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Natasha Simons, Joanna Richardson

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New Roles, New Responsibilities: Examining Training Needs of Repository Staff

Natasha Simons *Senior Project Manager, eResearch Services, Scholarly Information and Research, Griffith University*

Joanna Richardson *Associate Director, Information Services, Scholarly Information and Research, Griffith University*

Abstract

INTRODUCTION Institutional repositories play a critical role in the research lifecycle. Funding agencies are increasingly seeking an improved return on their investment in research. Repositories facilitate this process by providing storage of, and access to, institutional research outputs and, more recently, research data. While repositories are generally managed within the academic library, repository staff require different skills and knowledge compared with traditional library roles. This study reports on a survey of Australasian institutional repository staff to identify skills and knowledge sets. **METHODS** Institutional repository staff working at universities in Australia and New Zealand were invited to participate in an online survey which incorporated both open and closed-ended question types. **RESULTS** The survey found significant gaps in the current provision of formal training and coursework related to institutional repositories, which echoed findings in the United Kingdom, Italy, and the United States. **DISCUSSION** There is clearly a need for more and varied training opportunities for repository professionals. Repository work requires a specific set of skills that can be difficult to find and institutions will benefit from investing in training and ongoing development opportunities for repository staff. **CONCLUSION** The data from this study could be used to facilitate staff recruitment, development, training, and retention strategies.

Implications for Practice:

- Working on a digital repository requires a specific set of job skills and knowledge that is largely acquired through informal training rather than through formal training courses or academic curriculum.
- As an emerging and evolving profession, repository staff would benefit from tailored training at the commencement of a position in addition to ongoing training and skills development.
- The specific set of job skills and knowledge sets required to work on a digital repository has implications for staff recruitment, development, training, and retention strategies.

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INTRODUCTION

In keeping with a global trend, Australasian academic institutions have experienced the rapid development of institutional repositories¹ over the last decade. For these institutions, the decision to implement a repository has been driven by a range of practical and philosophical factors. Commonly cited factors include the need for a strategy to deal with the dramatic increase in journal subscriptions, the development of the open access movement, and the need to showcase scholarly research locally and globally and to preserve that research (Clobridge, 2010).

Adding to these motivating factors is the reality that funding bodies and governments are now seeking an improved return on investment for funded research. In several Commonwealth countries, accountability is measured among universities by means of a research assessment exercise. The United Kingdom has its Research Excellence Framework, while New Zealand universities are required to meet the requirements of the Performance-Based Research Fund (PBRF). In Australia, the Excellence in Research for Australia (ERA) initiative is designed to provide benchmarking data for Australian universities compared with international measures.

In addition to the stimulus provided by new government requirements regarding publicly funded research, there have been a number of collaborative initiatives that have provided impetus and support for the development of institutional repositories in Australasia. The Australian government has funded a number of repository projects over the past decade, including Australian Research Repositories Online to the World (ARROW), Australian Partnership for Sustainable Repositories (APSR), and Regional Universities Building Research Infrastructure Collaboratively (RUBRIC). New Zealand's collaborative efforts include Institutional Repositories Aotearoa and Open Access Repositories in New Zealand.

By 2006, all Australian universities had established, or were in the process of establishing, institutional repository services (Fernando & Gibson, 2007). A survey of 39 Australian universities conducted in September 2008 showed that 32 institutions had active repositories; by the end of 2009 this figure would rise to 37 (Keenan & Kingsley, 2009). In New Zealand the first publicly available institutional repository was launched in

November 2005 (Buehler & Boateng, 2005) and by May 2010 there were 11 institutions contributing repository data to the Kiwi Research Information Service (KRIS website, 2010).

In 2009 the Council of Australian University Librarians (CAUL) established CAIRSS (CAUL Australasian Institutional Repository Support Service) to provide support for all institutional repositories in Australian universities, regardless of the software being used. In 2011 membership was extended to CONZUL (New Zealand) universities. Currently, CAIRSS provides support for repository managers through a variety of means, including: providing a forum for discussion, support, and representation; developing toolkits for copyright and institutional repositories; assisting with the integration of repositories with the requirements of government reporting exercises; and providing a watching brief on trends and developments in repositories. In CAIRSS, there are 45 member institutions whose representatives include repository staff in a range of roles. Representatives communicate primarily through a Google group.

In this article, the authors discuss the results of their 2011 survey of university repository staff in Australia and New Zealand, conducted exclusively through the CAIRSS Google Group. The online survey is the first of its kind in Australasia and was designed to identify the skill set required to work on an institutional repository. The survey is intended to assist CAIRSS and its member institutions to identify skills and knowledge sets, training needs, and future trends that could be used to inform recruitment, development, training, and retention strategies for institutional repository staff. The authors believe that the information shared here will be useful in developing the skilled staff that will be required to maximize the potential of repositories to fully support the research lifecycle.

LITERATURE REVIEW

Librarians have played, and continue to play, a leading role in establishing, growing, and maintaining institutional repositories. Academic library staff have traditionally acquired, organized, and disseminated scholarly information. Therefore, it has been a logical step that institutional libraries would take the lead in managing research output through repositories (Horwood, 2004). An Australian study by Henty (2007)

revealed that “the open access origin of many repositories has led to responsibility for the repository being held by the library in all but one of the universities surveyed.” A later Australian study by Keenan and Kingsley (2009) found that 71.1 percent of repository staff had library backgrounds.

However, repository management requires staff with specific knowledge and skill sets that are different from more traditional library roles such as cataloger or reference librarian: “It can be particularly challenging to find the right people to support a repository program. Coordinator roles require a certain amount of understanding of both libraries and technology” (Henty, 2007). This new, emerging role of repository manager has been well-documented in the United Kingdom by Wickham (2010) and Zuccala and others (2008), and in Italy by Casella and Morando (2012), based on research which canvassed institutional repository staff in each country. Their findings highlight the necessity for repository managers to undertake courses and self-directed learning to develop competencies not gained through existing academic curricula.

Within repository management, Barton and Waters (2004) suggest that roles can be defined on the basis of either technical or user support and provide sample worksheets for identifying the skills required to run a digital repository service. They also discuss budgeting for repository services and training for existing staff features highly in that discussion. More recently, a census of institutional repositories (IR) in the United States (Markey et al, 2007) found that while the library tends to play a critical role in initiating and implementing IRs, staffing or support may include a range of positions from both within and outside the library. While this points to a need for collaboration, it also suggests that library repository staff may require some level of familiarity with domains outside their immediate areas of expertise.

Clobridge (2010), in providing a roadmap for implementing digital repositories, focuses strongly on staffing requirements. As she observes, “...frequently there is a gap between what work is needed, what the work entails, and what resources (staff time, staff expertise) are available” (p. 61). Her detailed description of the essential roles required to staff a repository—complete with sample job descriptions—supplements the research undertaken to date specifically on repository

management. Clobridge’s observations are echoed by the latest Survey of Institutional Digital Repositories (Primary Research Group, 2012).

Though repository staffing—and staff training—issues clearly exist, the demand for repositories appears to continue to grow. For example, as the world has keenly embraced institutional repositories as a vehicle for promoting open access, the concept of the repository’s function has expanded. Until recently, the scholarly output that libraries have focused on capturing has tended to be limited to traditionally published works. More recently, however, new publishing paradigms are emerging, with data—supporting journal articles—as the focus. In reviewing major data management lifecycle models, Ball (2012) mentions the role of repositories at several stages, e.g. preservation. Repositories will likely continue to have an important role to play in supporting the research lifecycle as that support now moves to encompass more than just print research output (Wolski, Richardson, & Rebollo, 2011).

In order to ensure that repository staffing models include both the roles and the training necessary to support this emerging landscape, it is vital to understand both current skill levels and projected training needs. This study seeks to contribute to the literature in this area, for the Australasian context and beyond.

METHODS

The authors’ survey complements an existing CAIRSS annual survey of repository managers conducted since 2009, in which repository services, rather than staffing, are the focus. The most recent CAIRSS survey (Drury, 2012), explored the involvement of research repositories in data management, in addition to monitoring ongoing trends in staffing, software, copyright, repository statistics, and other areas. As noted in the introduction, the authors’ survey instead focuses entirely on staffing and was conducted to aid CAIRSS and its members in gathering data that could be used to inform recruitment, development, training, and retention strategies for institutional repository staff.

The construction of survey questions was informed by the literature review, particularly the similar surveys conducted in the United Kingdom (Wickham, 2010) and Italy (Casella and Morando, 2012)², and the

documentation on job descriptions and repository posts produced by SHERPA (Robinson, 2008). Staff members employed by CAIRSS were consulted in the composition of survey questions and CAIRSS New Zealand members were also given an opportunity to provide feedback on the questions. Feedback was incorporated and the survey was constructed using the open source Lime Survey tool (hosted by Griffith University on a secure server). Prior to conducting the survey, approval was received from the Griffith University Human Research Ethics Committee (approval number INS/01/11/HREC).

Institutional repository staff members working at universities in Australia and New Zealand were invited to participate in the online survey through the CAIRSS Google Group. The response rate for the survey was 37.3 percent (85 out of 228 members of the Google Group). At the time the survey was conducted there were 45 universities represented through CAIRSS membership. However, data on participation rates by individual institutions was not collected in the survey. The majority of survey participants were working in Australia (86 percent) and a small proportion in New Zealand (14 percent).

The survey was composed of five sections designed to explore the skill sets required to work on an institutional repository in Australasia. Section headings included: about the repository, about your repository job, training, job skills and knowledge, trends in repository skills, and knowledge. There were 39 questions incorporating both open and closed-ended question types. The latter included yes/no responses, multiple choice, and Likert scale responses. Some closed questions incorporated free-text comment boxes. Open-ended questions with free text response boxes were also used. All questions were optional. The survey was designed to preserve the anonymity of the respondents and their respective institutions.

Given the depth and breadth of the survey, it is beyond the scope of this article to present all the data. Therefore, the authors have provided open access to the full dataset, which is hosted in a Griffith University repository³:

<http://dx.doi.org/10.4225/01/503C303E9B551>

Readers are encouraged to consult the data which supports the sections discussed in this paper.

RESULTS

Section One: About the Repository

To set the scene, the first section of the survey was entitled “About the repository.” Questions covered the type of information stored in the repository; the number of repositories each institution maintains; the type of software in use; whether additional software is used; and if the repository software is, or soon will be, externally hosted.

Consistent with the general purpose of repositories at higher education institutions, the most common type of information stored in a repository was scholarly research outputs, e.g. journal articles and theses (79 percent). Research data was also stored in repositories (27 percent). Other types of content included teaching and learning materials (13 percent) along with creative works, archival collections, images, and grey literature.

Section Two: About Your Repository Job

Section two of the survey investigated the types of repository jobs held by participants, their job level and experience, educational qualifications and job satisfaction.

Participants were asked how they would best define their job by selecting one answer from a closed list that included a short description of each of the roles (Table 1, following page). An equal proportion of respondents identified themselves either as repository managers (28 percent) or general repository support (28 percent). The remaining participants were identified either as repository administrators (17 percent), technical support (6 percent), or a combination of the above (21 percent). The employment status for the majority of participants was permanent, full time (74 percent). Figure 1 (following page) illustrates the number of years respondents had been working on a digital repository.

Participants indicated from a closed list the highest level of education they had completed. All but one had achieved an education level beyond high school. For the majority this was a Graduate Diploma (34 percent), a Masters Degree (27 percent), or a Bachelors Degree (27 percent). A small number had completed a Doctorate (6 percent).

Table 1. Repository roles as defined in the survey

Role	Definition
<i>Repository Manager</i>	Has overall responsibility for the repository including policy development, advocacy, software selection, liaison with stakeholders and team leadership.
<i>Repository Administrator</i>	Has responsibility for managing the technical implementation of the repository including software customization, managing metadata fields and quality, running reports and tracking statistics, training of clients.
<i>Technical support</i>	Has responsibility for making the technical changes to the repository including programming, software upgrades, implementing patches and bug fixes.
<i>General repository support</i>	Responsible for data entry and general support tasks.

Participants were also asked to indicate from a closed list an approximation of how many hours they spent per week on repository work (Figure 2, following page). Respondents who did not spend 100 percent of their time on repository work were asked to use a free text comment box to briefly describe their non-repository duties. The comments reflected that non-repository work most commonly involved managing a broader team in a library context. The function of each team varied in scope but provided a broad range of services including, but not limited to: reporting to government as part of a national research assessment, cataloging, interlibrary loans, and provision of research support. While some respondents worked as members of a larger team rather than as managers, others worked on projects.

The final question in this section asked participants to rate the importance of a number of factors to their job

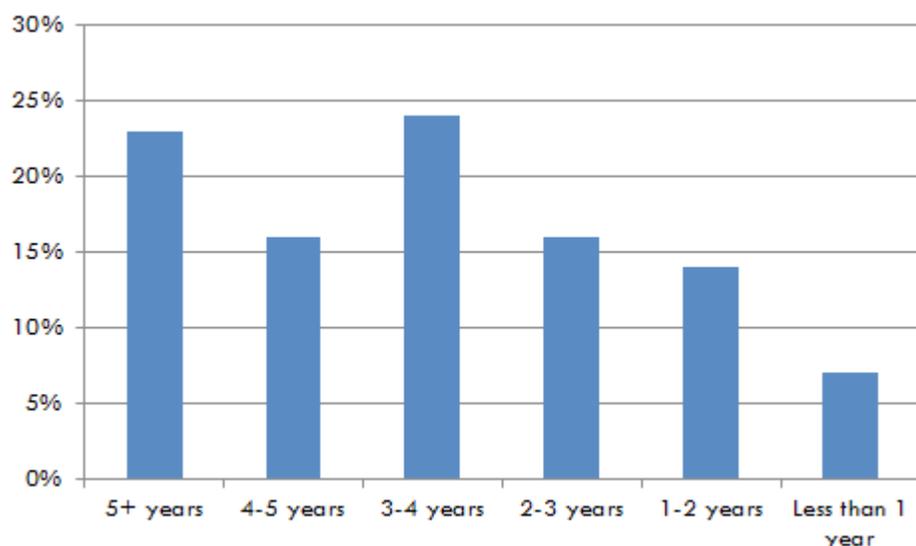
satisfaction. The job satisfaction factors were presented as a closed list and a Likert scale used to rate the factors ranging from very important to not at all important. The top four factors were: challenging or interesting work, a supportive environment, recognition of my capabilities and achievements, and job stability.

Section Three: Training

The third section focused on past and present training needs. It examined the types of training participants had received when they began their repository job and the type of training they would like to receive currently or in the future.

Participants were asked to identify the types of training they thought they needed when they first began their repository job in order to perform at a satisfactory level.

Figure 1. Percentage of respondents according to years of experience



More than one type of training could be selected from a closed list. The results clearly identified the top training needs as: specific repository software training, training in copyright issues and training in metadata skills. The top six results are illustrated in the chart below (Figure 3).

The vast majority of survey respondents (83 percent) had not received any formal training related to their repository job. Formal training was defined in the survey as “courses with a structured plan that have some formal recognition upon completion, e.g. certification.” Those who had received formal training (17 percent) were asked to specify the type of training they had received. This varied widely and included training in: specific repository software, digital preservation, project management, crystal reports, metadata, XSLT, Microsoft Excel, and

management skills. Training providers and funding sources also varied from self-funded university courses to employer sponsored software certification courses.

Almost the exact proportion of respondents who answered they had not received any formal training responded that they *had* received informal training related to their repository job (81 percent). In the survey, informal training was defined as “training related to your job that did not lead to any formal qualification or certification, e.g. supervisor or colleague-assisted training.” Elaboration on the type of informal training received was not requested. The remainder (19 percent) had not received any informal training.

The overwhelming majority of respondents (83 percent)

Figure 2. Percentage of time spent on repository work

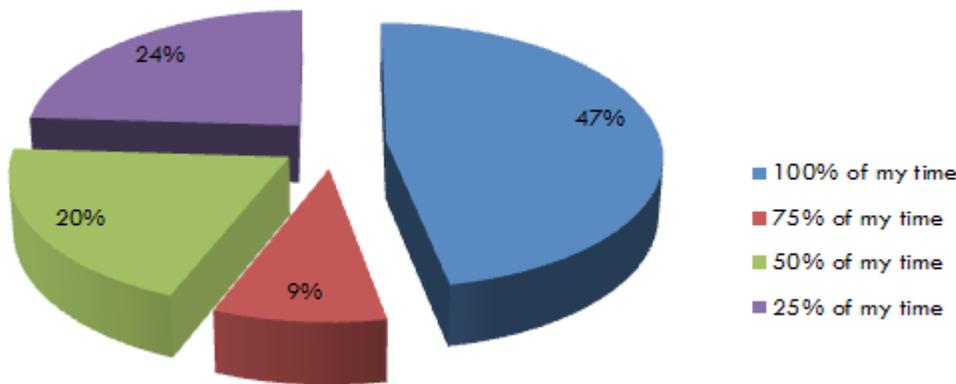
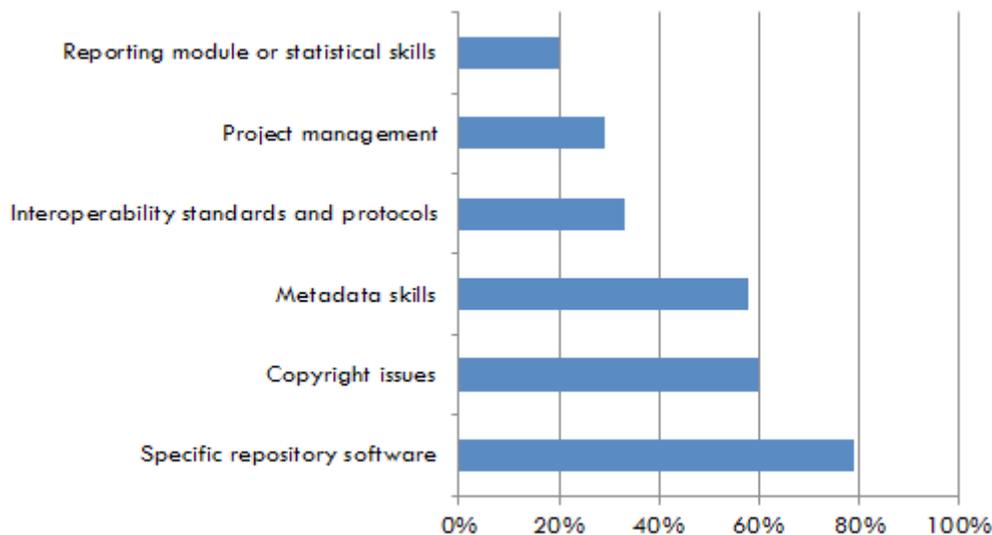


Figure 3. Anticipated training requirements at initial time of employment



spent between zero and two hours per week engaging in self-training related to their repository job (Figure 4). Of these, the majority (58 percent) spent less than one hour per week on this activity. In the survey, self-training was described as a “form of study in which you are to a large extent responsible for your own instruction, e.g. working through a training manual at your own pace.” The remainder (17 percent) spent between two and five hours or more in self-training each week. Comment on the type of self-training was not requested.

The final question in this section asked participants to indicate what type of further training they would like to be made available to them in their current repository job. More than one training topic could be selected from a

closed list as applicable. No training type received more than one third of the percentage of responses. Training needs are identified in Figure 5.

Optional free text comment boxes were available for each item on the closed list including “other.” The comments reflected specific training needs which included: DSpace and Digital Commons repository software, Google analytics, XML and SQL, Microsoft Excel and Access, a range of metadata standards, and OAI-PMH.

Section Four: Job Skills and Knowledge

The focus of section four was job skills and knowledge. Survey participants were asked to rate the importance of

Figure 4. Time allocated per week to self-training

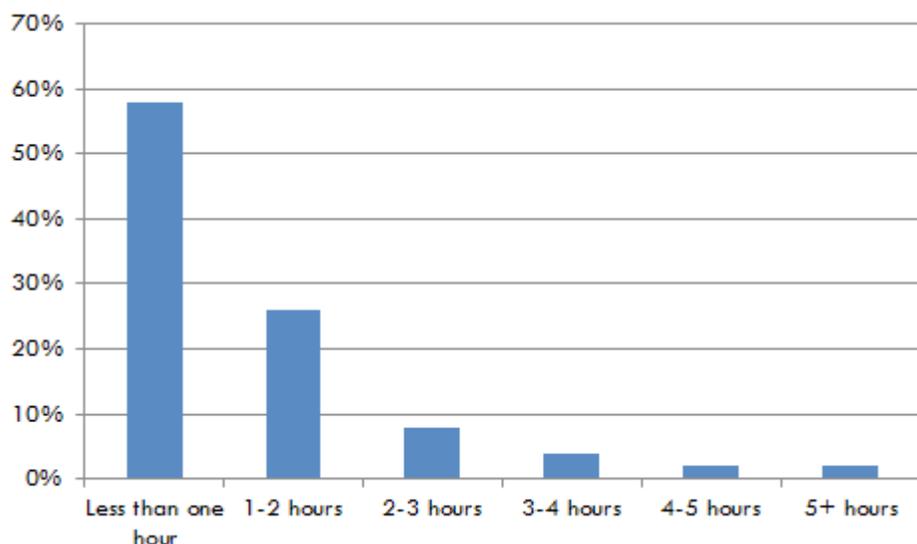
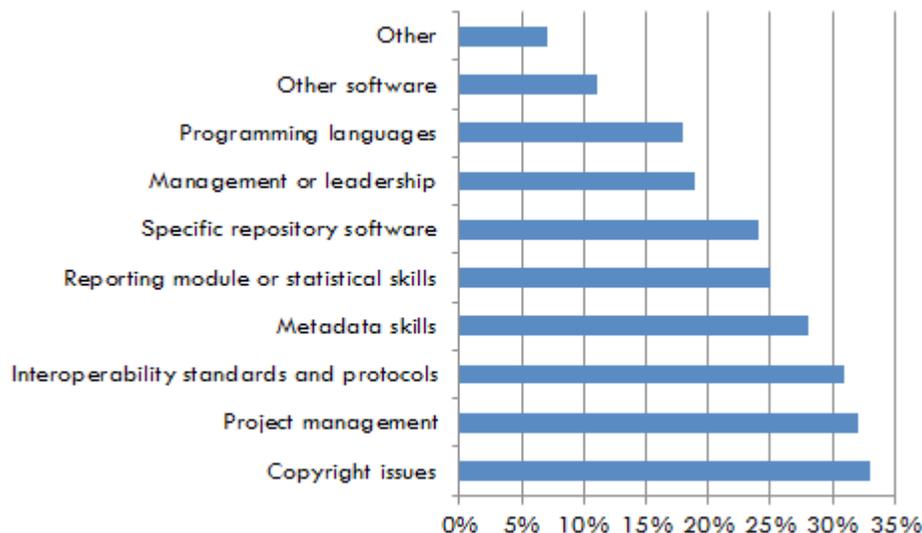


Figure 5. Current or future training requirements



knowledge sets to their repository job using a closed list with a Likert scale ranging from very important to not at all important. The results are illustrated in Table 2.

In response to an open question about additional knowledge sets, 35 percent of respondents identified those which they considered essential to perform their current repository job. A tag cloud generator identified “research” followed by “reporting” as most frequently mentioned in the comments field. “Reporting” referred to software, management and government reporting. Other skills sets mentioned included: software development, ontology development and semantic web knowledge, communication and negotiation, and marketing and promotion.

Technical Skills

Survey participants were asked to rate how often they used particular technical skills in their current repository job using a Likert scale ranging from almost always to never. Table 3 lists the skills which scored highest in each of the categories.

Participants were also asked to indicate what software knowledge and programing skills they used in their

current repository job. More than one answer could be selected where applicable. Three skills clearly dominated: repository software skills (73 percent), HTML (48 percent) and XML (45 percent).

Collection Management

Building and managing collections is at the centre of repository work. Survey participants were asked to rate how often they used collection management skills in their current repository job using a Likert scale ranging from almost always to never. Table 4 (following page) lists responses in order of the largest percentage for each item on the scale.

Participants were also given an opportunity to comment on any collection management skills not identified on the closed list that they thought were important to their repository job. Ten percent responded to this question. These included the ability to change, update, and map metadata; identify and collect research impact data; liaise with open source software collaborators; develop a collection policy; and develop skills in collection evaluation.

Table 2. Importance of specified knowledge sets

Knowledge set	Importance Rating	Percentage of responses
<i>Specific repository software</i>	Very important	66%
<i>Copyright legislation</i>	Very important	55%
<i>Open access issues</i>	Very important	49%
<i>Government reporting requirements</i>	Very important	45%
<i>Interoperability standards and protocols</i>	Fairly important	32%
<i>File preservation formats</i>	Fairly important	31%
<i>Taxonomies</i>	Fairly important	27%

Table 3. Use of technical skills

Technical skill	Most common response	Percentage of responses
<i>Liaise with IT support staff</i>	Almost always	29%
<i>Communicate technical issues to management and team members</i>	Regularly	42%
<i>Liaise with clients regarding technical problems</i>	Sometimes	33%
<i>Analyze and solve problems related to repository software</i>	Sometimes	28%

Table 4. Use of collection management skills

Collection management skill	Most common response	Percentage of responses
<i>Identify and manage copyright issues</i>	Almost always	49%
<i>Monitor metadata quality</i>	Almost always	44%
<i>Liaise with clients</i>	Almost always	43%
<i>Use metadata sets</i>	Almost always	23%
<i>Select appropriate file format</i>	Regularly	31%
<i>Use reporting tools</i>	Regularly	30%
<i>Use statistical analysis skills</i>	Sometimes	30%
<i>Liaise with software vendors</i>	Never	34%

Table 5. Use of management skills

Management skill	Most common response	Percentage of responses
<i>Lead and manage staff</i>	Almost always	32%
<i>Plan and develop the repository collection</i>	Regularly	32%
<i>Assess and evaluate repository performance as a service</i>	Regularly	31%
<i>Engage in strategic planning</i>	Regularly	30%
<i>Liaise one-on-one with internal clients</i>	Regularly	30%
<i>Ensure digital rights management issues are resolved</i>	Same percentage for Regularly and Never	27%
<i>Promote the repository to external stakeholders</i>	Sometimes	29%
<i>Promote the repository to internal stakeholders</i>	Sometimes	28%

Metadata

Metadata is used to describe records in repositories and requires skills in defining schemas, standards, and interoperability protocols. A closed list of metadata standards and exchange protocols was presented to survey participants who were asked to select which ones they used in their repository jobs. More than one could be selected. Three items from the closed list were clearly the most used: Dublin Core (68 percent), OAI-PMH (46 percent), and MARC (40 percent). Next listed were RIF-CS (Registry Interchange Format - Collections and Services) (16 percent) and local customized metadata (16 percent) followed by a range of other metadata schemas. The appearance of RIF-CS in the results indicates that at some institutions the repository team is dealing directly with records they provide to Research Data Australia, the service managed by the Australian National Data Service (ANDS). These records describe research data collections,

as differentiated from research outputs, and indicate a new and evolving content type in Australian repositories.

Management Skills

Participants were asked to use a Likert scale to indicate how often they used the management skills specified on a closed list. Likert items ranged from almost always to never. The results are illustrated in Table 5. The overall results for this question were mixed and could indicate the diverse roles of respondents.

Section Five: Trends in Repository Skills and Knowledge

The final section of the survey encompassed four open questions exploring job challenges and the development of new skills or knowledge. Participants were asked to reflect on the most challenging aspect of their repository

Further Comments

The final survey question provided participants with an opportunity to make any further comments. Comments included:

“Repositories are an exciting, interesting area in which to work.”

“It is a challenging role that requires an in-depth knowledge of the research processes within the institution and the ability to negotiate with many different stakeholders.”

“Potential area of growth is the promotion of open access publishing for outputs of institutional events, and in-house journals.”

“The halcyon days of open access impact-raising repositories are now dead, killed by the Federal Govts [sic] needs, and the complexities of multiple uni-internal repositories and the need to align with them. It’s a far more complex world now, the data (e.g. for author authorities) are far more complex and the need to align also with international developments, research impact analysis needs changes the whole reason for our existence. It’s not all bad, as we are clearly MUCH more relevant and important to our university now.”

Many repository staff have experienced challenges in obtaining the skills and knowledge (and time) required to perform their job satisfactorily, which will be discussed in detail in the next section. Despite this, it is evident that for some respondents job satisfaction is derived from a perception that repository work is challenging, repositories are a growth service, and the work undertaken by staff is aligned with the goals of the parent organization.

DISCUSSION

Skills and Knowledge Sets

The survey results identify a specific set of skills and knowledge required to work on a digital repository, many of which support suggestions in the existing literature. In terms of the following broad categories, these may be summarized as:

Knowledge sets

- Specific repository software
- Copyright legislation

- Open access issues
- Government reporting requirements

Technical skills

- Liaise with IT support staff
- Communicate technical issues to management and team members

Collection management skills

- Identify and manage copyright issues
- Monitor metadata quality; use metadata sets
- Liaise with clients

Management skills

- Lead and manage staff
- Plan and develop the repository collection
- Assess and evaluate repository performance
- Engage in strategic planning

It is clear from the responses that technical skills, in general, are vitally important. The majority of survey participants held managerial or administrative positions and technical support for repositories was provided by those in other teams (e.g., IT departments). However, technical understanding is still critical for repository managers and administrators who must be able to operate repository software as well as communicate technical issues to management, team members and clients. In addition, a technical problem must be diagnosed and described before it can be reported to IT support staff. Where IT support is overstretched, the repository team is likely to attempt to resolve the problem themselves. Where technical support is mostly provided outside the repository team, it is also still important for repository managers and administrators to stay abreast of developing technologies. Indeed, Clobridge (2010, p. 63) identifies a number of responsibilities and tasks for a digital repository program coordinator including the ability to “evaluate new technologies; stay abreast of developing technologies; recommend ways to integrate new technologies, services and systems into digital repositories.”

While managing copyright and monitoring metadata quality are obvious skills for repository staff, it is surprising that the ability to liaise with clients scored slightly less (43 percent), and that the ability to undertake advocacy work did not rate more highly. Communication with academic staff to persuade them to contribute to the

repository was considered difficult and of the utmost importance to the University of Melbourne (Fernando & Gibson, 2007), and the ability to plan a repository advocacy program was very important to participants in Cassella & Morando's (2012) study. Perhaps institutional compliance with government reporting requirements and financial incentive have produced the desired effect in getting academics to self-deposit their research outputs into respondents' institutional repositories without much prompting from the repository team. It is also possible that the repository staff surveyed are not responsible for such communication or advocacy efforts, which may be done by others within the library, such as academic librarians.

Interestingly, "communication" skills in general were not identified as issues for survey respondents. Both a 2010 survey by the UK Repositories Support Project (Wickham) and Cassella & Morando's (2012) survey found that communication was an important skill for repository staff. Communication can be between repository staff and a number of groups from IT to academic staff. While it is possible that this skill is simply not an issue for Australasian repository staff, it may also be that the construction of the current survey did not allow this skill to be readily elicited in responses.

Training

While there is a very experienced layer of repository staff represented in the survey responses, the majority did not acquire the specific skills and knowledge required to perform their job from either academic curriculum or through formal training avenues. Informal training, such as supervisor or colleague-assisted training, was instead the primary method by which repository staff acquired their skills and knowledge.

Regardless of their educational background, the vast majority (83 percent) had not been taught anything about digital repositories in the course of attaining their degree or diploma even though the majority had graduated in the discipline of library and information studies (54 percent). Those who did not study library science had graduated in IT (15 percent) or a wide range of alternative disciplines. This finding mirrors the situation in Italy, where "... no academic curriculum covers the basic needs of repository management" (Cassella & Morando, 2012, p. 416); in the U.K., where there are digital library management courses

but none that focus on the needs and requirements of repository management (Brown & Abbas, 2010); and in the U.S. where none of the "traditional library and information science schools' curricula...focuses on the particular needs and requirements of repository managers" (Zuccala and others, 2008, pp. 20-21).

In the latter instance, the authors have even suggested that library and information science schools should develop a new repository management curriculum. They have suggested that the major components would be drawn thematically from: the changing electronic publishing environment, repositories, management issues, librarianship, technical tools and legal issues. Such a program could be delivered worldwide through e-learning. Recognizing, though, that their suggested approach might not be readily adopted within the academic curriculum, they have proposed that consideration be given to "specialist modules" at a minimum.

While some Australasian library and information studies programs do offer "digital repositories" as a topic within a broader subject, this is not sufficient to prepare job-ready graduates. In fairness to these programs, that is not their objective. However, even if key knowledge areas such as those identified by Zuccala and others (2008) were incorporated more broadly into the academic curriculum, there would still be a need for the specific training of repository staff. This is because of the variety of specific repository software in use at institutions and the fact that almost half of the respondents did not in fact graduate in the discipline of library and information studies. In addition the results indicate a need for ongoing training, particularly in the area of copyright. One can logically conclude from current developments in research data management that intellectual property in data, for example, will feature more prominently in future in training needs identified by repository staff.

While academic degree programs may not be the answer, the fact that 83 percent of survey respondents had not received any type of formal training exposes a significant gap between training needs and provision. For example, in comparing the type of training respondents thought they needed when they first commenced their jobs to the type of training they felt they required at the time of survey participation, there was an expected decrease in the need for specific software training. However, a relatively large percentage (24 percent) still believe they require

repository software training, which may demonstrate that informal, on-the-job training is not sufficient in all cases.

As Cassella and Morando (2012) suggest, the lack of higher education courses that cover repository management means professional training (as opposed to informal, on-the-job training) is extremely significant in providing a means to develop these skills. Their study of Italian repository managers found that before setting up their repositories 55 percent of respondents had received specific professional training in a repository setting and 45 percent had attended from one to three courses. In this regard, Italy fares much better than Australia and New Zealand.

In general, these survey results are of concern, as they indicate a need for additional training that is not being met. Are employers unwilling or unable to fund formal training, including online courses? Or are they unaware of the need for this training or indeed the existence of such training courses? In Italy, repository training is run by two supercomputing consortia (Cassella & Morando, 2012) but there is no known equivalent in Australia or New Zealand. It is also a concern that copyright was marked in the top three most needed training but was not mentioned as specific formal training that respondents had received. And yet there are regular courses and workshops offered on this topic throughout Australia including an annual workshop offered through CAIRSS.

In addition to training, as an emerging and evolving profession, repository managers and administrators would benefit from keeping up to date with repository developments through methods such as reading e-lists, relevant articles, reports, blogs, webinars, and websites. The survey found that most respondents (82 percent) dedicated between zero and three hours each week to keeping up to date. Whether participants consider this amount of time sufficient is unknown. Ideally, this weekly activity would be supplemented by attendance at meetings and conferences, which Clobridge (2010) suggests is the best way to stay informed of current developments.

Staffing

Comments collected through the survey reflected that repositories can be very stressful environments in terms of staffing and time pressures: there is not enough staff,

there is only one staff member, new staff require training, there is too much work for the staff available, there is not enough time to complete the work. This is unsurprising, given that less than half (47 percent) of respondents devoted 100 percent of their time to repository work. This finding supports the notion that depending on the size and shape of the digital program and its team, a coordinator role may not be the only focus of a person's job (Clobridge, 2010).

Comments elaborating on the combination role generally reflected different staffing structures; small "teams" in which only one or two people were responsible for repository work; and roles with multiple responsibilities. They also reflected that the definitions provided in the survey for each role did not fit neatly and uniformly across Australasian repositories. There is a great variance in job description and responsibilities for repository work. Clobridge (2010, p. 61) suggests that "at many institutions, it is likely that the bulk of the work ... will be handled by one, two or three people." Fewer people working on a repository means they need to be knowledgeable about many roles and responsibilities.

As the comments about time pressures indicate, recruiting appropriate numbers of staff to a repository and providing them with training is critical to the success of the repository program and to retaining existing staff. Clobridge (2010, p. 186) suggests that "it can be particularly challenging to find the right people to support a repository program." Her advice is to "invest in employees so that they stay engaged, committed and energized" (p. 188). Indeed, in an environment where there is a very small pool of repository experience and knowledge, and few formal education and training courses to widen the pool, it is important for institutions to consider how best to attract and retain repository staff.

Though monetary compensation will always be a factor in recruiting and retaining valued staff, it is notable that respondents rated challenging or interesting work, a supportive environment, recognition of their capabilities and achievements, and job stability over remuneration as factors contributing to job satisfaction. While the repository landscape itself will likely provide the challenge that staff seek, it does not seem unreasonable to suggest that an important way to provide the desired supportive environment is through providing opportunities for training and professional development. Encouraging, and

enabling, staff to gain the skills and expertise they desire will not only benefit them but the institution's repository program as well.

CONCLUSION

Institutional repositories are an evolving and dynamic area in which to work. Repository work requires a specific set of skills and knowledge that can be difficult to find. Almost 100 percent of survey respondents had completed a higher education degree; yet the majority began their roles without having learned about digital repositories through an academic curriculum. While enhancing academic curriculum may be helpful, there is also a need to develop formal, recognized training opportunities outside of degree programs.

The need for this preparation is evident in the gap between training needs and the provision of formal training at the commencement of a position. The vast majority of respondents received informal training, including self-training, as the primary method to improve the skills and knowledge required to conduct their job satisfactorily. As an emerging and evolving profession, repository staff would benefit from tailored formal training at the commencement of a position in addition to ongoing training (both formal and informal) and skills development.

As with any new knowledge, the data provided from this study will only be meaningful if they are actually used to inform — and change — current practices. It is hoped that this research will be used to facilitate staff recruitment, development, training, and retention strategies. Potential uses of this data include:

1. *Creation of appropriate job descriptions.* The identification of skills and knowledge required to work on a digital repository could be used to create a template for job descriptions (such as that produced by SHERPA U.K.), which would include not only pre-requisite skills or knowledge, but also specify ongoing support for formal training at regular intervals once in the position.
2. *Creation of new educational opportunities to meet identified needs.* There is a potential role for service providers in facilitating training and knowledge development, for example, through the sponsoring

of workshops and/or sharing information about courses.

3. *Guidance for development of internal training.* Institutions could use the research to benchmark the training needs of new and ongoing repository staff and to inform training strategies.
4. *Development of academic curriculum.* Educators or providers of repository courses could use the results to inform and shape course content.
5. *Coordination of existing training opportunities.* Staff within the repository community could collaborate to create a clearinghouse of training opportunities related to the core skills/knowledge sets identified in the study.

While this study does provide useful information, further investigation in this area is also warranted. It is recommended that future studies of repository staff expand on the training questions from this survey. This would allow further exploration as to why such a small percentage of repository staff undertake formal training, the degree of effectiveness of various types of informal training, and the preferred modes of training delivery for different skills. In addition, it would also be useful to explore the demand for, and utility of, a formal certification or training program, both from the perspective of front-line repository staff and the administrators who hire them. Regardless of the focus of future research, however, the objective should remain the same: identifying how best to prepare, and support, the repository staff who will be vital to the success of repository services as they continue to evolve and mature.

ENDNOTES

1. For the purposes of this paper, institutional repositories are defined as “digital collections capturing and preserving the intellectual output of a single or multi-university community” (Crow, 2002, p. 4).
2. The authors of the Italian study kindly provided a pre-print copy of their article in 2011.
3. Click on “Log in as Guest,” which will activate the anonymous login.

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CORRESPONDING AUTHOR

Joanna Richardson
Associate Director, Scholarly Content and Discovery

Information Services
Scholarly Information and Research
Griffith University
Nathan Campus
170 Kessels Road
Nathan, QLD 4111
Australia

j.richardson@griffith.edu.au