“Making space” in practice and education: Research support services in academic libraries

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ABSTRACT
Introduction. How academic libraries support the research of their parent institutions has changed as a result of forces such as changing scholarly communication practices, technological developments, reduced purchasing power and changes in academic culture. We examine the professional and educational implications of current and emerging research support environments for academic libraries, particularly with regard to research data management and bibliometrics and discuss how do professionals and educators “make space” as new service demands arise?
Method. The present paper uses data from a recent survey of research support provision by academic libraries in Australia, New Zealand, the UK and Ireland, (Corrall *et al.,* 2013), and provides additional in depth analysis of the textual responses to extend the analysis in the light of forces for change in higher education. The original online questionnaire surveyed current and planned research support in academic libraries, and constraints or support needs related to service developments. It was distributed to 219 institutions in Australia, New Zealand, the UK, and Ireland, and obtained 140 valid responses (response rate of 63.9%).
Analysis. Results were analyzed using descriptive statistics with thematic categorization and coding for the textual responses.
Results. Most academic libraries surveyed are already providing or planning services in the focal areas of bibliometrics and data management. There was also increasing demand for other research support services, not the focus of the study, such as eresearch support, journal publishing platforms, and grant writing support. We found that while many academic libraries perceive increasing research support services as a “huge opportunity” they were constrained by gaps in staff skills, knowledge, and confidence and resourcing issues. With regard to staff education and training, it was reported they require a broader understanding of the changing research and scholarly landscape, the research cultures of different disciplines, and technological change. There was a near-universal support for development of more comprehensive, specialized, LIS education to prepare professionals for broader research support roles.
Conclusion. This further analysis of the implications of our survey in relation to influences such as economics, academic culture, technology, raises questions for both educators and practitioners about the future direction of the profession and how we collectively “make space” as new potential services arise.

Keywords Academic and research libraries, Research support services, Research data management, Bibliometrics

Paper type Research paper

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INTRODUCTION

The role of academic libraries is to support the teaching and research of their parent institutions. How they do this has changed radically during recent years as a result of changing scholarly communication practice, developments in technology, and reduced purchasing power (Auckland, 2012; Ball and Tunger, 2006). The role of education is varied, but in the context of education for a profession or field such as library and information science (LIS) a key purpose is to impart knowledge and skills in order to enable individuals to become responsible and employable professionals. Through education individuals become better informed about themselves, their environment, the discipline and/or profession which they wish to practice. LIS is a field which engages in teaching and research about libraries, information and documentation as a domain in its own right (Hjørland, 2000). It is our contention that education should take into consideration the needs of the profession, as well as discipline-specific academic needs. Trends in professional practice need to be examined and responded to by educators in order for education to be relevant. It is this viewpoint that has informed our writing—that is, we are building the discourse in this paper not only on our analysis of data collected in a specific context, but also on the analysis of some wider trends in the profession, in particular in academic librarianship.

In universities we find increasing emphasis on financial accountability, and this trend is reflected in the academy in many ways. Examples relevant to this paper include the use of bibliometrics for research evaluation by governments, other research funders and by university administrations as one way of assessing the quality of research outputs and for justifying proposals for future research expenditure by institutions or an individual. Similarly there is recognition that data collected in the academy as a part of research have value, beyond their original purpose, and need to be better described, curated and stored – managed for the longer term (Tenopir *et al.,* 2012).

As researchers and university administrators increasingly understand the demand for bibliometrics and research data management (RDM) in their suite of research services, academic libraries are taking up roles in these areas. A recent paper by reports on a survey of the bibliometrics and research data support activities of 140 libraries in Australia, New Zealand, the United Kingdom (UK), and Ireland (Corrall *et al.,* 2013). That paper explored the following research questions at a high level:

RQ1, What specialist research support services are academic libraries offering and planning to offer in the future in Australia, New Zealand, Ireland, and the UK?
RQ2, Are libraries and library staff constrained in providing specialist research support services?
RQ3, Do library staff require additional education, training and support in their research support roles?
RQ4, How might LIS schools respond to the evolving role of research support services in academic and research libraries?

The present paper builds on and extends this previous work by identifying and discussing issues arising from the above study, particularly addressing RQ3, and beginning to address RQ4, which have implications for the education and training of academic librarians in research support services. A distinctive contribution is that we approach these questions from the point of view of practitioners and what they are currently doing or planning to do, in order to understand educational needs.

LITERATURE

Forces for change in research support services

There are many important forces at work in academia including (1) academic culture, (2) economics, and 3) technology (Becher and Trowler, 2001). Following is a brief discussion of these trends and their influence on academic research practice and therefore on the practice of academic librarians. While academic culture may vary within different disciplines, there are also external forces which influence overall academic culture. These include the "evaluative state", the "slide to performativity" and the need to "chase the dollar" (Becher and

Trowler, 2001). These forces influence the work of faculty and those who support academic work such as university administrators and academic librarians. The issues covered in this paper relate to academic culture in two ways. First, in that academic libraries, the subjects of this research, are increasing their research support services in varied ways, in response to their perceptions of the changing needs of the academy; and second, in that LIS educators, also influenced by academic culture, have to then consider how they might respond to the changing needs in the profession, in particular academic librarians, as well as to the changes and challenges in their own environment as faculty.

Academic culture has been evolving with a particular emphasis on increased accountability, increased casualization, increasing emphasis on producing research outputs (e.g., publications and grant applications), increasing distance education, and an increase in overall number of activities that an academic staff member has to perform (Fitzgerald *et al*., 2012). Unstable economies and increasing global economic crises have constrained the ability of governments to fund research and education. Tightening federal treasury vaults lead to increased accountability for funding, and increased accountability has seen requirements for more documentation and use of a multitude of indicators (including metrics) to justify expenditures, appointments, and promotions. For individual faculty, their institutions and research funders it has meant collection of evidence concerning their productivity, and hence the role of librarians as bibliometricians, documenters, and informationists has become very important in this emerging administrative and academic landscape (e.g., Adams, 2007; Drummond and Wartho, 2009; McColl, 2010).

Research is also increasingly engaged with technology and enhanced by high performance computing, the development of general and discipline-specific data repositories, virtual laboratories and other shared technology-rich research infrastructures, known under several broad umbrella terms, such as 'eResearch', 'Digital Humanities', 'eScience', eSocial Sciences' 'Cyberinfrastructure', 'eInfrastructure', 'and 'The Grid' (Markauskaite *et al.,* 2012). The increasing engagement of researchers with research technology has also influenced the work of academic librarians. The importance of changes in technology as a major driver of change in academic libraries has been covered by many (e.g., Auckland, 2012; Crowe and Jaguszewski, 2010). Increasingly the involvement of academic libraries in eResearch has been seen as a natural extension of their electronic resource management and digital stewardship responsibilities. Libraries have been able to connect digital RDM with historical and contemporary areas of professional practice, including materials selection, metadata creation and collection management; reference services, information literacy and research consultation; and scholarly communication, open access and institutional repositories (Auckland, 2012). However, librarian involvement is also questioned by some because of the level of technical know-how and domain understanding required (Swan and Brown, 2008).

Just as there has been an emphasis on accountability in research funding, so there has been a push to better manage and share research data. This has come about for a number of reasons; technological as discussed above, but also for reasons of accountability. It is increasingly important to manage, store, describe and share research data. The characteristics of data that are particularly relevant here include that data:

1. Are expensive to collect and therefore publicly funded research should be publicly available (Murray-Rust, 2008).
2. May be unique, e.g., represent a snapshot in time or space (Henty *et al.,* 2008).
3. Can be re-used to reproduce and validate original findings, to advance the original research or to open another line of enquiry (Witt, 2008).
4. Can also contribute to answering questions which may require inter-disciplinary problem solving (Cragin *et al.,* and Witt 2010).
5. May be used to examine a phenomenon from different epistemic or social perspectives (Markauskaite, 2010).
6. May need to be collected from a variety of sources, beyond the scope of one research team, time or location (Borgman, 2007).

Altruism and the potential for new collaboration opportunities may motivate some researchers to share their data, but until recently there have been no explicit or tangible rewards for doing so and researchers report it as low on their list of priorities (Henty *et al.,* 2008; Markauskaite *et al*., 2012; Tenopir *et al.*, 2011). More recently research funders are requiring grant applicants to submit data management plans appropriate to their research, so there is likely to be increasing demand for assistance in this area (Tenopir *et al.,* 2012).

While these new academic "duties" – e.g., providing bibliometric evidence of research quality and/or use, and managing and curating research data – are becoming increasingly required, at the same time financial support for education and research has became increasingly competitive with overall decreasing government funding (Barr, 2004; Nicholas *et al.,* 2010). It can be suggested that decreasing state funding, a drive towards accountability, and budding technological changes are presenting a milieu in which academic libraries are leaning towards providing new research support services, and at the same time challenged to resource them.

The profession and jurisdiction

Academic disciplines which have an associated profession cannot operate solely as a part of academic culture; a more integrative approach is desirable (Sabelli, 2010). An awareness of what is actually going on in the profession must also exist. Similarly a profession cannot operate without an academic discipline. If we consider the five attributes attributed to a profession (Greenwood, 1957): (1) systematic theory, (2) authority, (3) community sanction, (4) ethical codes, and (5) a culture, and what Abbott (1988, 1998) terms a profession's "jurisdiction", then we acknowledge that these are conferred within the structure of an education, most commonly at the university level and providing some kind of certification. A profession can also be described as "…a vocation in which professed knowledge … is used in its application to the affairs of others, or in the practice of an art based upon it" (Hughes, 1963). Being a professional enables people to put into practice their knowledge and skills, and subsequent experience, in order to provide services to individuals, their communities and society.

Since the 1980s librarianship has been viewed as one of several information professions that exist in a turbulent environment in which other professions and academic disciplines vie for what librarians have seen as their traditional jurisdiction (Abbott, 1998; Van House and Sutton, 1996). Claiming, maintaining and re-claiming jurisdiction is an on-going task for a profession (Kennan *et al*., 2006). Macdonald (1995) characterizes these tasks as being a significant element in the "project" that professions engage in to maintain their identity. The resilience of the LIS core jurisdiction is apparent despite pressures to erode it (Cox and Corrall, 2013). In addition, previously clear boundaries between librarians and other information professions such as archivists and records managers have blurred (Cox and Corrall, 2013). Educators need to pay attention to these emergences and convergences, and related shifts in roles and services, and ensure that courses prepare students for current and emerging roles.

Education

An education provides students with the ability to acquire new skills, flexibility in times of change and a commitment to lifelong learning. But as students become new professionals they also need specific skill sets to get work (Ferreira *et al.*, 2007). This conundrum between learning to learn and learning particular competencies and skills has led to debates about what should be included and should not be included in LIS curricula as core and/or elective, with too vast a literature to be reported here (e.g., Corrall, 2010; Dillon and Norris, 2005; Gorman, 2004; Partridge *et al.,* 2011; Tenopir, 2000; Van House and Sutton, 1996).

If we look at the subjects covered by our survey, recent literature reports very limited coverage of bibliometrics in LIS education in North America (Zhao, 2011) and no courses teaching informetrics methods in Australia (Davis *et al.,* 2005). What coverage exists appears to be focused on collection management and theory rather than on ways of offering

innovative services in libraries (Zhao, 2011). We note a disconnect: while bibliometrics is a prominent research field in LIS, it is little taught and appears in few research methods texts, or texts aimed at assisting librarians to use informetrics in practice (Corrall *et al*., 2013).

The education of LIS professionals for roles in RDM has been more prominent in recent literature (e.g., Corrall, 2012; Henty, 2008; Pryor and Donnelly, 2009; Swan and Brown, 2008). However, the role for LIS professionals here is complicated by the breadth and depth of the technical, contextual and other competencies required. Librarians, archivists, records managers and other information professionals have the information management skills to which skills in data management are related and can usefully be added. However, in surveys conducted by JISC (historically, JISC stood for Joint Information Systems Committee but is now a company known as JISC) and RIN (the Research Information Network) (Pryor, 2012), researchers perceive that in order to properly manage data, data managers/librarians require a substantial level of disciplinary and research process knowledge. Such attitudes pose a challenge for information professionals working in the data management space. Nonetheless, in the US and elsewhere, there are LIS schools offering various subjects, courses and specializations in RDM, including to students from other disciplines (Corrall, 2012; Harris-Pierce and Liu, 2012).

Bringing it all together

After examining some of the forces for change in academia broadly, the literature and our experience tell us that these forces are having an effect on academic libraries, the professionals who work within them, and the kinds of research support services they offer to individual researchers and their institutions. These services are changing and evolving. And when new services are offered that require different and new knowledge and skills, these create a demand for education and training, which survey responses indicate are not being met (authors; Tenopir *et al.,* 2012). The present paper uses data from a recent survey of research support provision by academic libraries in Australia, New Zealand, the UK and Ireland, to extend analyses of responses in the light of these forces with particular reference to the education and training needs expressed.

METHOD

This study takes a pragmatic approach to explore what is actually happening in academic libraries and makes use of both quantitative and qualitative data in order to analyze and unpack respondents' views about research support services in academic libraries. An online questionnaire was chosen as the data collection tool as the objective was to describe and understand the current state of research support services in academic libraries in multiple locations in a relatively short period of time. Australia, New Zealand, the UK, and Ireland were selected as sample countries as: 1) the first three have national research assessment exercises which are being seen to influence the research of academics and thus the work of academic librarians (Steele *et al.,* 2006); 2) while there has been more work formally reporting on the development of research support services in North America (c.f. Soehner *et al.*, 2010; Tenopir *et al.* 2012), there was little baseline data in these four countries; and, pragmatically, 3) at the time of the survey, these were the countries of the researchers. The literature and discussion with academic librarians informed the development of the questionnaire which was submitted to the funding institution for ethics approval, which was granted in December 2011. The instrument was pilot tested with four senior academic librarians in research support roles from four different institutions in Australia and the UK in January 2012, and then modified in the light of feedback.

Data Collection

The questionnaire contained thirty-five questions, mainly multiple-choice, with many questions also containing fields in which respondents could provide free text responses as further explanation. It was arranged in four main sections: 1) About you and your organization; 2) Research support services – Bibliometrics; 3) Research support services –

RDM; and 4) Research support services – Future plans**.** The sample of academic libraries in Australia, New Zealand, the UK, and Ireland was identified through the membership lists of the respective national organizations: the Council of Australian University Libraries (CAUL), the Council of New Zealand University Librarians (CONZUL), the Society of College, National and University Libraries (SCONUL) in the UK, and the Consortium of National and University Libraries (CONUL) in Ireland. The questionnaire was distributed using SurveyMonkey in February 2012 via personally addressed emails to targeted contacts identified as being responsible for research support services. One hundred and seventy-four responses were received from 219 potential respondents. Following data integrity checking, data were cleansed of thirty-one largely empty records and three duplicate records. One hundred and forty valid responses were analyzed. Valid response rates varied between countries (see Table 1). While the response from the UK is out of line with the rates for the other countries, it is still a good response. (It may be partly explained by the different profiles of the membership organizations used to construct the sample: SCONUL membership includes a significant proportion of higher education institutions that do not have a strong research focus.)

Table 1: Library response rates by country

	Australia	**NZ**	**UK**	**Ireland**	**Total**
No. of institutions	39	8	163	9	219
No. of responses	35	8	88	9	140
% response rate	89.7	100	54.9	100	63.9

Data analysis

Descriptive statistics were used to analyze and report on most of the survey questions. Comments in the text boxes were also categorized and coded thematically by the researchers. Categories were created for the free text responses in each question by one researcher. Reponses were then coded to the categories, and both categories and codes checked by another researcher. Counts of the most frequently mentioned terms are used in reporting the findings; however, not as a "quasi-statistical rendering of the data", but more as a description of patterns found in the data and then confirmed by counting. Sometimes a quotation from participant responses is reported as a "meaningful essence" that exemplifies responses for that question (Williamson *et al*., 2013). Aggregated findings are mainly reported here, as while there are some interesting between-country differences, which are reported in our earlier paper (Corrall *et al.,* 2013), most of the results for the education-related questions are not sufficiently dissimilar to justify additional breakdowns of the data.

FINDINGS AND DISCUSSION

The study from which this paper is further developed (authors) confirmed the growing involvement of academic libraries in providing bibliometrics research support services to researchers with, for example citation reports for grant applications, promotions and tenure, and impact calculations for academic units and also at institutional level, as well as training and guidance for individual researchers and research groups. Lower levels of current involvement in RDM were reported by the libraries surveyed, but many expressed plans for significant expansion of RDM services with priority assigned to assistance with technology, infrastructure and tools, support for data deposit in an institutional repository (IR), and development of institutional policy to manage data. When asked about factors which constrain the development of research support services (Table 2), the most common constraints identified were knowledge and skills gaps among library staff and a lack of confidence surrounding their expected roles in both RDM and bibliometrics.

It is interesting to note that while RDM services are relatively new and bibliometrics, in one

way or another, have been a part of the role of librarians for some time, there are gaps in the knowledge, skills and confidence in both areas which libraries saw as needing to be addressed. Another interesting finding was that a significant number of libraries in all countries regarded *differing levels of demand across departments/schools* and *differing specialist needs* as the third and fourth most important constraint in developing both services, implicitly suggesting that understanding and working with these differences poses an important challenge for information professionals. Thus, not just RDM or bibliometrics may need to be a part of the curriculum, but also an understanding of the environments, needs and research methods and processes of different research communities, or "tribes and territories" and their associated academic and research cultures (Becher and Trowler, 2001).

Table 2: Constraints on RDM and bibliometrics service development

	Bibliometrics		**RDM**	
	No.	**%**	**No.**	**%**
Staff need additional knowledge/skills	**99**	**73.3**	**101**	**76.5**
Staff need additional confidence	**88**	**65.2**	**84**	**63.6**
Differing levels of demand	81	60.0	59	44.7
Differing specialist needs	74	54.8	65	49.1
Not a priority	42	31.1	40	30.3
Not perceived by others as a library role	20	14.8	50	37.9
Other (please specify)	39		39	

While bibliometrics and RDM were seen as rising service demands in the comments field, resourcing issues were frequently mentioned as a major constraining factor:

> "The need is extensive, resources are limited, particularly people"

Funding to higher education is limited and resources must be judiciously deployed. Academic libraries cannot offer all possible services, and so understanding of research and scholarly processes, the higher education environment, and their own institution are critical in decision making. Similarly LIS educators cannot offer courses in every possible subject. Knowledge of the requirements of constituencies must inform decision-making.

Current staff education and training for Bibliometrics and Research Data Management

The survey found increasing growth in bibliometrics and RDM services in academic libraries. Participants were asked questions about the education and training their staff received in bibliometrics and research support services. Table 3 shows the percentages of responses for each source of education for both bibliometrics and RDM. (Note: respondents were able to select more than one category in each case.) Notable was the very small percentage of respondents whose staff came to work prepared by their LIS or other education for bibliometrics (15.5%) or RDM (slightly higher at 28.6%). Most libraries reported that their staff learn their bibliometrics and RDM knowledge and skills *on the job* (around 80 percent across all four countries) or through in-house and self-training, with relatively low proportions reporting professional or other pre-service education as the source of staff knowledge and skills. However, interesting differences in terms of predominate types of training between these two services were found. In the case of bibliometrics *in-service training or seminars* was considered as the second most important source of training whereas in RDM *self-training* was identified as the second most important.

In the free text field for these questions, two of the "other" responses for RDM training and education in Australia mentioned training through the Australian National Data Service

(ANDS) national initiative (Treloar, 2009). We note that a number of services provide self training modules such as the Digital Curation Centre (DCC) in the UK and DataOne in North America. Also a distinct source of RDM training was mentioned—specialized research projects involving an in-built training component—which did not find any mention in the case of bibliometrics training. All of the other responses, for both bibliometrics and RDM, referred in one way or another to these being areas of development, so education and training needs were still being assessed.

For bibliometrics "vendor training" was the most frequently recurring theme in the free text field - *in-service training* or *seminars* were provided by vendors of well-established bibliometrics services. Another source of training was the research office within a university. With regard to this question in particular it is important to note an important between-countries difference for training for bibliometrics. Specifically, self-training was regarded as the second most important source of training by libraries both from Ireland and the UK (100% and 80.6% respectively) whereas in Australia (67.7%) and New Zealand (50%) far fewer libraries considered this an important source. It is possible that economic circumstances characterized by budgetary tightness both in Ireland and the UK has led to self-training emerging as the second most important source of training for bibliometrics, and this warrants further investigation.

Table 3: Sources of education and training for bibliometrics and RDM
(Note: more than one response possible)

	Bibliometrics		**RDM**	
	No.	**%**	**No.**	**%**
Learn on-the-job	98	84.5	79	80.6
Are self-trained	89	76.7	63	64.3
Within the library: in-service training or seminars	74	63.8	53	54.1
Library-funded external professional development	46	39.7	55	56.1
Prior to joining the staff: part of their LIS or other education	18	15.5	28	28.6
Other (please specify)	16		14	

Need for bibliometrics and RDM education

However, libraries were not necessarily satisfied with these high levels of self training and on-the-job learning. Table 4 indicates that more than a third of libraries identified a need for more formal education and training in both bibliometrics and RDM as a part of the core curriculum of LIS students. Around 60% think that education in both should be offered as an elective unit of study. Very few see it as unimportant. The majority of libraries call for both bibliometrics and RDM as elective units, perhaps signifying that these are specialist areas rather than areas of importance for all librarians. Also noteworthy is the expressed preference, in both cases, for continuing education to be provided as external training and education, perhaps providing LIS academia with an important opportunity to develop partnerships with the profession for providing customized training and education, and possibly contributing some funds to LIS Schools.

Table 4: Need for bibliometrics and RDM education/training

	Bibliometrics		RDM	
	No.	**%**	**No.**	**%**
As preparatory education				
Yes – core curriculum	46	33.3	53	39.3
Yes – as elective unit	85	61.6	79	58.5
No	7	5.1	3	2.2
As continuing professional development				
Yes – as external training	88	63.3	94	70.1
Yes – as in-house training	46	33.1	39	29.1
No	5	3.6	1	0.7

Whether these opinions are formed from libraries' own exposure to the emerging needs for these services in the profession, assessment of the skills set of recent LIS graduates, or self assessment of their own skills acquired either recently or in the past, is worthy of further investigation.

Additional knowledge required for Bibliometrics and Research Data Management Services.

Having identified a need for further education and training, libraries were asked about specific knowledge and skills required. For bibliometrics, the majority of participants regarded *knowledge of bibliometrics tools and techniques* (93%) as the most important area of requisite knowledge, followed by *knowledge of different purposes and applications of bibliometrics* (87.5%) (Table 5). A possible reason for the libraries to place more weight on these two choices can be the underlying practical reasons for which bibliometrics are used. Bibliometrics can be used for many different purposes, even within the research support frame, for example for research evaluation, collection development, benchmarking, in support of tenure, promotion and job applications. In three of the four countries surveyed, there is a national system of research evaluation, in which citation and other measures of impact increasingly play a part, either directly or indirectly. Also interesting is the high level of reported need for skills in quantitative methods and statistics.

Table 5: Additional bibliometrics knowledge and skills required by library staff
(Note: more than one response possible)

	No.	**%**
Knowledge of bibliometrics tools and techniques (e.g. citation analyses, impact factors and associated indices)	119	93.0
Knowledge of different purposes and applications of bibliometrics (e.g., research evaluation, collection development, benchmarking)	112	87.5
Skills in quantitative methods and statistics	104	81.3
Subject and/or disciplinary knowledge	49	38.3
Other (please specify)	12	

For RDM, data curation skills were considered the most important knowledge area required (90.2%). Technical and ICT skills were considered the second most important, followed by knowledge of research methods. Knowledge of research processes (79.7%) and research methods (67.5%) as a requirement for working with RDM, may tie with the expressed need

for quantitative methods and statistics in the bibliometrics question. While subject or disciplinary knowledge ranked lowest, a sizable proportion (43.1%) of libraries still saw it as valuable (see Table 6).

Table 6: Additional RDM knowledge and skills required by library staff
(Note: more than one response possible)

	No.	**%**
Data curation skills	111	90.2
Technical and ICT skills	97	78.9
Knowledge of research processes	98	79.7
Knowledge of research methods	83	67.5
Subject and/or disciplinary knowledge	53	43.1
Other (please specify)	10	

For bibliometrics, although only a small number of libraries added textual responses to this question those that did provided insight. For example, libraries stated:

> "Currently lacking is a broad understanding of international league tables and the context in which they're created and used – a holistic view"

> "... primarily library staff need to know how they [bibliometrics] might be applied in the wider university context so knowledge of different purposes would be key..."

> "Subject and background knowledge … sufficient to have credibility when working with academic staff ..."

These comments indicate that while practical knowledge (tools, techniques, and applications) is important, a broader understanding of the context, including the academic environment in general, and research processes in particular, is equally important for library staff to successfully perform bibliometrics services. In the textual comments in the RDM area, participants also mentioned the importance of a knowledge of policies (e.g., copyright, open data, ethics), of broader aspects of RDM, and of very specific skills (e.g., metadata, minting of DOIs for research data, and the ability to conduct research data interviews). From a purely curricular standpoint for existing LIS courses, these expressions of additional knowledge and skills required provide an important message: the responding information professionals consider current LIS curricula do not meet their needs in educating them for bibliometrics and RDM.

Demand for research support services not currently offered

To assess if there may be potentially different education and training opportunities, we asked respondents about demands for research support services not yet offered, providing a short free text field. Ninety four libraries responded to this question, and some identified more than one area. Responses were extremely varied. The greatest area of demand was RDM (18), followed by data curation (11), bibliometrics and related services such as citation analyses, altmetrics, and impact measures (10), systematic reviews and/or literature searching (7) and digitization of archives, records or data (4). Nine libraries reported a general growing call for library engagement in the world of research, as exemplified by the following quote:

> "I am aware of a growing need across higher education and believe our Library needs to provide as much support to research as we have in the past to teaching and learning - but it's a slow process to change the perceptions of librarians as to our responsibilities in the University, and to researchers in the wider range of services and support which the Library can provide."

Also interestingly, some reported that there was no expressed demand but:

"…we know that there is a need; users don't perceive that the library might support them."

Many services were listed by three libraries as having a growing demand: data storage, metadata creation for data discoverability, additional institutional repository services such as statistics and reporting, data preservation, and copyright and intellectual property assistance. An even more varied list of services were listed as having growing demand by two responding libraries: services related to data publication, grant application support, research information management, high end tool training, assistance with finding funding sources, NVivo training and support, and assistance with open access issues and requirements. Services with demand reported only by one library include assistance with writing for publication, the development of research project web services/collaborative research environment, assistance with identifying journals in which to publish, assistance with the creation of technical appendices, assistance with data analysis and manipulation, assistance with research method, eportfolio management and development of a journal publishing house.

Clearly some areas of perceived demand arise from technological changes and developments, for example, digitization, high end tool support, and altmetrics, whereas others arise from changes in the culture of higher education. Examples of these latter demands include RDM plans and open access (increasing requirements of funding bodies), and assistance with finding research funding opportunities as the receipt of grants becomes increasingly important (and competitive). Providing these services will require librarians to have acquired a broad understanding of the scholarly, research and higher education environments and the changes occurring therein. While many of these services fall within what we might generally call a library's "jurisdiction" (RDM, bibliometrics, data curation, digitization, data discoverability and so on) others appear to be completely outside of the existing jurisdiction of libraries, for example, high end tool support, research methods support, NVivo/data analysis training, and assistance with finding funding.

Planning for new research support services

The survey next asked libraries what new bibliometrics, research data and other research support services they were planning to offer. Many responses indicated more than one planned new service for example:

> "Reporting and impact measurement tools with our institutional repository. The completion of our Author Normalized Impact per Paper application. Assisting the Research Office in developing a researcher gateway …"

> "advanced literature review search service and information management for grant applications and funded grant projects"

Of the 87 respondents to this question, 14 reported they were in the process of undertaking a review of their research support services and would be better able to answer this question after the review was undertaken. These responses were expressed in ways such as the following:

> "Part of the challenge for the Library is how we can cover these areas in greater depth and increase engagement with various segments of our researcher community"

Thirty two respondents indicated that they were planning to offer new research data services (variously reported as data management, preservation, storage, curation, archiving and deposit). Fifteen respondents reported new bibliometrics services are planned. As these were reported in various different ways under this category we clustered under "bibliometrics", institutional benchmarking, citation analyses, and research impact studies. Nine libraries reported they were planning on increasing research information literacy. In this category we clustered responses referring to planned graduate research student and post doctoral researcher workshops on getting published, bibliometrics, calculating research impact, copyright, intellectual property, and RDM. Eight libraries reported that they are implementing or further developing their IRs. Further IR developments included the addition

of metrics, facilitating more open access and merging IR functionality with research reporting and/or current research information system (CRIS) functionality. Three libraries mentioned that they were planning to offer support for researchers in grant application preparation, but did not specify what support.

Some planned services not explicitly asked about, but which emerged in free-text responses, were that four libraries are planning to offer either advanced literature review or systematic reviewing services; another four libraries are involving themselves explicitly in eResearch, variously expressed as just eResearch, supporting collaborative technologies, or eResearch infrastructure development. Three libraries are experimenting with new organizational models such as embedded librarians, the establishment of a research and innovation unit, and the creation of a digital humanities post within the library. Three libraries mentioned they would be further supporting open access, not surprising given the increasing move to mandating open access by funders (ARC, 2013; Finch Group, 2012). Another three specifically mentioned that they are increasing their support for author pays open access, again, not surprising given the Finch report (Finch Group, 2012) in the UK. Planned services mentioned by only one respondent included support in qualitative research methods, maps and GIS services, digitization, enhanced online services (netvibes universe and tumblr blog) and journal hosting.

Thus there is a perceived demand, an unmet need, for a wide range of research support services within universities, some of which present an obvious path for libraries and which while providing great opportunity will require more thought from the libraries themselves and LIS educators.

Are these new research support services ongoing?

To ascertain whether these new services are project based, and therefore likely to either require more staff and thus more education and training, or to peter out once project funding ceases, we asked respondents to identify the nature of funding for new services in this area. Ninety five participants responded. Sixty nine percent of respondents indicated that these new services are part of their ongoing services with ongoing funding, 13% of respondents indicated that while these services are currently project funded, they are expecting that after the projects are complete, the services will continue, and only 13% stated that once the projects are complete, they will be unfunded. Comments associated with this question include:

> "These will be core services, and we are restructuring and recruiting to ensure they are embedded, sustainable and prioritized. The REF is a particular driver, but the needs are wider and longer-term" [in the UK, the Research Excellence Framework (REF) is a national research evaluation exercise.]
>
> "We support the ERA requirements as they come up, but other services like repositories, publishing and HERDC support are ongoing. [The Excellence in Research for Australia (ERA) initiative is an Australian research assessment exercise and HERDC is the Higher Education Research Data Collection exercise, covering research publications and income.]
>
> "Initially new services will be connected to particular projects but with the aim of ensuring sustainable processes that become embedded or integrated into service delivery."

In their own words – the future and education and training

Finally, respondents were given a free text space in which to provide any information about the provision of research support services such as RDM and bibliometrics in academic libraries - 60 responded. Some of the responses centered on the current and future role of libraries, the importance of new and evolving research support services:

> "It's a huge opportunity!"
>
> "We are aware that there is a gap between what we currently do and what we could do. I

see research services becoming the single most important area of activity for academic libraries in research intensive universities. … we will add most value by curating and disseminating the original information created by the research activities of our host institutions."

"Libraries have a crucial role to play in research information services. This role needs to be directed by libraries and based on researchers needs, rather than directed by research administrators with limited understanding of services libraries can deliver and the expertise of librarians"

"Research support … is broader and wider than a 'reference librarian's' responsibility; it is a service which crosses library functional sections and divisions and requires a new service paradigm."

Many used this space to reiterate their earlier responses about the need for further education and training of staff, examples below:

"… re-skilling existing staff is an enormous challenge. "Soft" people skills have been prioritized to the detriment of hard knowledge and keeping up-to-date with technology-driven changes in information management."

"This [research support] is an evolving part of our offering and I think dialogue between employers and LIS educators needs to be on-going to ensure we meet current and future needs of the profession."

"I believe these are the areas libraries need to be engaging in, in order to become more relevant. However, there are significant resourcing issues particularly in terms of skills and how to acquire skills when external recruitment is rare … "

And finally, some reported that they have found that the education and training do not need to be formal; involvement in research can lead intuitively to research confidence and thus working with researchers.

IMPLICATIONS AND CONCLUSIONS

The findings of this study suggest that LIS educators should take cognizance of the ongoing changes and prevailing trends in the profession with special reference to bibliometrics and RDM. This is supported by evidence from the literature which indicates that there are significant opportunities for further engagement in bibliometrics, for example, trend analysis, publishing strategies, faculty reviews, grant writing and job applications, similar work to that already conducted by academic libraries, just extending the boundaries. Just as there is a "fit" with existing research support and information management work conducted by academic libraries for RDM. These moves into more active offering of bibliometrics, RDM and other research support services can be understood as responses to the changing academic environment (Swan and Brown, 2008) and also responses to challenges to the LIS profession's jurisdiction (Cox and Corrall, 2013).

This emergence of new specialties is not new – it has occurred before with the emergence of information literacy specialists, of systems and digital library specialists, and IR managers. However, LIS practitioners have often criticized LIS educators for responding too slowly to the emergence of new roles, notably for failing to prepare librarians adequately for roles as information literacy teachers (Peacock, 2001; Walter, 2006) and as digital librarians (Choi and Rasmussen, 2006; Varalakshmi, 2009). It is therefore particularly important that educators consider urgently how best to respond to the present opportunities and challenges. If we think of academic librarianship as being a part of the LIS profession, and of professions as ongoing "projects" that can be enhanced or degraded by the collective decisions of professionals, clients and educators, then we need to think of how we collectively advance the project of academic librarianship by taking advantage of opportunities to make new ground and establish it further. Much of the discussion has addressed what is new and should be taken up, but also needing to be addressed is what

should be dropped to “make space” (Kennan *et al.* 2006), both in practice and in education and training, for the innovations such as bibliometrics and RDM . What can go from the curriculum to “make space” for more advanced education and training in scholarly communication, research methods and processes, RDM or bibliometrics? Or will research support librarianship (or research information management) become a separate path with separate education and training (Swan and Brown, 2008)? This question has implications for accreditation granting bodies, as much as for the academics who teach.

Finally, the survey has focused on two emerging areas of research support (bibliometrics and RDM) in academic libraries, and on the educational and training requirements for those. However we recognize that this narrow scope does not take into account the reasons for, overarching themes of, and interrelationships between research support services within and around libraries. We should not isolate two activities like these from the research support context: we need to be paying more attention to why we offer these services, or even if we should. Is it to support our researchers, our universities, or meet compliance obligations? If LIS faculty and academic librarians do decide that these research support services are to be offered, then we need to ensure that the education and training for these services are available for both new entrants to the field and currently practising librarians who wish to upgrade their skills and knowledge. It is incumbent upon library and information schools to do so, before the need becomes overwhelming; and while some have done so, others are slow to fill the gap. Ensuring that graduating librarians desiring to work in academic libraries are up-to-date in the knowledge and skills required in current and emerging research support environments, enables academic libraries to pay attention to the higher level goals of helping universities and researchers maximize research impact and promote their research.

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