation of faculty (OP14) was considered to be the biggest challenge.

Another challenge our interviewees identified was preservation. Interviewees had very different levels of expertise concerning preservation issues, ranging from those who equated regular back-ups with preservation (IMP3) to those who were planning to make their IR into a Trusted Digital Repository (TDR). "What we are doing looking forward for preservation is we're . . . trying to look very carefully at what it would take to be a trusted digital repository" (IMP17). Overall, not many interviewees were interested in preservation issues, but those who were concerned about preservation consistently emphasized that IR staff should know what they were promising. PPT13, for instance, believed that IR staff members overcommitted given the reality that they could not guarantee the preservation of digital objects in the long term. PPT18 noted that there were a lot of unknowns in maintaining digital objects in perpetuity.

While budget, content recruitment, and preservation were major challenges for sustainability, a host of others also emerged in the interviews. These included management (OP16), ongoing funding (OP14, OP15), metadata (IMP13, OP8), getting a coherent whole out of different parts (OP7), getting everything up and rolling (PPT2), overreliance on certain people to contribute (IMP12), and long-term institutional commitment (PPT9). Every interviewee was able to list at least one challenge and many noted multiple issues that remained unresolved at their institutions.

There is no question that a sustainable IR requires institutional commitment beyond an individual IR staff's and library commitment. IMP16, an assistant director of library information technology, noted that his IR was just beginning and that it was just a small piece of technical infrastructure on the campus. To sustain an IR, he believed that the infrastructure had to reside within central computing or data centers managed by professional computer staff. Only a minority of our interviewees would agree with his statement. Instead, most would be more likely to agree with PPT13's remark, which emphasizes the collaboration among different units of university for sustainable IRs: "It's a very broad topic and it requires a lot of planning and variety of skills and collaboration on campus to pull the thing off."

## CONCLUSION

The MIRACLE Project team enlisted the telephone interview method to gain depth and clarification on issues and trends related to IR planning and implementation that emerged from the Census. The research reported in this article was based on interviews with thirty-six interviewees who volunteered to participate and were willing to talk with us for about one hour; consequently, results are not generalizable to all four-year uni-

versities and colleges. Therefore, the implications of this study needs to be discussed with caution. Nevertheless, the results provide a fruitful basis for a number of interesting points. More importantly, we believe that we were able to present perceptions and experiences from diverse people who have played different roles in IR development.

We found IR staff expressing high levels of enthusiasm about the roles that an IR is or will be playing in their learning communities; however, they did not view the IR as a stand-alone repository. Instead they firmly believed that the IR served as the infrastructure for their university's participation in the open access movement. In fact, interviewees agreed that it was inevitable that most academic institutions would eventually deploy IRs to provide access to digital materials.

IRs have evolved over the past few years in terms of branding and scope. While early IR literature emphasized recruiting faculty's scholarly publications in order to challenge the traditional publishing model, the results of our interviews showed that IR staff focused on providing a central place in which a variety of research and teaching-related materials, datasets, and multimedia files could be openly accessed and permanently preserved. Under the umbrella term "institutional repository," each institution characterized and developed an IR and made considerable effort in "branding" it locally. IRs were increasingly perceived in terms of an overarching goal or purpose (e.g., what can an IR do for our institution's learning community) rather than specific functions and features (e.g., what kinds of content can be collected).

Most interviewees agreed that developing policies was critical for an IR to set the goals and to communicate with various stakeholders, but the policies needed to be lenient and flexible. Policies related to content contribution and access appeared to be most prominent across institutions; preservation policies were not as frequent. In addition, interviewees expressed concerns about copyright issues; however they were still in the phase of "wait-and-see" toward developing policies to address these issues. Overall, interviewees preferred to use terms such as framework, guidelines, and strong advice and emphasized that policies would be open to change as the IR developed. More interestingly, interviewees preferred to make policies as simple as possible rather than being overly specific, detailed, and targeted. This approach to policy development enabled them to have a "serious conversation" with a variety of people, including contributors and users in particular, and gave them leeway and flexibility with regard to making changes from time to time. This tactic reflects the newness of institutional repositories and the uncertainty surrounding these systems. For those IRs interested in pursuing Trusted Digital Repository status, this will have to be changed.

Most surprising was the lack of comprehensive service models among the institutions that implemented IRs. We characterized a variety of types

of mediated service for IRs ranging from training for self-submission and proxy submission to helping contributors work with publishers. However, most of the services uncovered were ad-hoc rather than based on pre-designed service models. In fact, the answers from the interviewees about services indicated that they were still focusing on routine services rather than providing new services that an IR could offer. We found that providing a repository to meet the needs of users is the most fundamental purpose of IR development. However, in the long run, to do so, it is important for IRs to develop value-added service models which allow them to better serve their learning communities, contributors, and end-users.

Sustainability is a crucial issue in IRs. There are two aspects to sustainability: sustainability of the IR itself and preservation of the materials in the IR. Although IR staff members were consistent in their confidence about IRs' long-term sustainability, they were far less coherent when discussing digital preservation. This inconsistency may be a function of time. IRs have not been sufficiently confronted with materials in diverse media and have not yet had to migrate existing contributions (and their meta-data) into new systems. These developments might force consideration of preservation issues. Up to now, the main focus in IRs has been on the other end of the life cycle—enabling contribution and promoting use of the IR.

Although many institutions are still in the planning and implementation process, IRs are an increasingly common feature of online library services on academic campuses. The lack of clear service models indicates that IR staff are still testing the waters and assessing where IRs fit in the mix of other online library services, such as the online catalog, e-journals, and database search engines. As more comprehensive service models develop, the ambiguity of the IR's role within the library should decrease. The next few years should see the development of these service models and it will be interesting to see how they differ and are differentiated from existing library services. In developing service models, IRs should remember that these do not necessarily have to focus on the parent institution. Contributions to IRs are increasingly accessible through the Web, which puts the scholarship and teaching resources of educational institutions—big, medium, and small into the hands of scholars as well as learners around the world.

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