THE QUEST FOR DEEPER MEANING OF RESEARCH SUPPORT

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UCT LIBRARIES

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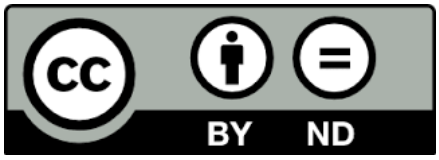

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Foreword

Changing pedagogy and rapid growth of enabling technologies has significantly influenced research trends and processes within the higher education research ecosystem. These changes have triggered a series of positive responses from academic libraries such as the re-evaluation of their approach to research support services. The expansion of the suite of research support services such as bibliometrics, systematic reviews, data management, digital preservation and curation, Open Access and open journal publishing have moved the librarian from the periphery to the epicenter of research support. This transition is viewed by many as revolutionary in terms of support for research production.

The synergical relationship between evolving research processes and evolving research support services consolidates the librarian's critical role in research production and dissemination. This evolution of research service trends has also been influenced by, amongst others, recent open mandates from some funding agencies. The swing in the research pendulum demands a metamorphic role of the academic librarian from reacting to research needs to becoming a collaborative partner in the research journey. Taking a proactive approach to this new role, integral services that are now being offered are: assisting researchers in understanding and managing the data lifecycle (including having data management plans and digital preservation), open scholarship, alternative metrics, competency-based learning and digital humanities. The use of research performance management tools to understand the research landscape, which includes assistance in determining the impact factor and assistance where to publish research results, also form

part of the suite of services academic libraries need to make a contribution to research production at high education.

The International Federation of Library Associations and Institutions' Academic and Research Libraries Standing Committee's preconference was held in Cape Town, South Africa, between 13 and 14 August 2015. The theme of the preconference was *The quest for deeper meaning of research support*. There was a blend of papers with young researchers sharing empirical research information while seasoned LIS researchers and practitioners shared 'best case practices'. The keynote speakers are thought leaders with Ms Tise being a past president of IFLA and Dr Haricombe being a renowned open access advocate.

Ms Ellen Tise, Senior Director of Library and Information Services at Stellenbosch University in South Africa highlighted that librarians cannot only be helping researchers succeed in completing and disseminating their research, but they need to be also contributing to the knowledge creation, using their specialized knowledge and skills. She stated that this research partnership includes active creation and constant engagement with researchers.

Dr Lorraine Haricombe, Vice Provost and Director of Libraries of the University of Texas at Austin gave emphasis to the deeper collaboration between librarians and researchers, which result in librarians contributing to the research productivity and scholarship of higher education institutions. This requires distinctive competencies to engage with faculty, to understand the scholarly communication process, and to leverage technology, thereby embracing the change and empowering scholarship.

The paper by Jeremiah Pietersen and Jaya Raju report on a masters' study that examined the 'look and feel' of a 21st century academic library. The services interrogated include digital curation, digital scholarship, open access and collaboration. Agnes Kanzira and Robinah Kalemeera also share empirical research conducted on the role of the academic library in Uganda, in supporting research through the development of research collections and data repositories, and providing bibliometric analysis, data literacy training and research data management. Notice Pasipamire reported on a study which investigated how subject librarians gain the skills and knowledge required to support researchers in the new research landscape of higher learning institutions in Zimbabwe. Jayshree Mamtora and Gaby Haddow brought a developed world perspective to the programme sharing how librarians support researchers with information and services relating to research impact measures, specifically bibliometrics and altmetrics tools. The exemplar presented by Mike Berrington on restructured services to create a dedicated research support team is a clear demonstration on academic libraries re-evaluating their role and responsibilities within the changing higher education paradigm. Charlotte Beck highlighted the new trend of systematic reviews. The librarian can be an active research partner and demonstrate value by being directly involved in the university agenda by offering this service.

The paper by Matthew Buy's brings to the fore the necessity for the bridge between the developing world and the developed world. Buy's paper examines the need for some commonality of standards that will ensure the easy exchange of research information. The focus of the paper is on the digital ecosystem of research information and the need for the use of standards to facilitate the exchange of data to ensure that the information can flow seamlessly through the ecosystem and be reused to its maximum capacity. The contribution by Elliot Shore and Kathleen Shearer is significant as they share the role of the professional association to provide support mechanisms to promote and accelerate the transformation to greater collaboration and innovation amongst academic libraries.

As academic librarians embrace their role as research partners, embed themselves in the research enterprise by emphasising collaboration and being connected their transition to the epicenter of the research process becomes more pronounced.

Jill Claassen (Scholarly Communication and Publishing Manager, UCT Libraries)

Preface

This monograph is the culmination of months of contemplation as to whether UCT Libraries was ready to launch its open monograph publishing service using the new principle of diamond open access publishing. As one of the hosts to the Academic and Research Libraries Standing Committee of IFLA, the Library was presented with a unique opportunity to pilot publishing quality papers presented at the preconference.

The standard of the abstracts made it incomprehensible not to pursue with the urge to share the ensuing full papers with the largest reading audience as possible. The high quality of the abstract and subsequent papers, and the drive by UCT Libraries to enter the open monograph publishing arena, gave the project the necessary impetus.

The quest for a deeper meaning of research support is advanced on the principle that need for librarians to make the paradigm shift away from reactive 'disseminators' of information to proactive partners in the research and teaching and learning processes. In that transition, the librarians need to provide a wider range of services including the new. The inclusion of services such as research data management, open scholarship, bibliometrics, and systematic reviews as 'mainstream' services has to become the norm as librarians engage the principle of being a research partner or collaborator.

This compilation of chapters is meant to add to the debate that the role and responsibility of the research librarian is changing and the new roles and responsivities need to be

adopted to dismantle the thinking that the role of the librarian is superfluous or redundant. At no time in the history of librarianship is there a more desperate need for the librarian to assist in the determination of 'good' sources and the dissemination of those 'good' sources of information to those communities that are in dire need of information but cannot afford to pay the huge toll fees. This compilation will confirm to the reader that the role of the librarian is changing and if those changes are not embraced then librarianship, as described by Guyton, will be on life-support.

Academic librarianship is at its pinnacle and is also at a crossroad, the choice taken at this point will determine a blossoming relationship with the researcher or the death of the 'bespectacled-buned librarian'

Acknowledgements

The Academic and Research Libraries preconference was the end product of extensive collaboration between the ARL IFLA Standing Committee and the University of Cape Town Libraries. The editors would like to acknowledge the Standing Committee members and in specific, Vicki McDonald, Janet Fletcher, Mimi Calter and Liz State.

The editors would also like to acknowledge the financial support of EBSCO, Thomson Reuters, Sabinet and Digital Science. Their generous financial contributions ensured that as many delegates, especially from developing countries, could attend the preconference.

In terms of the development of the platform, the support from Public Knowledge Project and in specific Kevin Stranack and Michael Felczak, and the training provided. The excellent contribution by the Information Technology Department of the UCT Libraries must also be acknowledged. The contribution of David de la Croes, Gareth Dawson, Wesley Barry and Warren Hansen must be acknowledged. The UCT OMP Project team is also acknowledged. The team includes Jill Claassen, Amina Adam, Busi Khangala Elizabeth Moll, Lena Nyahodza, Jeremiah Pietersen and Tamzyn Suliaman. A special note of acknowledgement for the contributions by Elizabeth Moll and Jeremiah Pietersen who took the lead role in this publication.

Given that the process was double-blind review, the editors can acknowledge, without divulge the name of the reviewers, the massive contribution of the reviewers.

Peer review statement

Each chapter, including the introductory chapter, has been peer-reviewed. The reviewers were Emeritus Professors who have a National Research Foundation (NRF) Rating. The review process was as follows:

- The papers were submitted to reviewers;
- The editors requested authors to correct the manuscripts as per the suggestion of the reviewers;
- The authors, in table format, indicated to the editors how they addressed each of the comments of the reviewers; and
- If the editors were satisfied with the revised manuscript addressed the issues raised by the reviewers, the manuscript was submitted for publication.

The revised papers were then language edited by a third party.

Chapter One

From Research Support to Research Partners

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Abstract

Academic libraries are at the cross-roads. Their relevance depends on the provision of a radically expanded suite of research support services. Rapid advances in the information and communication technologies and the growing demand for the internationalisation of higher education necessitates that libraries explore, adopt and adapt new research support services that transform the librarian from a reactive service provider to a proactive research partner. This transformation compels librarians to engage with a paradigm shift that propagates the provision of new services such as bibliometrics, data management and open scholarly communication.

In an era of data deluge librarians are exploring new roles and services. Bibliometric analysis is being exploited to measure and assess the research impact of individuals, and groups of individuals or institutions. Libraries assist researchers to identify their h-index and the high impact factor journals in their field. They are engaging in new types of collaboration to support data-centric research; guiding researchers in the fast expanding phenomenon of open access publishing, providing repository services and gold open access services such as article processing charges. The concept 'library as a publisher' is gaining traction with librarians playing a much more central role in the publishing process, having shed their reactive reference service role and responsibilities.

Keywords

Research support; research partner; bibliometrics; open access; data management; research data management; RDM; library as a publisher

Introduction

The provision of new suite of research support services beyond the traditional has now become a priority for academic libraries. The aspiration to extend the suite of research support services is precipitated by rapid advances in information and communication technologies (ICTs) that facilitate the production and transmission of scholarly information and the internationalisation and globalisation of higher education in preparing students for productive citizenship in an increasingly globalised world. Aligned to these changes is the transformation of scholarly communication. Collectively, these changes are fast converting the aspirations into obligations to ensure the efficient delivery of new and innovative services commensurate with 21st century pedagogy and research, and internationalisation.

Many libraries have responded to these changes by developing and implementing new organisational structures. In some instances, academic libraries have introduced different service models to support researchers and research production. Venturing down this road raises a number of questions such as 'does the offering of these new services add value for the researcher?' Another significant question is 'has there been a mind shift from being a supporting service in the research process to a partnership in the research process?'

The authors propose that there are pockets of librarians who are searching for a deeper interpretation of research support and are providing proactive support in the research process. However, there is a dearth of evidence demonstrating that libraries are viewed by the researcher community as key partners in the research process. Despite the lack of awareness on the part of researchers, the authors maintain that libraries are recognised by their principals as major contributors to their institutions in achieving their strategic goals. However, it is the librarians, in the first instance, who need to make the mind shift and be more aggressive in advocating the centrality of the library to the research process and research excellence. Librarians need to do much more in strategically locating the library at the epicentre of the research process – locating the library as a key partner and not just a supporter in that process.

As pointed out by Raju and Schoombee (2013), librarians need to traverse the divide between themselves and the researcher, and locate themselves as partners in the research cycle which starts at the conceptualisation stage and ends with dissemination and preservation. This approach combines collections, professional expertise, subject knowledge, researchers, scholarly communication et cetera and places the library as an equal partner at the core of the research process and the research projects of an institution.

The purpose of this chapter is to highlight the point that academic libraries need to embrace the fact that their roles and responsibilities are changing radically. For librarians to remain relevant they have to make a paradigm shift from a reactive service provider to a proactive collaborator in the research process.

Reconceptualisation of research support

Libraries have traditionally prided themselves on being the stewards and gatekeepers of scholarly information. In the past was there was a scarcity of scholarly information, and librarians were the key to accessing the available information and their expertise in retrieving information made them core to the research process. In the current era of a glut of information and its ubiquitous availability, searching for information is being done increasingly by the researchers themselves, rather than by information professionals. Astrom, Hansson and Olsson (2011) comment that this new information seeking behaviour has removed the librarian from the 'research link'.

The disaggregation of librarians from this link has forced them to move away from using the term 'research support' to mean providing reference services or prescribed resources for

students. Librarians need to move towards developing a new philosophy and the reconceptualisation of 'research support' to highlight support for novel and new research (Parsons 2010; Borchert & Callan 2011; Parker 2012). This reconceptualisation must embody the library's role in contributing to increasing the productivity of research and scholarship.

The core mission of the research library is to connect the library's contribution to the academic mission of the university with the focus being the researchers as opposed to the university as a whole. It is becoming a common practice in Australian academic libraries to appoint research librarians to ensure that they make a constructive contribution to the research process. To rollout these new research support services, Parker (2012) points out that a new set of skills is required. This set includes leadership skills, the ability to approach and communicate with academics, willingness to learn and experiment with different ways of promoting library services and excellent written and analytical skills. However, there are specific skills related to research support that require mastering in order to provide the envisaged collaborative research support services.

Transition from supporter to research partner

Monroe-Gulick, O'Brien and White (2013) assert that the librarian is a 'partner' in research rather than a 'supporter' of research and this is an area of academic librarianship that needs further exploration and emphasis. These authors quote Law's (2010) argument that 'librarians now are much less clearly partners in the academic enterprise and much more a provider of services in an increasingly hierarchical relationship.' The concept of being a partner can be interpreted as not only helping researchers succeed in completing and disseminating their research, but also contributing to actual knowledge creation using the specialised knowledge and skills which librarians possess. The definition of partnerships should include this proactive creation and active engagement in the research process and not simply passive support.

In pursuing an agenda to provide new services to support research, academic libraries need to reconceptualise 'research support services'. This need is succinctly summed-up by Parker (2012) who posits that research support services should be planned strategically and applied systematically, rather than on an ad hoc basis for the individual researcher who visits the library. Her view is that the haphazard roll-out of new research support services solicits negative impact.

This negative impact is evident in the United Kingdom (UK) and United States of America (USA) where there is evidence to show that the 'uncoordinated' provision of research services has solicited mixed messages from researchers about the value of the libraries' research support services. The Research Information Network Report (2007) reveals conflicting views among researchers, librarians, and library directors on the relative importance of suggested future roles for librarians. The point of departure is that library staff attach more importance to information literacy teaching, metadata management, and copyright advice than researchers do. Nonetheless, there is consensus that the library has responsibility for the custody of special collections, institutional repository management, and e-resource administration. MacColl and Jubb (2011) point out that a survey conducted in the UK found the library's role in e-resource procurement was increasingly valued, but that faculty were unlikely to consult a librarian in person, visit library service points, or search online catalogues. Researchers in the UK and USA concluded that 'researchers have little interest in the support services libraries have built for them in recent years, yet they are aware of support needs that are not being met' (MacColl & Jubb 2011: 10). Hence the need for strategically planned and applied research support services becomes ever more critical.

Garner (2006) presents the Research Services

Unit (RSU) at Curtin University as an exemplar of a planned and systematically applied research support service giving credence to the assertions made by Parker (2012). Garner (2006: 38) says that the purpose of the Research Services Unit is to 'proactively support the growth and development of research activities at Curtin University by providing high quality resources, supporting research processes, facilitating scholarly communication and promoting research output'.

The new research support services, located in the purpose statement of RSU at Curtin, are indicative of services that need to be rolled-out at higher education institutions. These services are commensurate with the changing higher education landscape with research increasingly becoming a collaborative global activity enabled by the internet. The library's support for research must be firmly located within this paradigm which more often than not would be immersed in the strategic plans of the institution. For the library to be embedded in the new higher education landscape, it has to ensure that its proactive services will command a partnership relationship as opposed to a reactive and 'peripheral support service' relationship.

The librarian in a changing information landscape

As mentioned by Garner (2006), the services provided by Curtain University are a positive response to the changing higher education and information landscape. One of the significant trends influencing this landscape is the radical transformation of scholarly communication. Another significant trend is management of research data. Developments such as cloud computing, open access (OA) publishing and online social networking have had significant effects on research practices and research dissemination (Bourg, Coleman & Erway 2009). The convergence of these trends has resulted in researchers drowning in a deluge of raw data and published information. Researchers have to acclimatise themselves to the available options for disseminating and sharing their work. The choices researchers are forced to make have implications for intellectual ownership, potential audiences, ways of measuring impact, potential re-use, and long-term preservation.

Bourg, Coleman and Erway (2009) assert that while it is argued that academic libraries are playing an increasingly important role in scholarly research, others fear that they are on the brink of extinction and must change radically to survive. It is time to rise above the extinction debate, and take a fresh look at the role of academic libraries in supporting research. The authors assert that the changing information environment necessitates that academic libraries take on new roles, provide new services, build new partnerships and work more closely with researchers as research partners.

The authors posit that these challenges have to be mediated by skilled professional librarians. However, for the librarian to be successful in assisting the researcher they themselves need to make the mind shift away from reactive reference services to proactive research support services. They need to negotiate the 'academic-research' barrier and locate themselves as partners in the research life cycle. Academic librarians need to make this paradigm shift and provide innovative services and resources to support emerging forms of research, publishing, and information and data management.

New services

There are a number of academic libraries that are providing new research support services. Further to the Research Services Unit (RSU) at Curtin University, Riera-Quintero, Cuxart and Zuniga-Ruiz (2012) point out that at the Open University of Catalonia a group of research librarians provide support to researchers from the start of the research process to the assessment of their scientific output. This team of research librarians are also used by this university to provide support for its strategic decision-making through the analysis of bibliometric data.

In addition Stagg and Kimmins (2012) ob-

serve that academic libraries are elevating their 'game' and taking on the challenge of providing a suite of 'new' research support services across the disciplines and with complementary research support divisions at universities. The growing suite of services includes, *inter alia*, bibliometric support, advice on repositories and open-access publication, and guidance on the dissemination of research. These are the innate skills of librarians which contribute exponentially to determining the most appropriate method or forum for disseminating research output, thereby elevating the researcher-librarian partnership status.

Bibliometrics

Ocholla (2007) advances the view that it is generally accepted that the primary purpose of publishing research results is to complete the research cycle. The research process is completed when the results are read by fellow researchers or the general public. Publishing research results is an integral part of a researcher's professional life. In the current research evaluation system, as pointed out by Raju, Adam and Powell (2015), citations are the only public statement of intellectual recognition of the cited author. For all intents and purposes, citations are an indicator of the dissemination of an article in the scientific community and provide a quantitative system for public recognition of work by qualified peers.

Traditionally, the library has played an important role in collecting, organising and disseminating research output. This role has been the bastion of academic librarianship. However, in the current research environment, the academic library has, in the view of the authors, a lot more to offer the research process through the promotion of the researchers and their research output. One of the ways of doing this is through the provision of a bibliometric service.

Bibliometrics is the statistical analysis of bibliographic data, commonly focusing on citation analysis of research outputs and publications, that is, how many times research outputs and publications are being cited. Further, researchers are using bibliometrics to demonstrate the importance and impact of their research. In an era of tight fiscal control, the demonstration of impact is important as funding bodies are requesting evidence of return on investment. Bibliometric analysis is increasingly becoming mainstreamed as a service provided by the library to measure and assesses the research impact of individuals, and groups of individuals or institutions. Be that as it may, bibliometrics has always been a service provided by academic libraries. However, the level of sophistication of the service has been, at best, very rudimentary.

It is fast becoming an obligation for research librarians to extend their 'service-reach' by exploiting the capacity of bibliometric tools to assist researchers identify areas of research strength and weaknesses and to identify the top performing journals in a subject area. In terms of the former, librarians can work with researchers, especially emerging researchers, to ascertain emerging areas of research. The current tools available can assist emerging researchers identify potential collaborators or competitors and to identify sources of funding. Further, for emerging researchers, bibliometrics provide substantial guidance as to where to publish.

Drummond and Wartho (2009), Riera-Quintero, Padrós-Cuxart and Zuñiga-Ruiz (2012), as well as Bradbury and Weightman (2010), expand on the role of the librarian to include bibliometrics as a research evaluation service. They point out that there is evidence to show that many librarians have stepped forward to help negotiate the landscape of both traditional impact metrics and emerging web-based alternatives. The alternative metrics used to measure value of research output is in its infancy. Lapinski, Piwowar and Priem (2013) advance the view that as altmetrics mature, libraries will help to facilitate an informed dialogue with the various constituencies that will intersect with altmetrics. Such constituencies include both researchers (students and faculty) and the aca-

demic administrative office (faculty affairs, research and grants, promotion committees, et cetera).

At South African academic libraries that do provide a bibliometric service, researchers are assisted, as mentioned above, with using metrics to support decision-making about where to publish. Librarians also assist researchers with queries relating to h-index, journal impact factor (JIF) and journal citation reports. Such support often involves assisting researchers when they make applications for research rating or when they submit applications for funding. South African academic libraries provide very limited support for altmetrics. In cases where such support is provided, the focus is mainly on Google Scholar Metrics and Google Scholar Citations.

At the University of Cape Town, one of the leading research universities in South Africa, librarians work with the research office to assist the university in its submission of the number of peer-reviewed research outputs to national government. This submission results in a significant financial boon for the university as there are substantial financial rewards for publications in peer-reviewed journals and books. The librarians scan the major databases, including citation databases such as InCites and SCOPUS, for UCT research output and make the results available to the research office to facilitate the claiming of research rewards. Librarians also work with faculties to provide citation count analyses of scholarly output of researchers and academics over a defined period. Data generated for the faculties include scholarly output per researcher, citation count, h-index, field weighted citation impact and publications in top journal percentiles (Raju, Raju & Johnson 2016).

Data managing

Review of research resources and services offered by the libraries shows that libraries, in the changing information landscape, have moved seamlessly from collectors of published scholarly resources to publishers of e-prints and journals through repositories and e-presses. The debate is whether this is a fundamental departure from the previous traditional role of the academic library or is it a natural progression of the library's role in support of researchers. Providing access to published scholarly resources has been a traditional role of the librarian. The authors argue that providing the technology to access research output is a naturally evolving role for academic libraries: this includes libraries 'publishing' content in repositories.

With regard to digital data Charbonneau (2013) makes the point that a direct derivative of the change in the research landscape is the exponential growth in the volume of data being generated. She elaborates on the importance of the library in this era of data deluge recognising that data is integral to the knowledge base that underpins scholarship, provides insight into the complex world, and informs decisions about the present and the future. Within this changing paradigm, the rapid change in the nature of research has led to a change in the role of academic libraries in supporting data-intensive research. Librarians are exploring the new roles, services and types of collaboration needed to support data-centric research. A further demand for this exploration is the reorganisation, by research funding bodies, of the essential infrastructure and services required to organise and preserve research data. Tenopir, Sandusky, Allard and Birch (2014) maintain that academic research librarians are the most appropriately equipped to provide required research data services such as data management planning, digital curation (selection, preservation, maintenance, and archiving), and metadata creation and conversion.

The 2030 vision of the Association of Research Libraries (2010) and the 2050 vision of the Society of College, National and University Libraries (SCONUL: 2011) highlight the fact that there is a major shift in the use and re-use of data. In these visions, data becomes the critical element for research and the librarian must be skilled to provide the necessary services as mentioned above. Again, these services are com-

mensurate with data becoming the new currency for knowledge creation and innovation.

As pointed out by Tenopir et al. (2013), skilled, knowledgeable and confident librarians will resolve the ambiguity surrounding the roles and specific responsibilities of libraries, researchers, and others involved in the research cycle in managing digital data and other outputs is problematic. Raju, Raju and Johnson (2016) assert that as librarians grow their skills and expertise in data management, they can become uniquely positioned to support data management processes throughout the research life cycle.

Open access practices

As indicated, one of the core services provided by the librarian in rolling out a new suite of research support services is that of providing advice and guidance on repositories and OA publication. The primary purpose of this service is to promote the distribution of scholarly literature for the growth and development of research and society, thus connecting the researcher, society and development. The issue of connectedness highlights the fact that the research process is only complete when the end product is distributed as widely as possible. In this globally connected information society, the researcher is both the user and creator of information or knowledge as access to current information is essential for the production of new knowledge. Hence, OA becomes critical both at the beginning and at the end of the research cycle - from the conceptualisation of the research problem to the distribution of the research findings.

OA practices have significant benefits for research and the researcher in that they have the capacity to improve the visibility of, and equitable access to, research output, thereby impacting on society and contributions to further research. Supporting the issue of improved visibility, the UK's Jisc (formerly the Joint Information Systems Committee: 2013) asserts that:

- Universities must increase the visibility of their research to demonstrate the contribution they make to the knowledge economy, improve their chances in the competition for government research funding and position themselves well to work with industry or third sector partners.
- An open access repository or journal is a way for authors to make their research papers freely available online. Studies have shown that such papers are more frequently cited than those solely available via subscription-based journals.
- Open access benefits not only researchers and their institutions, but the economy and society at large, as the outputs of publicly-funded research are available for all to use.

Reinforcing the need for libraries to provide OA services is Lee-Hwa, Abrizah and Noorhidawati's (2012) view that open access to research makes researchers more productive and research more effective. Further, these authors assert that institutional 'repositories have become a common platform for the academic institutions to store, share, disseminate and preserve knowledge'.

Institutional repositories, as pointed out by Parker (2012), showcase a university's research output and provide equitable access to scholarly literature. She also claims that in many cases, the institutional repository is an exemplar of a (usually library-based) research support service. It suits the needs of both researchers – in providing a single place to manage all of their publications – and the university, as a comprehensive record of its research output.

To assist researchers with disseminating the results of their research through scholarly channels, libraries are increasing their offerings of a publishing service to the research community. This gold route publishing service (institutional

repositories are the green route) [1]is fast becoming infectious. Park and Shim (2011) point out that several libraries have recently launched library publishing services to support scholarly communication dissemination. Some of the libraries that have implemented publishing services include Columbia University Library, Cornell University Library, Duke University Library, Massachusetts Institute of Technology (MIT) Library, and University of Calgary Library. South Africa's academic libraries have also made provision for gold open access publishing services and this is discussed below.

A second tier of support for publishing in OA journals is through the creation of a fund to pay author page fees. Park and Shim (2011: 82) report that Cornell University Library organised a task force on OA publishing through which institutions pay a publication fee for their faculty who publish in refereed OA journals. Likewise, in South Africa, Stellenbosch University (SU) Libraries have developed an OA business model that helps authors publish in OA journals. SU has an article processing charges (APCs) fund. The Universities of Cape Town and Pretoria also provide support for gold open publishing via APCs.

The OA movement has grown by leaps and bounds and research support librarians have been, and still are, at the epicentre of that growth. Riera-Quintero, Padrós-Cuxart, and Zuñiga-Ruiz (2012) state that in this fast expanding OA environment, librarians are guiding researchers on OA publishing and the different types of licences that could be used for their publications. Research support librarians are actively providing advisory services on the different channels for the publishing and dissemination of research results.

South African research support librarians and academic libraries are not exempt from provision of these new services. Four of the 25 South African public higher education libraries offer a hosting service (or act as publisher) for OA journals. Although publishing is compatible with librarians' traditional strengths, there are additional skill sets that librarians have been scrambling to acquire in order to provide robust publishing services to their academic communities. The software that is being used by libraries that are providing this publishing service is Open Journal Systems (OJS). As very early adopters of OJS and having self-taught OJS skills, Stellenbosch University, following the advice of Skinner, Lippincott, Speer and Walters (2014) that new OJS skills are necessary to provide this service, facilitated a training workshop that was delivered by the creators of the OJS software, Public Knowledge Project (PKP). This was the beginning of the OJS skills development in South Africa.

As early adopters, SU has taken the lead and began carving out a path for the use of OJS. Three other academic institutions followed in their footsteps. In October 2011 SU, via the library, launched its SUNJournals platform. This publishing platform currently hosts 20 journal titles.

Raju, Smith, Talliard and Gibson (2012) point out that SU provides a suite of services relating to its role as 'the library as publisher'. One such service is the distribution of unique Digital Object Identifiers (DOIs). As a registered member of CrossRef, an international DOI registration agency, the SU Library has the capacity to assign a DOI to each article. The DOI ensures authenticity, which reinforces the trustworthiness of the journal title. Further, CrossRef also ensures that the DOIs are harvestable by leading harvesting institutions.

The other three universities that offer an open access publishing service are the University of South Africa (Unisa), the University of the Western Cape (UWC) and the University of Cape Town (UCT). Unisa publishes the following five titles via OJS:

[1] Open access is dominated by two streams: the first is that of institutional repositories which is referred to as the 'green route' and the second is publishing directly with an open access publisher. The latter is referred to as the 'gold route'.

- *Journal of Philosophy in Schools;*
- *International Journal for Educational Integrity;*
- *The Journal of Educational Enquiry;*
- *The Journal of Student Wellbeing;*
- *Teaching and Learning in (Higher) Education for Sessional Staff*.

UWC publishes two titles using OJS and these are: *Critical Studies in Teaching and Learning* and *Journal of Student Affairs in Africa*.

UCT has begun its OJS journey with the publication of an undergraduate journal *UR@UCT: Undergraduate Research Journal*. As a research intensive institution, UCT's ambition is to increase the number of postgraduate students through growth in the pipeline of undergraduate students. UCT pursues the principle that research begins at the undergraduate level and hence the objective of this journal is to give undergraduate students an opportunity to get published.

Further, the creation of *UR@UCT: Undergraduate Research Journal* provides a conduit to showcase scholarly output from undergraduate students. The journal is also meant to encourage and explore intellectual capabilities beyond the classroom and provide a forum for the exchange of research ideas. The opportunity to publish in a journal allows undergraduates to explore creating new knowledge and career opportunities in the academic world. Publishing research as an undergraduate provides a bridge between knowledge and experience.

In expanding the scope of its open access publishing agenda, UCT is experimenting with a pilot initiative which publishes OA monographs. Currently, academics at UCT are placing their unpublished monographs on websites for use by fellow researchers and practitioners. The possibility of using Open Monograph Press (OMP) to convert the websites into published monographs has become a distinct reality and is being currently piloted.

The pilot is guided by the announcement by Willinsky (2009) that the OMP software platform is available for use to manage the editorial workflow required for the publication of monographs, edited volumes, and other scholarly editions. The workflow allows for internal and external reviewing and editing. Using open source software, the system is freely available to the academic community, and is designed to reduce clerical costs and supplies, as well as overheads, with libraries becoming involved in hosting the system and scholars able to play a more active role as series editors in the review process. The title, *The quest for a deeper meaning of research support*, is being piloted for publication using OMP by UCT Library.

Conclusion

Bourg, Coleman and Erway (2009) hold the view that librarians must pursue their position as critical partners in the research enterprise by anticipating, understanding, and addressing the challenges and opportunities inherent in new research practices. Their argument is that if academic librarians fulfil their partnership agenda, they will ensure that current and future researchers will have the support they need to navigate and exploit the full potential of evolving digital scholarship. Supporting this view is the proposal by Corrall, Kennan and Afzal (2013) that libraries must design and develop tools to support discovery, offering a new vision for the role of the librarian on campus as research partner and innovator, strengthened research partnerships on campus, and redefined subject specialists to shift their emphasis from collections and reference to 'services'.

None of the new services that libraries are offering (bibliometrics, altmetrics, data management and OA services) are completely new but are now being offered at an unprecedented level that is viewed as revolutionary as opposed as being evolutionary. Librarians are taking on the challenge of providing these revolutionary 'new' services. The fact that in-depth bibliometrics services are becoming mainstreamed and that librarians are maximising their skills and training to provide data management services is testi-

mony to librarians engaging their partnership status. The provision of publishing services including publishing content in repositories and in gold OA journals is simply another level of information dissemination. The dissemination is to a much broader community than that of the institutional users with the 'user' community now being global.

The librarian as reactive reference service provider is fast becoming obsolete. Despite the fact that the transition from reactive service provider is difficult, librarians are embracing change and are taking their rightful place as partners in the research process. The analysis of bibliometrics and the guidance as to where to publish for commensurate impact, the guidance and advice on data management and the dissemination of research results (including data) via OA coalesce to consolidate the librarian's position as a partner in the research process.

In alignment with the provision of 'new' research support services, the status of the research support librarian is changing from reactive reference provider to a proactive research partner.

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Chapter Two

The Shape and Form of the 21st Century Academic Library, with Particular Reference to a South African Case

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Abstract

This chapter reports on a study of the 21st century academic library. Academic libraries are confronted by the need to restructure services in response to the pervasive influence of technology on higher education. The study's objective was to ascertain the shape and form of the 21st century academic library, using the case of the University of Cape Town (UCT). Themes emanating from literature include, inter alia, digital curation, digital scholarship, open access and collaboration. A largely qualitative research approach and case study design inform the study's methodology. The study concludes that UCT Libraries are in the process of establishing themselves as a 21st century academic library; their infrastructural developments for new service delivery modalities gives them the 'form' necessary to establish a new 'shape' commensurate with the digital age.

Keywords: academic libraries; 21st century; higher education; technological advances; South Africa

Introduction

Traditionally, libraries have been aggregators of knowledge in its print form. With the advancements in information production and dissemination brought on by technological innovations, 'libraries have grown much broader and are now inclusive to any medium that makes access to knowledge and information possible' (Tise & Raju 2012: 7). This development is strengthened by academic libraries traditionally being positioned at the centre of a campus; a reflection of its place as 'a crossroads for intellectual activity' (Council on Library and Information Resources 2008: 5). Academic libraries, being at the 'forefront of accommodating advances in IT [information technology] and the internet' (Kim & Lee 2011: 76), are faced with the challenge of developing and growing virtual space to house these developments. In a blog post more than ten years ago, Farkas (2004) asserted that

> …librarians are going to be asked tech related questions by an increasingly tech-savvy youth generation, and it will be difficult to engage these young people if you don't speak their language.

Farkas (2004) went on to state that the nature of librarianship is changing and that a new skills set will have to be developed by librarians so that they are able to survive in the modern academic library. According to Michalak (2012: 413), 'today's successful academic library faces outward to connect with patrons'. A persuasive reason to comply with the idea of an outward facing library is the constant decline in the use of building-based statistics (Michalak 2012: 413). Hence collections are moving away from the physical library structure and more to where the user is.

This chapter reports on a study (Pietersen 2015) conducted at the University of Cape Town (UCT). The objective of the study was to ascertain the shape and form of the 21st century academic library in South Africa, including library staff and users' expectations of services rooted in the technological advances of the digital era – using the case of the academic library of UCT, a leading research-intensive South African university.

The study was further informed by the following sub-objectives: 1) to ascertain, via rigorous review of literature, how far along academic libraries worldwide are with incorporating technological advances in their services; 2) to empirically determine the progress of UCT Libraries in establishing themselves as a 21st century academic library; 3) to establish how readily staff adapt to changes and new technology in the library; and, 4) to find out what user expectations of a modern, digital era academic library are.

Supporting theory

The aspect of the study that focused on staff development and adaptation to change in the academic library was supported by theory relating to organisational learning. According to Danielson and Wiggenhorn (2003: 17), 'today's progressive corporations have moved from treating [organisational] learning as an obligatory cost factor to regarding it as a weapon in the battle for competitive advantage'. Organisational learning is driven by 'the globalisation of markets and ever keener worldwide competition, the shortening of development cycles for individual products, demographic shifts in the world's industrialised countries and reduction in the half-life of knowledge' (Maier, Prange & Von Rosenstiel 2003: 14). In the context of this study, organisational learning would be driven by technological advances in the social sphere and in the Library and Information Services (LIS) sector, as well as by the resulting increase in the production of academic research outputs. Clifford and Thorpe note that organisations always require people who are able to perform effectively in their jobs and this is becoming more apparent and important in a context of increase in the pace of change. Hence they argue that 'employees are required to adapt and respond to these changes quickly and without the loss of productivity' (Clifford & Thorpe 2007: 6-7). This study used Szulanski and Cappetta's (2003: 518-521) four stages of knowledge transfer (initiation, implementation, ramp-up and

integration) to guide its investigation into staff adaptation to change and to new technology in UCT Libraries.

The literature and emerging trends in academic libraries

In response to the study's first sub-objective, a review of literature was undertaken to ascertain how far academic libraries worldwide have currently advanced with incorporating technological advances in their services. This review is presented in the sub-sections that follow themes adapted from the Association of College and Research Libraries (ACRL) Research Planning and Review Committee's (2014) list of top trends and issues affecting academic libraries.

Academic libraries in the context of universities and higher education

The essential purpose of a library is to serve the community in which it is situated. Organisationally, the academic library is located in a higher education institution. Thus, when assessing change in the academic library, it is important also to consider changes in the higher education sector. The higher education landscape, globally, is changing. As with the academic library, teaching practices also utilise Web 2.0 tools to support learning at universities. According to Eijkman (2009: 240) the internationalisation of higher education draws learners from different cultures and languages. Web 2.0 tools such as the social media present a 'driver supportive of more discursively inclusive learning spaces' (Eijkman 2009: 241). The technological advances that the library adopts do impact on how the physical collection of the library is maintained and how many of the resources are diverted to cater for the web-based library services. Hence, even if Library 2.0 refers to the development of technology and web presence in the library, there is concomitant impact on the physical aspects of the library.

In higher education, emerging technologies have had a 'significant impact on educational technology' (El-Hussein & Cronje 2010: 12), particularly e-learning. E-learning is learning facilitated by 'technological infrastructure with applications and software that manage courses and users' (Kumar 2009: 1). According to Abram and Cromity (2013: 43), in order to add value to e-learning the library can advance and promote information literacy training through the learning management system. Mobile learning, or m-learning, is similar to e-learning, but with the use of mobile devices (primarily smartphones) and this too has found been found to be prevalent in higher education with significant implications for the delivery of information services by academic libraries (Walton, Childs & Blenkinsopp 2005: 57-58; Chandhok & Babbar 2011: 639).

While academic libraries have had success in developing e-collections, the adoption of e-books in particular as part of e-collections seems to have been slow. According to Ashcroft (2002), cited in her later work (Ashcroft 2011: 398), issues regarding 'the introduction of e-journals, such as raising user awareness, bundling, proliferation of passwords and consortia purchase' have been resolved, but although there is a large market for e-books, 'the situation regarding e-book provision is less stable' (Ashcroft 2011: 398). Vasileiou, Rowley and Hartley (2012: 225), in their study on the future of e-books in academic libraries, suggest that academic libraries should work collaboratively and in consortia with other libraries to 'benchmark evolving practice, and to support engagement across the academic library community with evolving standards, technologies, and licensing and pricing', issues that are ongoing and the subject of constant review in present day academic libraries.

According to the ACRL Research Planning and Review Committee, prioritising student success forms part of the list of top trends in the academic library's list of priorities. The academic library, being part of the parent institution, has to align itself to the goals of the institution and in this spirit, several academic libraries in the United States of America have formed collaborative relationships

with other stakeholders in order to place emphasis on student success in academia (ACRL Research Planning and Review Committee 2014: 297). The ACRL review report asserts that 'libraries must … align their missions with institutional and state student success missions, and focus resources on those students most in need of support'. Similar imperatives also apply to academic libraries in other parts of the world.

Mobile environment

More and more library users are equipping themselves with mobile devices. The range of devices has made it imperative that the library (in collaboration with relevant stakeholders) develops services that are device neutral (ACRL Research Planning and Review Committee 2014: 296). The ACRL report referred to earlier (2014: 296) reports that the development of digital services for only desktop or only mobile phones is no longer sufficient. The mobile environment offers users efficiency and information on demand. With the rapid change in the library in terms of technologies and web applications (such as social media), it is plausible to state that 'librarians are perfectly aware that they are facing now a Web 3.0 environment' (Corradini & Pérez-Montoro 2013: 178).

Students and researchers increasingly access library and other university affiliated services through mobile applications and sites. Mobile technology has infiltrated the scholarly workflow and this fact makes it important for libraries to optimise and integrate their services for mobile access (Johnson, Adams Becker, Estrada and Freeman 2014: 8). In a study conducted at a Ghanaian university, researchers found that nearly all the respondents in their study owned at least one mobile device. On making this observation the researchers state that an affirmation of the ownership and use of mobile technology 'is essential if the [library] plans to deliver some of its services by means of mobile technologies' (Akeriwa, Penzhorn & Holmner 2015: 291). It is particularly significant that the University of Development Studies Library (Ghana) has few automated library services; yet the permeation of mobile technologies among the user population warrants more innovative use of technology to facilitate the accessibility of services and resources (Akeriwa, Penzhorn & Holmner 2015: 287).

Digital curation

Curatorship is becoming increasingly vital as electronic resources are increasing in importance and research data is multiplying. Digital curation also forms part of digital scholarship (discussed below). Digital curation is a recent development in the LIS sector. With the magnitude of data that is being digitized and data that is created for the digital environment, there is a need for the management and the preservation of this data (Abbott 2008). The library is at the forefront of information management in the academic environment, so it is natural that information professionals have assumed roles as digital curators in the formal academic setting. Digital curation includes 'managing data from planning its creation, best practice in digitisation and documentation, and ensuring its availability and suitability for discovery and re-use in the future' (Abbott 2008). According to the definitions provided by the Department of Arts and Culture (DAC) and the National Council of Library and Information Services (NCLIS: 2014: 20), digital curation is also the act of 'establishing and developing long term repositories of digital assets for current and future reference by researchers, scientists, and historians, and scholars generally'.

'Digital curation' and 'data curation' are terms that are sometimes used interchangeably. For the purpose of the current study, 'data curation' is seen as a subset of 'digital curation' and refers to the management of research data specifically. As opposed to digital curation, data curation has to do with 'research data management [RDM] and repository infrastructures' (MacDonald & Martinez-Uribe 2010: 4-5). Data curation requires skills from parties across the university. These skills include: 'information management, computing, economics, institutional governance, and

social dynamics'; supplied by 'departmental heads, librarians, computing staff, principal investigators, records managers, archivists and research office staff' (Macdonald & Martinez-Uribe 2010: 5). Collaboration between various departments to establish a data curation system combines both resources and expertise. Data curation has become necessary because funding agents have come to the realisation that 'much of the data that they are paying to have generated is not being properly curated or fully utilised and is often lost' (Heidorn 2011: 663). Although it has not traditionally been the role of the librarian to manage research data, libraries are equipped to curate and disseminate research data successfully (Heidorn 2011: 663).

Another aspect of digital curation is digital preservation. Digital preservation is the 'long-term curation and preservation of digital materials' (Ross 2012: 44). Preservation in the digital context is fraught with technological concerns. With rapidly changing technologies, 'there is a risk that information becomes inaccessible and unusable' (Muir 2004: 73). Preserving digitally-born content, involves issues of licensing and copyright. Further, digital materials often bound to specific software which make them prone to corruption (Ross 2012: 44). Therefore when a library undertakes the task of creating a repository for digital materials, policies and standards have to be adapted and implemented in order to ensure consistency in quality. Digital preservation makes it possible for rare artefacts to be shared widely without transporting or damaging the artefact. The library, being a traditional storehouse of information resources, stands in good stead to accommodate digital preservation as part of its services to the university community.

Digital scholarship

The term 'digital scholarship' lends itself to many interpretations which are dependent on the particular culture of the institution, institutional organisation and the environment (McCullough 2014: 187). Andersen (2004: 16) defines digital scholars as people who are aware of the expanded options available to them, their students and their research through new technologies.

At New York University Libraries, digital scholarship services extend to 'high performance computing; geographic information systems; quantitative and qualitative data analysis; data finding and management; the digitisation, creation, manipulation, storage, and sharing of media content; repository services; digital preservation; streaming media platforms; digital journal publishing; online collaboration; and intellectual property consultation' (Vinopal & McCormick 2013: 27-28). Vinopal and McCormick (2013: 27) observe that these services are offered in conjunction with a unit of the Information Technology Services at New York University. This places emphasis on the role played by academic libraries in collaboration and in connecting resources in order to offer superior services. Each institution has different cultures and needs, thus the scope of the services offered by a digital scholarship centre in a library depends on institutional need (McCullough 2014: 190). The term 'digital scholarship' easily encompasses most library services that are delivered through technology.

Adams and Gunn (2013) describe digital humanities (DH) as being 'an emerging, interdisciplinary movement which looks to enhance and to redefine traditional humanities scholarship through digital means'. Arguably (DH) falls within the scope of digital scholarship. However, Fitzpatrick (2012: 14) argues that DH particularly contributes to digital scholarship in its exploratory investigation of the difference that digital practices can make in work processes and also the difference it makes to our methods of communication. DH is not confined to one field but is highly collaborative and encourages contribution from all sectors (Adams & Gunn 2013). The modern academic library, rich in technology applications, has a role to play in the promotion of DH.

Open access

While open access (OA) is not new to academia, it has only become a serious alternative to

traditional publishing processes in recent years (Mercieca & Macauley 2008: 244). Although OA has 'not been designed with libraries as its foundation' (Bailey 2007: 370), the library has the capabilities to enhance access to OA resources for its users. OA has been around for more than ten years, but 'academic promotion processes may be in conflict with the increasing support with open access modes of publication' (Mercieca & Macauley 2008: 244). Houghten (2002) states that 'promotion, tenure, and funding allocations in universities and research institutions are often linked to publication in a few, leading, refereed journals'. Negativity towards OA seeps in when these few titles linked to the promotion, tenure and funding allocations are not OA.

Bailey (2007: 376) notes that although there are many benefits of OA to the institution and the library, there is still the question of funding. He suggests that as the OA repository grows, it could eventually be a substitute for conventional journals. This means that the library will be able to cut away some subscriptions (Bailey 2007: 376). For access to journals, libraries are victims of the terms of licensing agreements. If the library promotes and facilitates OA, 'researchers would not encounter gaps in the collection corresponding to journals with unacceptable prices or licensing terms' (Bailey 2007: 370). The growth of OA has major implications for the scholarly e-resources.

In a study conducted by Rodriguez (2014: 609) on the awareness of and attitudes toward OA in the university, she concludes that while researchers have not fully come to terms with restricted access (due to subscription costs), most of the large publishing houses are experimenting with incorporating an OA option in their publications which makes it necessary for librarians to play advisory roles in evaluating OA journals for the purposes of quality and OA mandates.

Collaboration

The internet and social networks have enabled the sharing of information across the globe instantly. For the library to fully embrace the new academic environment, collaboration is critical. According to Neal (2010: 71), the core needs of research libraries and the needs of big science complement one another, hence partnerships across campus play a role in the advancement of scientific discovery and progress, and support the interests of individual scientists as well as teams of researchers, universities and research centres, and funding agencies.

Cook (2000) cited by Dixon (2006: 6) reiterates this view stating that because of the 'complex and expansive information and technological innovations of today…, it is vital for librarians to make connections' and to '… redefine their roles and to establish proactive partnerships across the campus and beyond'. According to Neal (2010: 66) collaboration 'combines rapidly evolving user requirements, recognition of the need to rethink redundant inefficient library operations… [and] a focus on the need to achieve scale and network effects through aggregation'. Hence collaboration becomes an important aspect of the modern academic library. Collaboration should not be limited to the librarian-faculty level because the research process extends beyond the faculty and library. As articulated under the theme digital scholarship, partnerships with sectors on campus like the information technology unit, give substance to the view that academic libraries lie at the centre of the research process.

The preceding review of literature, in response to the first sub-objective of the study being reported here, ascertained that academic libraries, globally, are indeed embracing technological advances to enhance their services in a changing higher education pedagogical and research environment itself affected by advancing technology. The review of literature informed the empirical aspect of the study.

Empirical investigation

The study employed a largely qualitative research approach as well as use of some quantitative data collection for purposes of supporting its qualitative approach. It adopted UCT, a leading research-intensive university in South Africa, as a case study in order to respond to its remaining

sub-objectives. A case study design (Yin 2014) was considered optimal for ascertaining the shape and form of UCT Libraries' services. For the purposes of triangulation to enhance validity of data collected, the study employed both interviews and self-administered online questionnaires. Two population groups were targeted in the study, namely, library staff (interviews and questionnaire) and library users (questionnaire). Purposive sampling was appropriate for the library staff population of which two groups were sampled (one group was interviewed and the other surveyed via an online questionnaire).

The library user group, divided into three strata (namely, undergraduate students; postgraduate students, and researchers and academics), were sampled using stratified random sampling. The sample sizes were determined using a random sampling table (Sekeran 2003: 294). The eventual response rates for each of the sampled population groups are reflected in Table 1. Administrative error resulted in a low return rate for researchers and academics. Although the yield from researchers and academics was low, the response from the library user population as a whole was deemed adequate for the study at 49% (especially as the study draws conclusions and makes recommendations based on the responses of the library user population as a whole).

The interviews were unstructured, but an interview guide was produced to guide the direction of the conversation. The purpose of the interview guide was to be as exhaustive as possible in the interview regarding the developments at UCT Libraries. The subject of this study was UCT Libraries as an organisational entity (making it opportune to employ organisational learning as the supporting theory for the staff development and adaptation aspect of the study). Thus these aspects of the interview guide were designed to interrogate the organisational entity and not the interviewees per se.

Copies of the questionnaire were distributed amongst purposively selected library staff working in different departments of UCT Libraries. These copies of the questionnaire were distributed electronically in August 2014 in the Chancellor Oppenheimer Library (main library) where the roles of different librarians are more distinctive and thus each department within the Library has different levels of interactivity with technology and technology-driven services in the Library. Library users at the University of Cape Town are widely spread across several campuses in an array of disciplines. Hence the self-administered questionnaire was the best option to reach the library users selected for participation in the study using stratified random sampling. Before disseminating or administering, each of the research instruments was pre-tested in June 2014 to ensure reliability. *KwikSurveys*, an online survey builder, was used to construct the questionnaires and collate results. Ethical clearance was obtained from UCT to use it as a research site.

Main findings and discussion

Main findings from the study are discussed according to the sub-objectives of the study responding to the overall objective of ascertaining the shape and form of the 21st century academic library in South Africa.

Academic libraries globally

According to the literature reviewed, digital scholarship has gained traction in academic libraries because of the array of added services and expertise that this development has to offer the research community. While there is much debate as to what digital scholarship services entail, the literature suggests that these services are dependent on institutional design and the needs of the library user population (Vinopal & McCormick 2013: 33). OA, institutional repositories, digital preservation and RDM all form part of digital scholarship, and hence indicate that digital scholarship is a core service of the modern academic library. Typically, these new technology-driven services require expertise in digital (including

Table 1: Response rates by population

Population	Sample size	Return
Undergraduate students	377	270 (72%)
Postgraduate students	367	231 (63%)
Researchers and academics	315	20 (6%)
Library staff (questionnaire)	95	39 (41%)
Library staff (interviews)	16	15 (94%)

data) curation, a skills set that is becoming increasingly sought after in academic libraries.The increasing volume of research data being produced and digitized in higher education institutions further necessitates skills in data curation (Abbott 2008).

As academic libraries the world over proactively embrace technology advances in their services (Peters & Dryden 2011; Phillips 2011; Lombardo, Morrow & Le Ber 2012; Corrall, Kennan & Afzal 2013; Zhao 2014), it is important for them to document and share progress so that academic libraries worldwide can stay abreast of best practices to support research and academia.

UCT Libraries as a 21st century academic library

The professional basis of the LIS sector is the Library and Information Science qualification. The majority of the library staff members (about 85%) in UCT Libraries have professional Library and Information Science qualifications and almost 30% are either in the process of obtaining their professional qualifications, or are fairly recent graduates. Having a workforce with a largely professional staff complement, including a significant cohort of recent graduates, in the context of a rapidly evolving and technology-driven changing profession like that of the LIS sector, bodes well for a library service requiring professional and newly emerging skills sets. Older Library and Information Science qualifications may not necessarily address new roles in the modern academic library, but are usually indicative of the staff member having LIS experience which is valuable in servicing a scholarly community.

A library staff interviewee stated that the Library does not have all the competencies that are required of a modern academic library, but a senior management interviewee mentioned that skills are being developed to supplement this shortage. The latter interviewee went on to say that UCT Libraries 'has a significant budget for training and development. This is partly because of the transition from very traditional services to 21st century services'. When asked whether they are overwhelmed by the changes in the academic library, 34% of the 35 library staff respondents who acknowledged that they are overwhelmed, indicated the reasons for their anxiety as being the lack of mental space and time to upskill in areas such as RDM, OA, bibliometrics, altmetrics, citation managers and e-book platforms. According to some of the library staff interviewees, expertise in some of these areas, such as OA and citation managers, already exists in the Library. The 100% positive responses from researchers and academics (18 in total) regarding the desirability of uploading of their own materials on to an OA institutional repository indicate that mature library users (such as researchers and academics) are open to taking advantage of novel developments that the Library is willing to explore. Even more telling is the finding regarding research data management: from the 16 researcher/academic respondents, 19% indicated that they knew that library staff had some expertise in RDM. The latter is a recent development in the LIS sector and hence the 19% of members who were aware of it indicates the Library's development with regard to this skills' set.

Collaboration is important in the academic library environment. Many of the library staff interview respondents could attest to the fact that

there is much collaboration between UCT Libraries and other departments on campus. This collaboration includes, but is not exclusive to, the UCT Research Office, the Centre for Higher Education Development and the Student Representative Council.

Modern technology has already had much impact on the services rendered by UCT Libraries. Just over 50% of the 37 library staff questionnaire respondents agreed that there is some significant change in the library services because of technology while just over 40% indicated that there has been complete change in the services offered by the Library because of technology. Recognising that technology is changing the way libraries deliver services is a positive step towards accepting and adapting to these changes. The researcher/academic population was asked to respond to the same question. Similar to the responses from the library staff, 47% of the 19 researcher/academic respondents agreed that there has been some significant change in the library services because of modern technology and 37% indicated that there has been complete change. The library staff response is further emphasised by almost 70% of these same respondents indicating that modern technologies have been incorporated into their daily activities to a great extent. One aspect of library service that has changed as a result of technology is the reference service, now offered virtually by UCT Libraries in the form of the 'Ask a Librarian' service. Findings in the study indicate that across all three categories of users surveyed (undergraduate students, postgraduate students and, researchers and academics) there was almost a 50% spilt response in knowing about this service. Of those who knew about the service, approximately 25% made use of it and of these, just over 50% found the service to be useful. This trend is bound to grow in the future. Farkas (2004) did indeed advise a decade ago, that 'reference work is going to be done more and more online as electronic collections grow and virtual reference becomes more common'.

The new service model that senior management of UCT Libraries is proposing links strongly with the University's institutional design. It emerged from an interview with a senior manager that UCT Libraries is in the process of restructuring. Following UCT's institutional design, the restructuring would culminate in three clusters of service support, namely: teaching and learning, research and, access and visibility. Hence, according to this senior manager 'at least 60% of the services rendered in the future will be new'. Amidst all this development, however, library staff questionnaire respondents indicated that there is an issue with communication between the different sections of the Library, primarily client services and technical services – an important issue that requires serious attention.

While it is evident that UCT Libraries has been making advances in adopting 21st century services trending in the literature, at the same time, some library staff respondents pointed out that there is still work to be done to address staff development to fully embrace these advances. In terms of Szulanski and Cappetta's (2003: 514) four stages of knowledge transfer (or organisational learning), namely, initiation; implementation; ramp-up; and, integration, it would seem that UCT Libraries is still in the initiation stage of knowledge transfer. Both staff and senior management seem to realise that there are gaps in the knowledge of the organisation and senior management is making an effort to address this.

Staff adaptation to modern technology and change

Academic libraries are dynamic in nature. As mentioned earlier, academic libraries are at the forefront of accommodating modern technological advances. This means that staff members are always required to upskill to be able to better adapt to change. Danielson and Wiggenhorn (2003) identify three fundamental challenges to organisational learning. The one most relevant to the LIS setting is identified as 'affecting real learning'. This is defined as 'understanding and managing the forms of learning … that can improve

the work performance of individuals and nourishing a culture where learning takes place as a natural consequence of work and progression in the firm' (Danielson & Wiggenhorn 2003: 19).

In establishing the respondent profiles of the library staff, respondents were asked to state the length of their employment at UCT Libraries. Over 50% of the 54 library staff respondents (questionnaire and interview respondents) indicated that they had been at the Library for longer than ten years. If this is representative of the whole organisation (UCT Libraries), then there are both benefits and disadvantages to having a large cohort of staff working for more than a decade in the organisation. A major benefit is staff having extensive organisational knowledge. A disadvantage of this set-up is a change-adverse staff. A library staff interviewee mentioned that older staff are typically sceptical about which training sessions they would want to attend: 'they would rather go for something that is going to help them [with current work processes rather than new applications of technology], especially with technology advancing at such a rapid rate'. Newer staff members are keener to undertake diverse training modules. The majority of the library staff questionnaire respondents in this study (about 60% of 39) ranged between 29 and 49 years of age. According to Tapscott (2009: 15), this age range falls within the Generation X category. This generation is the oldest group that is familiar and comfortable with the habits and norms of the 'Net Geners' (Tapscott 2009: 15). It augurs well for UCT Libraries to have such a large cohort of staff falling within this age range. They would be in a position to relate to the student population (which makes up the majority of the user population) which typically comprises the Net Generation.

Just over 20% of library staff in the questionnaire survey indicated that they attend more than ten training sessions throughout the year. The largest segment, about 45% of staff, stated that they attend five to ten training sessions per year. The amount of training that staff members are exposed to is indicative of UCT Libraries' endeavours to accommodate change and development. According to Danielson and Wiggenhorn (2003: 17), there is rising expenditure in progressive corporations for 'both traditional and technology-driven learning activities'. A UCT Libraries' senior management interviewee, in acknowledging that substantial funds are made available for staff training, corroborates this assertion. Over 40% of the training activities take place in-house. This is indicative that many of the skills required for upskilling staff are already present in the organisation (UCT Libraries) and indicates the Libraries' preparedness to embrace development. The learning process is a natural one, brought on by a need to solve problems within a social context (Danielson & Wiggenhorn 2003: 43) – the social context in this case refers to the challenges of an academic library (UCT Libraries) situated within a parent institution (the University). The presence of ongoing training and commitment to providing time, space and funding for training augurs well for UCT Libraries striving to be as a 21st century academic library. The only issue that arises from frequent and ongoing training, is the workload that continues to pile up while staff are away. Approximately 50% of the library staff questionnaire respondents were aware of this problem.

On the issue of whether they are expected to attend training sessions when catalogues are changed and whether they would like to attend these sessions, while 86% of those surveyed indicated that they are required to attend these training sessions, 95% of the same respondents indicated that they would like to attend these sessions. This could be a reflection of willingness on the part of library staff to attend training for purposes of adapting to modern technology and software.

Dale (2011: 30) states that this is a challenging time for librarians because of the rapid progression of modern technology, social networks and web developments. Notwithstanding this, UCT library staff appear to readily accept and adapt to

changes brought on by technology. Findings indicate that older library staff members have a more tentative approach to training in new ways of doing things, but that a large cohort of staff are younger, thus promoting organisational learning by making the transition to the 'new' easier for the organisation as whole.

User expectations of a modern academic library

The user population comprises undergraduate students, postgraduate students and researchers and academics. Almost 80% of the three groups of user respondents collectively were under the age of 28, making them part of the Net Generation. This implies that a majority of the library users are likely to be comfortable with modern technology and technological advances (having been exposed to computer technology their whole lives). This synchronises well with the library staff comprising mostly of 'Generation X-ers'.

Across all three categories of the user population, as can be seen in Figure 1, there was overwhelming agreement that the academic library is relevant in the higher education context. This was also the case in the response from library staff members (see Figure 2). User responses to this issue peaked at 'strongly agree' while library staff responses peaked at 'agree' The overwhelmingly positive response from the user population to this item stands UCT Libraries in good stead. Comments at the end of all three of the user surveys spoke positively of the quality of the Library's services, one saying 'this is my 4th university and the staff here deserve real credit' and another, 'the library has been brilliant in keeping up with technology'.

Compared to the 34% of library staff surveyed who indicated that they were overwhelmed by the changes in the Library, only 14% of the postgraduate students and researchers and academics surveyed felt this way. This finding could be attributed to the fact that most student users remain on cam pus for a much shorter time than staff typically do, and thus they are not as affected by system overhauls due to technological advances. The affirmative responses elicited from the researchers and academics regarding the change in services because of changing technology and web developments were consistent with the responses from the library staff respondents. This finding indicates that there is a shared perception between the Library and its users regarding the rate of change in the Library service. This shared perception between the two parties is optimal for a library service.

One of the traditional functions of an academic library is to provide support to the user via librarian-user consultations. In this study, users were asked to assess the level and the helpfulness of the service. On both counts over 85% of the three groups of users agreed that the level of service was good and that the service was helpful. Despite the numerous other responsibilities which librarians are required to give attention to in a modern academic library service, users are still pleased with the basic reference assistance they receive from the Library.

Another of the basic services offered by an academic library is the collection of resources. All the users surveyed were asked to indicate whether they make use of print resources, electronic resources or both. It is not surprising that users indicated that they make use of mostly electronic resources. Electronic resources allow users to work from remote locations rather than having to visit the physical library. The extent of the collection is one of the areas of the academic library that is most influenced by the users. All three categories of users were asked if their resource requirements were adequately met by UCT Libraries. While over 83% responded positively, there was some negative feedback relating to parts of the collection being outdated and that some top scientific journals were not being subscribed to.

Researchers and academics (as user respondents) were asked if they would support OA access. All of them indicated that they would if given the

Figure 1: Users' perceptions of relevance of academic libraries (N=501)

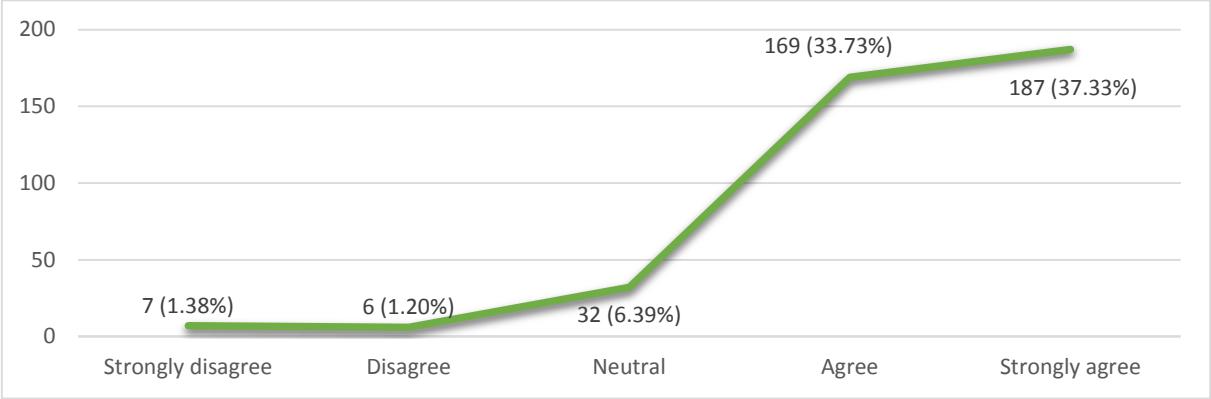
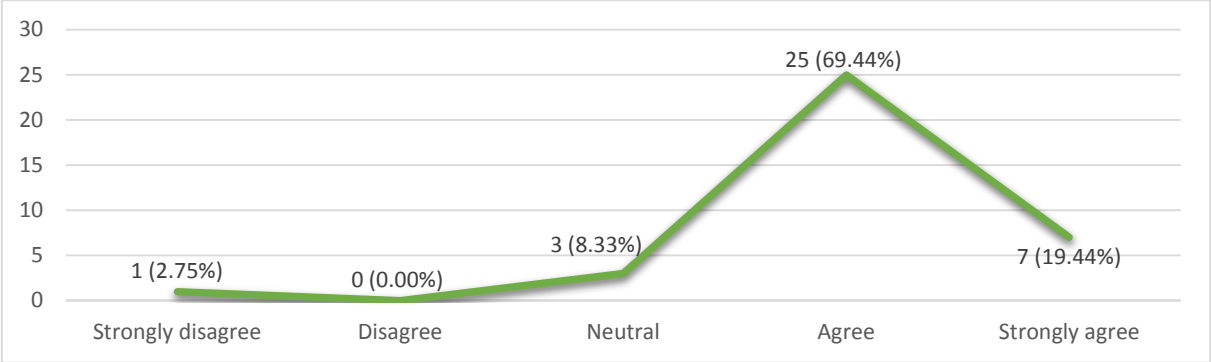


Figure 2: Library staff perceptions of relevance of academic libraries (N=36)



opportunity to do so. Hence UCT Libraries' infrastructure development to support OA and to increase the capacity of the institutional repository, is in line with developments in the research landscape. More than half of the researchers and academics surveyed were aware that funding bodies are including OA mandates in their conditions of award. If this response is indicative of the support for OA from the research community in general, then the issue of non-subscription to top journals lamented by a few (mentioned earlier) could potentially be eradicated in academic libraries in general.

Researchers and academics were asked whether they consult library staff to assist with RDM processes. Only a few indicated that they do. Upon elaboration, some respondents indicated that they did not know the Library could assist with RDM. This indicates that there needs to be some form of marketing so that the user population is made aware of such new services.

Half of the researchers and academics surveyed attested to having multiple collaborations in their departments with library staff. These small scale collaborations are a step towards collaborative efforts on a bigger scale with faculty and departments in the future. According to Abram and Cromity (2013: 41), the core of sustainable 21st century library strategies is collaboration. This collaborative strategy is not exclusive to campus research offices and Information and Communication Technology (ICT) departments, but also includes users (students, faculty staff and researchers).

Users' expectations of library services and their collections have changed. This change has been driven by, *inter alia*, networked technologies, freely available powerful search engines, social technologies and large collections of digitised materials (Michalak 2012: 413). The responses from users regarding the services of the UCT Libraries were largely positive. Gauging from

the general comments made by all three groups of users, users expect the online services to be more intuitive. There is a general sense that accessing online resources is currently a complex task. The researcher/academic user group indicated that regarding developments in the Library, there should be an open forum to discuss these new developments. Perhaps in the shape of regular meetings hosted by subject or liaison librarians, keeping different academic disciplines separate. These findings indicate that while user expectations are being largely met, there should be open communication between the Library and the user groups.

Conclusion and recommendations

Academic libraries, the world over, are adapting their services according to user demands and users' use of technology. The literature suggests that modern library services develop according to institutional design and culture. Academic libraries are realising their critical role in teaching, learning and research at higher education institutions located within, and influenced by, highly digitised contexts. UCT Libraries is already in the process of establishing itself as a 21st century academic library. Senior management in the Libraries have remarked that at least 60% of the services will be new after restructuring, indicates how geared towards change UCT Libraries are. The processes and procedures that UCT Libraries have in place to encourage new developments in the service will stand the organisation in good stead in establishing itself as a 21st century academic library. There is a strong emphasis in UCT Libraries on organisational learning in the form of training and willingness to learn and embrace change. The prevailing culture of learning in UCT Libraries bodes well for constantly adapting to new technologies and software. One of the conditions in the work environment that encourages organisational learning is a 'major cultural overhaul' (Danielson & Wiggenhorn 2003: 21). The study recommends an 'environment of frank and open dialogue from top management down through the different lines of business' (Danielson & Wiggenhorn 2003: 21). This would provide a solution to the issue of communication that was brought to the fore by some of the library staff and is something that library management would need to pay serious attention to. The study revealed that users are generally satisfied with the services they are receiving from the Library. However, the odd comment alluding to not knowing about new services hints at the possibility that the Library is not marketing its services sufficiently. Hence it is recommended that rigorous marketing is an area that should receive more attention. In view of the uncertainties around the definition and scope of digital scholarship, another recommendation is for further study to be undertaken to establish the place of digital scholarship in the academic library in the developing context.

UCT Libraries' journey to a 21st century academic library, with infrastructural developments underway for new service delivery modalities, gives it the 'form' necessary to establish a new 'shape' commensurate with the digital age; that is, an academic library service structure informed by technological advances of the current age. While the case of UCT Libraries was used in this study, in many ways this case is representative of academic libraries in other parts of South Africa as well as in other parts of the world. Hence the study of the shape and form of the 21st century academic library, reported in this chapter, has relevance for other academic library contexts as well.

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Chapter Three

Research Support Services in Academic Libraries in Uganda: Challenges and Opportunities

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Abstract

Academic libraries support research by developing research collections and data repositories, and providing bibliometric analysis, data literacy training and research data management. This chapter seeks to examine the challenges and opportunities associated with the provision of research support services in academic libraries in Uganda. The study complements surveys of emerging practice from developed countries. A survey was conducted among librarians of the Consortium of Uganda University Libraries (CUUL). The findings revealed varying levels of engagement with different types of research support services offered across the consortium. Numerous challenges affect the provision of research support services. The chapter recommends lobbying key stakeholders to support research. Although this study is limited in scope, it nevertheless offers insights into the nature and scope of the research support services provided by CUUL member institutions.

Keywords: academic libraries; research support; bibliometrics; research data management; Uganda

Introduction

The development of libraries in Uganda is associated with the colonial government. According to the International Network for the Availability of Scientific Publications (INASP 2000) the public library sector in Uganda was established in 1940, with the aim of providing information to a minority elite. Recognising that information is a vital resource for decision making, however, the government of Uganda has taken significant steps to improve access to information by recommending that one percent of the Gross Domestic Product is dedicated to research and development activities. This provision has transformed libraries into instruments of learning with the aim of eradicating illiteracy and inequality, hence promoting social cohesion.

The National Development Plan (NDP) for the period 2010/11 to 2014/15 places great emphasis on strengthening science, technology and innovation (STI). The plan promotes increased research and scientific innovation support through capitalisation of the STI Fund. The main mandate of higher education libraries is to facilitate access to information that meets the teaching, learning and research information needs of institutions. Research is the major activity of academic institutions of higher learning. Therefore, institutions in Uganda are required to allocate ten percent of the university budget to research. However, few universities have met this standard according to the National Council for Higher Education (NCHE). Public universities are heavily involved in conducting research while few private universities conduct research. Some of the challenges pointed out include: a persistent high staff student ratio of 1:24; an increased number of part time lecturers; inadequate resources, and heavy dependency on donor funding for research and publications (NCHE 2010). To address this challenge, the Ministry of Education and Sports has set up a fund for research and the training of staff in public universities, channelled through NCHE (2013).

Technological advances have caused academic libraries to modify their services and resources. New services are emerging in order to meet the informational needs of their users. Collaboration has been recognised as one of the strategies to cope with challenges such as: high costs of digital resources; users' changing needs and expectations; the need for information and communication technology (ICT) competencies and provision of the requisite infrastructure (Kinengyere 2007; Musoke 2008). Owing to budgetary constraints and inadequate resources, university libraries in Uganda decided to collaborate and hence the Consortium of Uganda University Libraries (CUUL) was established. CUUL undertakes the negotiation and licencing of e-resources, capacity building, resource mobilisation and advocacy for university libraries in Uganda.

Academic libraries are the pillars on which research in universities is based, providing a wide range of resources and services. Success in research is a major indicator of university performance hence universities are increasingly interested in how they can improve their competitive position by increasing their research output. In addressing this goal research support services in Ugandan academic libraries are of vital importance. It is not an overstatement to assert that academic libraries are the backbone of research and academic excellence in universities. A study by Ikoja-Odongo (2003) reported that politicians obtain information from libraries for both democratic and accountable governance. Rugambwa and Kintu (2013) found out that the availability of library and research resources at the parliamentary library are vital for legislators to perform their representative, oversight and legislative functions effectively. Mwesigwa (2013) reported that academic libraries in Uganda are involved in civic literacy through outreach programmes aimed at creating an informed citizenry.

Purpose and objectives

The chapter documents the nature and scope of research support services in academic libraries in Uganda. It provides examples of good practice,

recommends areas where new practices might emerge, as well as possible areas for collaboration among CUUL member institutions.

The study objectives were to: establish the existing research support services; examine challenges experienced in supporting research services, and identify opportunities exist for the improvement of research support services. Hence the research questions for the study were:

1. What research support services are offered or planned to be offered in the academic libraries in Uganda?
2. What challenges are experienced in providing research support services in academic libraries in Uganda?
3. What opportunities exist for improving research support services in academic libraries in Uganda?

Literature review

A review of the relevant literature revealed that scholarly research has undergone radical transformation which is affecting research practices. Technology, library space and design, and dynamic user services have emerged as strong drivers for change in academic libraries. Studies of library support services have been conducted in developed countries, but limited investigation of the situation has been undertaken in the developing countries.

Research support as defined by Parker (2012) is a set of services and facilities which assist in increasing research productivity and scholarship. Borgman (2010) observed that the role of libraries is changing from a provider of reader services to author services due to technological, political, economic and social changes in higher education. This means a shift in the role of the librarian from a supporter of the research process to a contributor to the process. Raju and Schoombee (2013) argued that research support is the proactive engagement of the librarian with the researcher throughout the research process.

Libraries in the developed world are adapting library practices to meet the research needs of their communities through academic liaison, collection development, information literacy (IL) and repository management (Kroll & Forsman 2010; Corrall 2012). Walker (2009) emphasised the role of academic libraries in providing new research services such as: research data management; management of institutional repositories, and the provision of information technology (IT) services. Kesselman and Watstein (2009) noted that librarians have taken on new roles in areas of integrated IL instruction and scholarly communication in order to meet the ever changing needs of their users.

To enable libraries to offer these research support services, a new set of skills is required by academic librarians. Auckland (2012) identified a range of skills required by librarians to support the process of scholarship including: bibliometric analysis, digital curation and data mining. Sinclair (2009) envisages a 'blended librarian' who possesses both traditional and IT skills to be able to address users' needs in the 21st century. The redesigning of library spaces is one of the new trends in academic libraries (Pennington 2012). Libraries are repurposing their spaces in order to encourage collaborative learning and research.

The study reported in this chapter sought to generate insights about research support services from the context of the developing world. The results of the study can inform the design of education and training programmes for the current and future library workforce in Uganda.

This chapter does not encompass all the traditional roles of academic libraries such as selection, cataloguing, circulation, course support et cetera, but focuses on research support services in the academic libraries in Uganda.

Methodology

The study comprised a case study using a mixed methods approach. This approach involv

Table 1: Responses by type of institution and CUUL membership

Type of institution	Ugandan universities	CUUL members	Number of responses	%
Public Universities	9	6	6	37.5
Private Universities	30	25	10	62.5
Total	39	31	16	00

-ed data using methods that are drawn from both quantitative and qualitative in nature (Creswell 2003).Gorman and Clayton (2005) define a case study as an investigation of an 'entity on the assumption that it is possible to derive knowledge of the wider phenomenon from intensive investigation of a specific instance or case'.

Research support is a new service area for academic libraries in the developing countries. Therefore, a review of literature was undertaken to establish new trends, roles and responsibilities for academic libraries. A literature review enables the researchers to sharpen the focus of the study (Fouche & Delport 2012).

The CUUL member institutions, both public and private, were identified through the membership lists available on the CUUL website (http://www.cuul.or.ug). Librarians responsible for research services in each library were identified and e-mail messages outlining the objectives of the study and containing a link to the web-based survey instrument were addressed to the contacts who were identified personally to maximise the response rate.

A structured online survey questionnaire, designed using Google Forms, was sent to CUUL member institutions. In March 2015, invitations together with the survey link were sent to all University Librarians of CUUL member institutions. The instrument contained ten open ended questions organised in four main sections, covering demographic information, research support services, challenges and future plans.

A reminder was sent in April 2015 and the survey was closed in June. Of the 31 copies of the questionnaire sent out, 16 were completed and returned, a response rate of 52%. Respondents from public universities constituted six (37.5%), of the total number of responses and ten (62.5%), were from private universities (Table 1). This breakdown is representative of the CUUL membership. Results from the survey were analysed using Google analytics.

Respondents represented their institutions rather than themselves as individuals. Therefore, the unit of analysis was academic libraries and the responses demonstrated the various research support activities and plans for the future as a whole. The review of literature about research support services and the case study of CUUL provided sufficient evidence to draw conclusions and make recommendations on emerging research support services in academic libraries in Uganda.

Findings

The findings revealed varied levels of engagement with different types of research support services currently offered or planned to be offered by the type of institution. Currently, institutions are offering: collection development; selective dissemination of information (SDI) current awareness services (CAS); IL training and open access (OA) publishing. However, new services are emerging in response to technological, political, economic and social changes in the operating environment such as bibliometrics and systematic review. There is evidence of plans for future service developments related to research support and provision of guidance on handling research data.

Demographic characteristics of respondents

In terms of gender, male respondents constituted 44% while 56% were females. In terms of academic qualifications, six percent had a PhD,

56% had a masters and 38% had bachelor's degrees. This shows that academic libraries have staff with professional qualifications who can ably support research if they are given further education and training in the new technologies and their application.

Collection development

Researchers and lecturers are directly involved in the selection of research collections through the provision of reading lists. Librarians compile the reading lists taking into consideration the latest editions as well as the formats. Findings revealed that 15 (94%) of academic libraries are actively engaged in developing research collections while one (six percent) indicated that it rarely engages in collection development due to budgetary constraints. Jubb and Green (2007) argued that academic libraries play a critical role in supporting research in all subjects and disciplines within their host universities or colleges by developing collections. Through CUUL, academic libraries in Uganda have been able to diversify their collections by subscribing to electronic books and journals in order to support research. As rightly observed by Shuling (2007), electronic information has gradually become a major resource in academic libraries in order to support teaching, learning and research.

Document delivery services

Universities in Uganda can access scholarly content from the development partners such as: Tufts University; the University of Tennessee, Knoxville; University of Bergen Library, and the British Library. The aim of the collaboration is to ensure that library users who fail to access full-text articles can order for the articles through the document delivery services (DDS)**.** Findings indicated that 14 (87.5%) respondents provide DDS to researchers while two (12.5%) do not.

The electronic gateway to information

ICT enables researchers to search and retrieve information effectively and efficiently. Mostafa (2005) observed that libraries provide computers and internet access to allow people to search for information online. Results showed that 53% of the respondents provide technical infrastructure to enable researchers to access information. However, 47% still feel that the available infrastructure is inadequate to fully support the researchers. Findings also revealed that 88% of academic libraries provide researchers with both manual and online tools for searching and retrieving information while 12% do not. Examples of web tools include LibHub/Kiox which is a single interface used to discover and access electronic resources which CUUL subscribes to; the online public access catalogue (OPAC), and reference management tools, indexes, guides and manuals.

Open access publishing

Academic libraries in Uganda provide gold route publishing through the institutional repositories (IRs). Westell (2006) defined an IR as, 'a digital research archive; an accessible collection of scholarly work that represents the intellectual capital of an institution'. Chan (2004) observed that the primary mission of institutions of higher learning is to create, share, and disseminate knowledge. Survey findings revealed that 66% of academic libraries have set up IRs while 34% have future plans of setting up IRs. Park and Shim (2011) pointed out that several libraries have launched library publishing services to support scholarly communication dissemination. IRs provides access to scholarly material without the economic barriers that currently exist in scholarly publishing. Ngulube (2007) expressed the view that researchers use research findings to generate further research and models, thus the need to provide access to such works. This view is supported by Rumsey (2006) who argued that IRs open up new forms of scholarly communication for both short-term and long-term accessibility. Similarly, Parker (2012) pointed out that IRs provide equitable access to scholarly literature.

Selective dissemination of information

Researchers need to keep up-to-date with the

latest results of work in their field as well as obtaining a detailed retrospective review of what has been achieved to date in a particular field before embarking on new research. SDI services aim at keeping researchers updated and this is done manually or electronically. Manually, librarians select information of particular interest to researchers in a particular field and disseminate it. Electronically, a regular alerting service on selected subjects, defined by the user, to newly published reports, journal articles, patents and other documents which have a high probability of interest to the user is set up. Survey data shows that 50% of the respondents provide SDI through e-mails while 50% rarely provide SDI services.

Current awareness services

The process of providing CASs in academic libraries has been re-emphasised by the advent of ICTs. Social media has equally played a critical role in enhancing communication between libraries and the researchers. To this end, libraries have created websites, Facebook and Twitter pages, and blogs in order to serve researchers better. Lists of electronic resources and databases are periodically distributed to the researchers on the staff listserv. Promotional materials from publishers are equally distributed to the researchers in order to keep them informed of new resources and services. Survey findings indicated that 56% of the respondents provide CAS regularly while 44% rarely such a service. Academic libraries provide services such as: e-mail notices of current journal tables of contents with links to available full-text; subject-specific journal databases; e-print repositories, and e-mail alerts of forthcoming articles and newly received books.

Information literacy programmes

In order to strengthen information gathering and retrieval by the researchers, academic libraries offer IL training. Survey findings indicated that 69% of academic libraries provide instruction programmes while 31% are planning to provide such training programmes. Libraries are partnering with the Directorate of Research and Graduate Training to conduct cross-cutting courses such as: Research Management, Scholarly Writing and Communication Skills, Information Competence and Management in order to address gaps in the research process. During the training, researchers are introduced to reference management tools such as Endnote, Mendeley and Zotero. In addition, researchers are introduced to open source tools for online storage and sharing documents like: Dropbox, Google Drive, Research Gate and Academia. LibGuides address issues such as the research process, scholarly publishing, critical and analytical skills, and OA publishing.

INASP, in partnership with CUUL, has been involved in building the capacity of librarians to deliver IL training as well as integrating IL into the curricula. Digital literacy is one aspect of the IL programme which relates to knowledge, skills, attitudes and behaviour in the use of a wide range of digital devices such as smartphones, iPads, laptops; all of which are seen as a network (Warschauer & Matuchniak 2010). Different scholars (Tise 2004; Wilson & Briscoe 2004) have argued that IL is one of the essential competencies if nations are to prosper. Mukungu (2011) recommended that NCHE should make it compulsory for all universities in Uganda to incorporate IL programmes into the curricula in order to cater for the development needs of Uganda.

Dedicated research spaces in academic libraries

Research Commons provide flexible technology-enabled space for researchers to collaborate. A study by Ilako & Ikoja-Odongo (2011) identified research commons as one of the creative and innovative ways in which some academic libraries in Uganda are supporting research. Only 38% of academic libraries have developed specialised space facilities such as a research commons to foster communities of shared interest on campus. The majority (62%) are planning to provide such facilities in future in order to support research.

New research support services

Two types of new support services were offered:

Bibliometrics. Current levels of activity in the area of bibliometrics seem to be relatively low in academic libraries in Uganda. According to the current study findings only Makerere University Library offers bibliometric services. With this service the following analytical studies are carried out: citation analysis; journal impact factor (JIF); bibliometric and multifaceted bibliometric analysis, and institutional research output analysis. In addition, training in bibliometrics, JIF, author level metrics, and OA are conducted for researchers. Other institutions are planning to develop these particular services in order to support research.

Systematic reviews. Partnering with researchers to conduct systematic reviews is one area librarians in academic libraries are keen to develop. Findings of the survey indicated that some six percent of academic libraries are involved in systematic reviews while the majority (94%) are planning to develop such a service. At the College of Health Sciences, Makerere University, librarians are involved in developing search strategies which inform the systematic review process. Librarians have been able to co-author publications with other researchers. A study by Jubb (2011) reported that researchers value the contribution of specialist librarians in the research process. Therefore, librarians need to work towards building further research partnerships.

Challenges

The study identified a number of challenges that constrain research support service provision by academic libraries in Uganda. A detailed description of challenges is provided in the sections below.

Budgetary constraints. Library budgetary cuts, coupled with the inflationary cost of resources, have hindered research support services in academic libraries. According to NCHE (2013), institutions are expected to allocate ten percent of the university budget to research. However, few universities have met this standard. Musoke (2008) attributed the inadequate funding of libraries to a limited appreciation of the role of libraries in higher education by the university management and other political leaders. Kasozi (2009), however, suggested a diversified funding model, based on autonomy and accountability, as a solution to the problem of funding. The model involves multiple sources including government, education insurance, a national education lottery, endowments, a national loan scheme, fees, scholarships, and income generating activities within universities and other tertiary institutions.

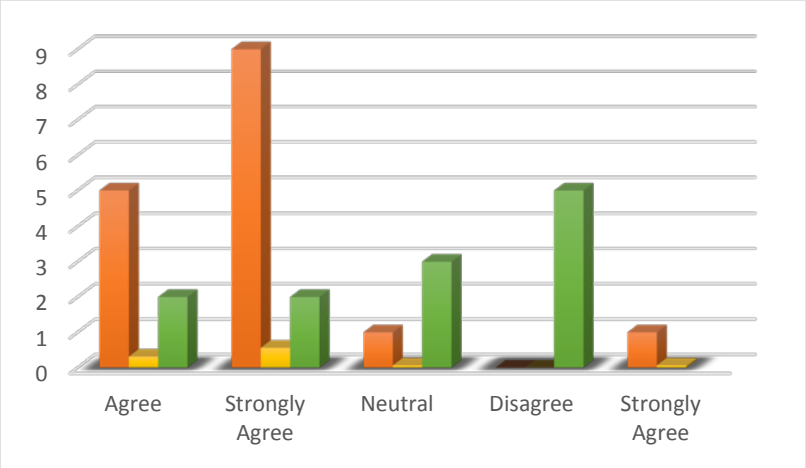
Inadequate bandwidth and power fluctuations. Asked whether they agreed that inadequate bandwith and power fluctuations were a deterrent to accessing research collections the majority (73%) of academic libraries indicated that inadequate bandwidth was a deterrent. The slow connectivity frustrates researchers while accessing resources and hampers the training of researchers. This greatly compromises the libraries' capacity to provide research support services. Although some institutions have standby generators, the cost of fuel for the generators is yet another challenge.
Table 2 reflects libraries' responses in a Likert scale.

Inadequate technological infrastructure. Research support services are hindered by inadequate ICT infrastructure as illustrated in Figure 1. The majority of the respondents (87.9%) agreed and strongly agreed that inadequate infrastructure is a major challenge to providing research support services including: data storage, tools for data analysis and support for virtual communities. This finding is consistent with a study conducted by NCHE (2010) which revealed that higher education in Uganda is experiencing infrastructure challenges. However, Musisi (2003) attributes the inadequate physical infrastructure to the past political turmoil and a general lack of

Table 2: Bandwidth and power fluctuations

Response	Bandwidth (%)	Power outages (%)
Agree	25	43.8
Strongly agree	50	18.8
Neutral	12.5	18.8
Disagree	12.5	12.5
Strongly Disagree	-	6.3

Figure 1: Inadequate technological infrastructure



a culture of valuing the maintenance of physical infrastructure.

Inadequate ICT skills. The majority of the librarians' expertise is limited to mostly traditional materials. Research data services and bibliometrics services are relatively new skills that librarians need and do not possess. Identifying and collecting data and data sets to include in repositories requires IT skills. Scholars (Mahmood 2003; Ameen 2006; Rehman 2008) have argued that, the problem of inadequate skills originates in library schools that produce graduates who are insufficiently skilled. Newton, Miller, and Bracke (2011) emphasised that librarians would be in a better position to develop scientific data collections for universities if they possessed additional skills in data management.

Opportunities

Strengthening the existing collaborative partnerships and networks is a sure strategy towards improving research support services in Ugandan academic libraries. Through the consortium arrangement, academic libraries can work together in order to support research. Various donor agencies such as Swedish Development Agency (Sida) and Electronic Information for Librarians (EIFL) have been instrumental in supporting research in academic libraries through e-resources subscriptions, capacity building, and OA publishing.

The Uganda Tertiary and Other Institutions Act, 2000 designates university librarians and other librarians as academic. The university librarian is a member of university management. This status gives librarians an opportunity to collaborate with researchers and to lobby for the library

to be recognised as the centre for research data management services.

Changes in ICT provide opportunities for academic libraries to reposition themselves to serve the evolving needs of researchers through the provision of search tools and digital repositories, and the organisation and support of scholarly communication within and across higher education institutions in Uganda. There is need to design flexible services, including online tutorials, and off-campus access or SMS messaging, around those parts of the research process that cause researchers frustration.

The application of web tools provides an array of advantages. Technologies such as synchronous communication provide academic libraries a platform for real-time communication. Libraries should enable their users to subscribe to updates on new items in a collection, new services, and new content from the library's databases.

Implications

This chapter suggests a need to for academic libraries to harness the opportunities presented by recent technological advances including: social media such as blogging, Twitter, Facebook, and YouTube, to consolidate research support service efforts. Librarians ought to find ways to demonstrate to researchers, students, academic staff and the university administration the value of library services and resources to scholarship, while providing services that may seem invisible and seamless to researchers.

Library staff need to be trained in the area of data curation and data management services. In addition, continuous professional development is necessary to enable library staff to attain the required skills and qualifications to perform their duties. This finding is in line with Sinclair's (2009) suggestion of a 'blended librarian', who combines both the traditional librarianship skills with new hardware and software skills. Librarians will become increasingly important as navigational guides; linking users to a wide range of digital resources, and helping them make choices among materials available in the public domain on the Internet.

Academic libraries need to recognise the new e-science environment thus build a new profile in their research community. This can be achieved by creating new research data services that expand the role of the library or strengthening the existing profile by extending traditional services into the new environment.

Librarian-faculty partnerships need to be created and developed in order to support research. Data literacy instruction provides great opportunities for librarians to develop such partnerships through the provision of embedded IL courses. Researchers need to be sensitised about data management services as well as the promoting of the sharing of data sets for the continuation of research.

Funding is critical for the development and management of research support services. Librarians need to lobby for more funding from government and engage in writing grant winning proposals in order to acquire the requisite ICT infrastructure.

For LIS graduates to remain relevant to the current market, they need to have new specialised skills (Ameen 2011) in addition to the traditional ones. Library and information science (LIS) schools have the potential to redesign their curricula in order to produce graduates with the necessary skills to match the expectations of the market.

In terms of staffing, academic libraries need to create the position of a data librarian to spearhead the RDMS initiatives in the library.

Conclusions

The findings reported in this paper have provided some insights into research support services in Uganda, including the constraints, opportunities and implications for policy and practice. Academic libraries in Uganda still provide traditional research support services, hence the need to diversity and update their services. The chapter challenges LIS educators to plan and design education and development programmes to meet the needs of both new professionals and

existing practitioners. Academic libraries need to take interest in all aspects of scholarly activity by engaging in data curation and preservation of research outputs.

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Chapter Four
Embracing Change, Empowering Scholarship

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Abstract

Open access (OA) has entered the mainstream. We now have more than a decade of experience from which to assess advancement in the OA ecosystem and the work ahead of us to realise the goal of unrestricted internet access to new scholarship. This chapter focuses on the role of academic libraries and librarians in facilitating and advancing an understanding of OA among faculty and researchers, key partners in accomplishing this transition. It will use the University of Kansas Libraries as a case study to highlight the changes, the challenges and opportunities to support researchers in the open access system.

Keywords: open access; academic libraries; librarians; institutional repositories; University of Kansas; KU ScholarWorks

Introduction

Long before the term 'open access' was coined, libraries faced a growing crisis in scholarly publishing known as the serials crisis, shorthand for the rise in costs for academic journals and the inability of libraries to bring these costs under control (Young 2009). Shulenburger (1998: 1) led the drive to 'move with dispatch to resolve the scholarly communication crisis.' He introduced the idea of a National Electronic Article Repository (NEAR) to ensure 'the ultimate right of the academy to inexpensive and open access to the scholarly communication it generates' (Shulenburger 1998: 6).

A few years later a small group of scholars saw the power of technology to transform a tradition for a public good. They launched a worldwide campaign for OA to all new peer-reviewed research and were the first to articulate a public definition of 'open access' as 'free availability on the public internet, permitting any users to read, download, copy, distribute, print, search or link to the full text of these articles, crawl them for indexing, pass them as data to software or use them for any other lawful purpose…' as stated by the Budapest Open Access Initiative (BOAI 2002: 1).That vision has attained global momentum: what appeared aspirational more than a decade appears to be achievable.

The move towards OA is a profound change for the whole infrastructure of scholarly communication, and is bound to have impacts on the library as it does on other parts of the process. There has been a lot of discussion around the impact of OA on researchers and publishers but less about what the shift means for libraries and librarians. More than a decade after the definition of open access was introduced a robust infrastructure of digital repositories, new open licenses and a growing body of institutional, national and international policies have been established. Scholars, at first hesitant, are now increasingly embracing OA distribution of their work. Within this higher education paradigm libraries have played a key role in advancing OA. This chapter will focus on libraries in the United States (US).

Institutional open access policies and libraries

In 2008 Harvard University's Humanities and Arts faculty led the way to adopt an OA policy, followed by the Massachusetts Institute of Technology (MIT) faculty with a campus-wide policy (Harvard University OA policy 2008; MIT OA policy 2008). These two institutions were instrumental in laying the foundation for OA policies and their implementation at institutions of higher education in the US.

The University of Kansas, the first public institution in North America to embrace OA, adopted a faculty-led, campus-wide policy modeled on Harvard's in 2009 and 2010 (University of Kansas OA policy). Harvard's policy has been widely adopted as a model for open access policies and resolutions at institutions of higher education. DuraSpace (DSpace), an open source repository developed by MIT Libraries and Hewlett Packard, was looked at as a model for digital repositories.

The majority of these institutional policies focus on faculty members granting to the university permission to make their scholarly peer-reviewed journal articles publicly available in the institutional repository (IR). In 2011, twenty two institutions, mostly librarians, founded the Coalition of Open Access Policy Institutions (COAPI 2011) to share information and experiences and to illuminate opportunities for moving faculty-led open access policies forward at member institutions, advocating for open access both nationally and internationally. The growth in institutional OA policies since 2011 has contributed to the growth of COAPI participants to more than 60 in 2015. The group maintains a listserv and conducts informal meetings while attending other national conferences. The growth of OA policies is not restricted to academic institutions. The Registry of Open Access Repository Mandates and Policies (ROARMAP), a searchable international registry, charts the growth of open access mandates and policies adopted by universities, research institutions and research funders that

require or request their researchers to provide OA to their peer-reviewed research article output by depositing it in an OA repository (ROARMAP 2015).

The work of moving an institutional OA policy forward is not easy. Two distinct phases are evident: first, an effort to gain consensus on the theoretical and philosophical underpinnings for the OA movement and second, determining the pragmatic requirements of practicing OA. (Emmett, Stratton, Peterson, Church-Duran & Haricombe 2011) document the process used at the University of Kansas to highlight the complexities of passing an institutional policy.

Libraries are natural partners in the process: they have first-hand experience of the impact of the serials crisis and understand the need for reform in scholarly publishing. Harris (2012) asserts that librarians already have many skills that should help in OA. Through their work in coalition building, outreach and education, copyright and licensing, and digital journals they have the skills and experience to support OA scholarly communication (SC). Emmett et al. (2011: 8) assert that 'as an active open access partner libraries will not only help universities demonstrate the depth of their own faculty's scholarship, but they will also provide the widest possible audience and increase its potential impact nationally and globally'.

Leveraging skillsets

Libraries have been actively involved in advancing their institutional OA policy from the beginning. If faculty are expected to participate in open access it is critical that they feel supported. Rosenblum (2010) identifies several ways in which front-line librarians can assist to sustain OA practices and policies, including assistance with rights and permissions, maintaining websites, copyright workshop and resources. Passing an institutional policy does not necessarily translate into compliance; rather, it marks the beginning of perpetual and consistent outreach and education among faculty who are key partners in advancing the goal of open access to provide unfettered, free, online access to their peer-reviewed journal articles. A unique and key strength of academic libraries is their relationship with all the departments through library liaison. Kenney (2014: 3) notes 'the past decade has witnessed the development and evolution of the library liaison model as full-time collection development and reference positions gave way to combined and expanded portfolios characterised by greater outreach to faculty and students'. Jaguszewski and Williams (2013) believe an 'engaged liaison' shifts the focus away from the work of librarians to the life-cycle of the research, teaching and learning process.

That shift was formally introduced into the profession at The University of Minnesota, an early adopter of the Librarian Position Description Framework to usher in an engagement-centered model for librarianship that was tied specifically to position descriptions (Williams 2009).

Many institutions have used this framework to add new activities to support these new roles, including scholarly communication, such as Cornell, Duke, University of Washington, Penn State, Virginia Tech, and Stanford (Kenney 2014: 4).

How libraries support the research agenda of their parent institutions has changed as a result of forces like changing scholarly communication practices, technological developments and reduced purchasing power. These drivers of change have implications for the professionals who work in them and require different and new knowledge skills that, in turn, create a demand for new positions, workflows, education and training (Tenopir, Birch & Allard 2012). Kenney (2014: 5) warns that 'as demands and expectations rise, it is clear that no one liaison can do it all'. Libraries have turned to creative staffing models, leveraging subject expertise and functional expertise to work in tandem to respond to these demands, a strategy not without its challenges.

Despite these challenges, libraries have assumed a leadership role in supporting research in

the open networked environment. This engaged scholarship has led to meaningful partnerships and support in new areas including copyright assistance, contract negotiation, repository management, digital publishing, author processing fees, and the life-cycle management of data.

Institutional repositories and libraries

Since 2002 when DSpace and other IR software began to be available, research libraries and their parent institutions have invested in IRs to collect and provide access to diverse locally produced digital material (Bailey et al. 2006).

OA policies and IRs go hand in glove; IRs are a key infrastructure component to support OA policies. They have become established components of many academic libraries, representing 83.7% of the world's repositories according to the Confederation of Open Access Repositories (COAR 2015: 5). The vast majority of OA policies request or require authors to deposit articles in an IR to provide visibility and OA to research outputs, with a focus on the journal literature.

Passing an OA policy does not itself result in an increase in article deposits to IRs (Zhang, Boock & Wirth 2015). Deposits into IRs rely on a host of new services that require traditional library skills, expertise and active engagement with faculty to recruit content, check publishers' policies, insure compliance and deposit the articles (Madsen & Oleen 2013: 3). Bankier and Perciali (2008) believe that supporting services that remove barriers to participation can help ameliorate the difficulty of soliciting faculty content. Madsen and Oleen (2013) highlight a survey of IR managers by Hanlon and Ramirez (2011) who found that the majority followed a mediated deposit process with librarians and library staff holding the role of copyright clearance. Promoting the IR is equally important; you may build it but faculty will not necessarily deposit their articles. Reference librarians, library liaisons and subject librarians are well positioned to take on the roles of marketing IR services and explaining the features and advantages to increase faculty participation (Rockman 2005). IRs have come into sharp focus recently due to the high volume of funding agencies responding to the White House's Office of Science and Technology Policy's (OSTP) directive for 'increased public access to ... peer-reviewed publications and digital data'. As the principal producers of the resources that are to be made publicly available, the White House directive provided a compelling reason to integrate higher education's investments into a system of cross-functional digital repositories. In response, in 2013, the Association of Research Libraries (ARL), the Association of American Universities (AAU), and the Association of Public and Land-grant Universities (APLU) established the Shared Access Research Ecosystem (SHARE) to help ensure the preservation of, access to, and reuse of research outputs. Their primary goal is to help maximise the benefits of research to science and society (*ARL News* 2014).

Libraries supporting public access policies

The enactment of the US National Institutes of Health (NIH) Public Access Policy in 2008 required researchers to release to the public their manuscripts supported by NIH. Implemented as a request in 2005 and following years of discussion and opposition to the NIH's public access policy, the request became a legal mandate in 2008 requiring NIH funded researchers and scientists to release their papers within 12 months of publication. Suber (2008: 1) asserts that 'measured by the ferocity and opposition overcome and the volume of literature liberated, this is the largest victory so far in the open access movement'.

Libraries were swift to embrace the opportunity to take a leadership role in developing services to support their research communities which were required to comply. Typical services identified in an ARL survey included consultations, presentations, compliance guides, training, and policy overviews and the drafting of language and advocacy for policies in support of public access (Sarli, Dubinsky, Engeszer & Lewis 2009). In providing these services libraries leveraged the expertise of units on campus. In doing

so, they developed new alliances with units outside the library to support public access including the Office of Research, General Counsel and the Office of Sponsored Projects. Within this new paradigm of OA higher education libraries demonstrated their ability to embrace change and to leverage resources and expertise to respond quickly and efficiently to future mandates. They became the leaders in the effort to address the complexity of research in the 21st century (Antell, Foote, Turner & Shults 2013).

Several funding agencies around the world have joined the international push to provide OA to publicly funded research. In the US the world fundamentally changed for the research community when the White House's OSTP in 2013 directed that 'within six months each federal research funding agency with R&D [research and development] budgets of $100 million or more' develop a plan to support increased public access to the results of research funded by the federal government including peer-reviewed publications and digital data (OSTP memo 2013). The mandates extend the requirement beyond access to articles to the underlying data.

Libraries and data management mandates

The majority of the institutional OA policies focus on peer reviewed articles but it is clear that the funding agencies' mandates focus on data with implications for libraries. These mandates have reached a tipping point in recent months as agencies began to respond to the OSTP directive which will affect researchers at every research institution. Data management, once viewed as peripheral to the core of librarianship, is now becoming mainstream.

Libraries understand their role in advancing research in order for researchers to focus on their work. They have long assisted researchers in broad data support services including locating data sources, geospatial analysis, acquisition of datasets, copyright and patent advising. Many libraries launched research data management (RDM) services to support faculty with data management plans for the National Science Foundation (NSF). Universities that have begun to address research data management actively have found that they need a multidisciplinary team that includes the information technology units, libraries and the research office to pool their skills. A snapshot of the range of services for research data management support include consulting, data management plans, copyright services, data curation, archiving and preservation, digital publishing and copyright assistance (Fearon, Gunia, Lake, Pralle & Sallans 2013; Brown, Bruce & Kernohan 2015).

While these services do align with a diverse skill set across the library an ARL survey listed specific essential skillsets to support RDM services. These include application of metadata standards, digital preservation, data ownership, technical skills in data acquisition, analysis and visualisation (Fearon et al. 2013). Tenopir, Sandusky, Allard and Birch (2013: 76) believe that academic research librarians are the most appropriately equipped to provide research data services such as data management planning, digital curation (selection, preservation, maintenance, and archiving), and metadata and creation and conversion. Neal (2005) thinks the need for new skillsets may perpetuate the trend in academic libraries of populating professional ranks with staff with alternative or non-traditional academic backgrounds.

Data management is not a new concept to researchers; however, the number of funding agencies' mandates requiring formal data management is new. As the need for research data management grows, many libraries are considering adding data services to support the research mission of their institution. While many research libraries have begun to respond to this emerging demand by adopting new roles, services and organisational structures, libraries are still in the early stages of development and implementation of research data management services. Antell, Foote, Turner and Shults (2014: 557) found mixed themes of uncertainty and optimism in their

study of science librarians' participation in data management. They found '…uncertainty about the roles of librarians and libraries, and other campus entities; uncertainty about the skills that will be required; but also optimism about applying "traditional" librarian skills to this emerging field of academic librarianship'. The lack of institutional data management policies and clear institutional directives to support new research services is partly to blame. Despite this environment libraries are offering services ahead of evidence on which models are most effective. Witt (2012: 186) asserts that 'data management will have matured when "data reference" becomes just "reference" and data is no longer treated as more special than any other collection'.

OA publishing and libraries

The evolutionary development of OA in libraries owes its traction to the 'serials crisis' in the 1990s. Young (2009: 6) described this movement as 'an attempt to remove barriers of price and permission, which enables numerous additional benefits'. OA requires libraries to be active participants in creating scholarly materials and in recruiting the content of their institution's scholarship. In Walters's study (2012) on the future role of publishing services in university libraries participants saw collaborating with multiple libraries and other stakeholder organisations to establish publishing cooperatives as essential. Several libraries have responded to this opportunity by combining the traditional strengths of publishers and librarians to provide an array of services to their faculty, including Purdue University Libraries' Publishing Division and the University of Michigan Library's Michigan Publishing. Others are shaping their own responses to provide the means to scholars 'to launch a new generation of journals committed to open access, and to help existing journals that elect to make the transition to open access…' (BOAI 2002: 1).

The evolution of OA publishing models has budgetary implications for libraries as they explore ways to support faculty who embrace OA publishing. Increasingly authors face processing charges ranging from US$200 to $5000. Poynder (2015: 1) writes:

> BOAI did not specify that OA journals should levy an article processing charge (APC), but while OA advocates point out that most OA F do not charge a fee, the reality (unless something changes) is that the pay-to-play model is set to dominate OA publishing. One of the main promises of the OA movement was that open access would solve the affordability problem that has held universities in its iron fist for several decades now – the so-called 'serials crisis'. Pay-to-publish gold OA may seem like a good solution, but if it proves as expensive as (or more expensive than) subscription publishing, how will the research community afford it?

With the number of articles being published in OA journals charging APCs growing, and an increase in the number of institutional policies mandating their employees to make their works available in OA repositories, faculty will continue to face this dilemma (Fruin & Rascoe 2014).

The Compact for Open-Access Publishing Equity (COPE) is a programme by universities to support equity in business models used for scholarly publishing. Several programmes exist to reduce barriers to OA publishing for authors needing to choose the venue for their work that best suits their needs. These include the Directory of Open Access Journals (DOAJ), PeerJ, and eLife. However, the landscape is complex with concerns about predatory journals, and there are ongoing efforts on the part of some publishers to undermine the investment libraries have made in repositories over the last decade to ensure that the academic community is asserting control over its own intellectual property (Joseph 2015).

Faculty perceptions

The new roles and services imply significant investments by libraries to advance the goal of OA but has it been transformational? Kroll and Forsman (2010: 18) assert that 'researchers have

no perception of the huge internal transformation most libraries have undergone in the conversion to digital access'. Affirming this perception is Ithaka S+R's Faculty Survey (Housewright 2012) that shows faculty's highest level of need for the library is that of acquisition agent. Faculty still tend to value established scholarly dissemination methods and journals with impact factors and there is less widespread agreement about the value of support services offered by libraries that are intended to maximise access and impact. A shift in this perception will not happen overnight unless we embrace our role to lead our universities into the 21st century. Zhang, Director of the National Science Library of the Chinese Academy of Science, warns of the sense of urgency for libraries to do something or be left behind (2012: 2).

Embracing change, empowering scholarship

The literature review reflects the significant investments academic libraries have made in infrastructure, resources and partnerships to advance OA. While libraries have responded to the call through transformed workflows, services, organisational structures and retooling current employees, they need to do more to transform themselves from a knowledge service provider within the university to be a pre-eminent and active partner within a rich and diverse learning and research ecosystem. Simply put, libraries need to shift from being collections-centric organisations to become more engagement-centric.

Kenney (2014) writes, 'Perhaps no other library has embraced this shift more fully than the National Science Library of the Chinese Academy of Sciences'. Zhang, its director, has defined a resource strategy reframing the needs and roles for libraries. Kenney (2014: 4) quotes Zhang describing his vision of a transformed research library in an OA world:

> And a knowledge analysis and experiment laboratory is to rise from the clouds of digital content to support tracking, detecting, analyzing, and discovering trends, structures, and abnormalities in science, technology and innovation, so to help and stimulate R&D decision-making and research road-exploration. The library will no longer be bounded by resources and systems but diffusing into users' knowledge processes in a digital, network, and computational way.

In Zhang's model, the relationship between the users, the librarians, and the library will be transformed. Librarians and services will be disentangled from THE library or its processes, with librarians becoming knowledge workers working together with researchers and within their research processes. The challenge, he says, 'is to recontext the library, to capitalize on the complexity and to shape the future, not just for themselves but for research and learning' (Zhang 2012: 2). A case study of the University of Kansas Libraries further highlights the changes, the challenges and opportunities to support researchers in an OA system.

Case study: University of Kansas (KU) Libraries

This case study will highlight the process and the investments made to support OA that culminated in the faculty-led campus-wide OA policy and the libraries role in implementing the policy.

KU has enjoyed a rich institutional history of supporting OA. The University was a founding partner of BioOne, an early signatory of the high energy physics OA initiative, Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOAP), and also a campus partner in developing support for NIH open access compliance (Ludwig 2010). From the beginning the libraries played a key role in advancing OA on campus.

Achieving consensus

Deeply rooted in the serials crisis of the 1990s, the KU's chief academic officer, David Shulenburger, led the movement among stakeholders in higher education to reshape the scholarly publishing system. Following OA policies at Harvard and MIT in 2008, KU adopted a faculty-led, campus-wide OA policy in 2009 and in 2010, became

the first public university to pass an institutional policy requiring faculty to make their journal articles available through an OA repository (University of Kansas OA Policy 2010). KU's OA policy was the culmination of a decade long campaign to build consensus on a set of principles that could guide the transformation of the scholarly publishing system. The process took two full academic years and significant investments of time on the part of many faculty, including library faculty in leadership roles in the faculty senate: 'Achieving reasonable levels of consensus across such a diverse faculty required diplomacy, patience, forethought, and careful crafting of presentations and messages to faculty' (Emmett & Peterson 2010: 7). Ludwig (2010) agrees, noting three key elements that led to the successful adoption of a faculty-initiated campus-wide OA policy: significant institutional support for OA built over more than a decade; leadership by faculty for faculty in developing a policy and accompanying implementation strategy; and deep engagement of faculty across disciplines in discussions about the implications of open access scholarship over time.

Institutional repository

The institutional repository, KU ScholarWorks, was a key investment made in 2003 and launched in 2005 to coincide with KU's resolution to encourage self-archiving by its faculty. The libraries were involved in its development and planning and sought faculty input regularly. Following an assessment of IR deployment in the United States, Lynch and Lippincott (2005: 1) asserted that 'institutional repositories are now clearly and broadly being recognized as essential infrastructure for scholarship in the digital world'. Although KU had been widely recognised as a leader in reforming scholarly publishing, faculty authors were not necessarily among those who recognised IRs as 'essential infrastructure.' An assessment of KU's implementation strategies revealed a disconnect between faculty behaviour and the University's investment in an IR to assist faculty to retain control of their intellectual rights. This finding was consistent with those in the literature review about faculty's attitudes and OA. Recognising its role as a catalyst to advance OA, the libraries adjusted the submission process and introduced a suite of services that transformed the IR from a self-archiving model to a mediated service model that began to generate a higher volume of articles and high visibility in KU ScholarWorks.

KU's decade long strategies provide valuable lessons for others who are pursuing institutional OA policies. These lessons include the critical importance of: meaningful engagement with faculty to understand their concerns and needs; implementing barrier-free submission or mediated services to assist faculty who support OA; using multiple approaches to engage faculty; including and consulting all stakeholders; assessing services regularly, and being prepared to provide continuous outreach and education. Mercer and Emmet (2005: 1) stated 'KU ScholarWorks will fill its role as an institutional repository when its contents are representative of the vast research output from the many disciplines at KU'. The content representing KU's scholarship is diverse including KU's electronic theses and dissertations, graduate student project submissions and small sets of data, among others.

KU's IR reflects what Goodyear and Fyffe (2006: 3) define as 'making visible – to the campus and to its leadership – the breadth, depth, and value of the scholarly papers, research data, and other assets held in campus information systems and, by extension, demonstrates the scholarly importance of properly managing those systems and assets'.

Open access publishing

KU Libraries provide a variety of support services for OA publishing as enumerated in the literature review. They continue to invest in initiatives to open access to scholarship globally and to its own published work, for example, Journals@KU (2015) supports the KU community in the publication of scholarly journals online by providing two platforms, and KU ScholarWorks

and Open Journals System make journals visible and assure their preservation, but also support the editorial management workflow, article submission, multiple rounds of peer-review and indexing. In 2012 KU established a central fund, the One University Open Access Fund, to support faculty, staff and students on the main and medical campuses who choose to publish in OA journals that require author fees for accepted manuscripts. Unlike most campuses where libraries provide all or some of the funding support for APCs, KU's fund is supported centrally by the provosts on each campus and the vice chancellor for research and graduate studies. The libraries, in consultation with faculty developed the criteria for funding and evaluate requests for APCs in a monthly competitive review process. The libraries provide special services to digitize older theses and dissertations (even handwritten ones!) that have resulted in generous cash donations to the library.

Education and outreach

Education and outreach are ongoing through existing organisational structures, services and programmes. Celebrating OA week through hosting visiting speakers, workshops, and special projects are among the most visible activities to raise awareness around OA on campus. KU Libraries host an annual session specifically for graduate students to introduce them and engage them in conversations about OA. It also supports the international OpenCon, a conference for students and early career professionals on OA, open education and open data, by sponsoring a graduate student to attend the conference.

Professional development opportunities are provided for librarians and staff to assist and participate in outreach and education. In 2013, a statement of expectations to advance open access was included in librarians' position descriptions as a strategy to begin to mainstream their roles in advancing OA.

An OA advisory board of faculty and deans assists with policy development and assessment while appointed OA liaison staff in several disciplines across campus serve as key contacts between the libraries and their departments. These structures are beneficial in 'testing' the waters, for example, the value of altmetrics in tenure and promotion decisions. Highlighting the top ten downloads in the IR every month helped to showcase the broad reach and impact of KU's scholarship.

Conclusion

Open access has gained significant momentum. Since it entered the mainstream in 2002, more than a decade ago, libraries have emerged as leaders to reshape the scholarly communication landscape in response to the serials crisis. This new role has deeply impacted infrastructure, new services, staffing skills, workflows, funding and outreach to promote OA among faculty. Progress is palpable.

IRs and workflows have become mainstream, the number of institutional OA policies have increased beyond single campuses to university systems and state-wide policies, research institutions and funding agencies are mandating access and re-use and publishers have begun to modify their behaviour or create new models to provide options for open access to published materials, albeit at a cost. The open agenda has broadened to include open data, open science and open educational resources in which libraries are well positioned to contribute distinctive expertise. Despite the evolution in the open access ecosystem libraries have remained key stakeholders in this changing landscape.

Zhang, Liu, Li, Zeng and Ku (2012) reframe the needs and roles for libraries in an OA world by looking at three different but closely related perspectives: what is needed for and enabled by OA from OA research and learning institutes; what is needed for and enabled by OA for scholarly communications, and what would be the libraries' roles and services contributing to the transformation. In doing so, Zhang et al. (2012) have identified opportunities for libraries to embrace the changes to empower scholarship and to advance

their work in a growing OA world. The case study detailing the KU's strategies provides valuable lessons for others who are pursuing institutional OA policies.

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Chapter Five
Supporting Academic Librarians' Transition from Generic to Research Dedicated Roles

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Abstract

In 2014 the library service at Nottingham Trent University (NTU), United Kingdom restructured its academic liaison team to create a new dedicated research support team. In this case study, the author considers the issues involved in supporting librarians who are moving from a generic full-service model to a dedicated research role. Approaches to developing new technical knowledge and skill competencies are addressed as are the differences between their old and new roles in relation to interpersonal skills and behavioural competencies, reflecting the changed nature of the relationships they were expected to develop. Based on the experience at NTU conclusions are drawn regarding best practice in supporting librarians moving from generic to research specific roles.

Keywords: training; research support; organisational change; up-skilling; staff development; academic libraries; United Kingdom

Introduction

Nottingham Trent University (NTU) is a large university situated in the midlands of England with a student population of just under 27,000, of whom approximately 6000 are studying at postgraduate level. The University is structured around three colleges: Arts and Science; Business Law and Social Sciences; and Art, Design and the Built Environment. Nine academic schools sit within these colleges. The colleges provide business and administrative functions while the schools are the focus for academic activities. The NTU Graduate School works in partnership with the nine schools to support the management of postgraduate research degrees.

The University defines itself as 'teaching-intensive' and 'research-active' and aims to prioritise activity that promotes and enhances high-quality learning opportunities for all students, including raising their awareness and experience of research. Its aim is to achieve sustainable growth in the quality, volume and applicability of research, although it has no aspirations to become a research intensive university. To this end, there is a strong emphasis on equipping researchers (many of whom are early career researchers) with the appropriate skills to succeed, and maximising the impact of the research carried out to improve awareness of the University and its reputation for the research undertaken. In 2014 the library service at NTU restructured its academic liaison team to create a new dedicated research support team.

This case study is based loosely on Stake's (1995) approach of observation with conclusions drawn by the author who considers the organisational change and human resource issues involved in supporting librarians who are moving from a generic full-service model of support to a dedicated research role. In addition to looking at approaches taken with regard to developing new technical knowledge and skill competencies, the chapter considers the differences between the librarians' old and new roles in relation to interpersonal skills and behavioural competencies, reflecting the changed nature of the relationships they were expected to develop with their new key customer group of active researchers. Based on the experience at NTU conclusions are drawn regarding best practice in supporting librarians moving from generic to research specific roles.

Academic liaison and the need for change

Library support for research had been provided by an academic liaison team (ALT) which had been in operation largely unchanged for over ten years. It was well established and integrated into the University and held in high regard by academic staff. It operated a 'full service' model, in that all aspects of academic support work were handled by the team through a single named contact. From the perspective of academics or researchers this was a very simple but effective model as they simply had to contact one person for any of their library needs, including research support. It has worked well while the university environment remained relatively stable in terms of research support needs but the team had been operating at full capacity for some time both in terms of the volume of work undertaken and also the breadth of knowledge and understanding they needed given the wide range of responsibilities they already had. The library's support for research was satisfactory but operated within a relatively undemanding environment; it was broadly meeting demand, but not helping to inform, shape or lead on developments. In terms of practical support the offer from the team to researchers could be characterised as:

- Collections focussed, but without any dedicated funding for research materials. Research materials tended to be acquired with 'one off' funding or as part of a balanced overall collection to support learning, teaching and research.
- Limited involvement in or support for management of research outputs. There was encouragement to contribute to the institutional repository but it was not mandated.

- Ad hoc support provided to researchers on advice on publishing options, retaining copyright etcetera.
- Limited researcher training offered and usually outside of mainstream activity. Much of it was on a one on one basis.

The context for research support in the United Kingdom (UK) universities was, however, undergoing some significant changes, and these were beginning to be reflected at NTU in increasing demand for a more active role in terms of supporting what was becoming an increasingly critical university activity. The national agenda to enhance access to publicly funded research had gained considerable traction within the UK over the previous three to four years, spurred on in part by the influential government sponsored Finch Report (Research Information Network, 2012) which proposed a move to open access (OA) for all public funded research. Arguments for and against OA were debated across UK universities which were all considering its implications. Some funding bodies were already insisting on particular approaches to OA, but there was not a consistent requirement or indeed response across the UK Higher Education (HE) sector. In parallel with this public debate, the UK's Research Excellence Framework (REF) which is a system for assessing the quality of research every six years in UK higher education institutions, was also making moves towards OA and more generally indicating that it would be expecting greater understanding of the impact of research carried out at the next major review in 2020.

NTU was, of course, not immune to this, and the changes to OA and REF were encouraging the University to take a more strategic approach to how it undertook research and how this was managed. The conversation had started about how to respond and in particular what role libraries might have; after a long period of inaction there was now talk about the future and the library had been challenged to play a significant role in it. External pressures were driving developments and creating the impetus for change, with the library now being seen as part of the response. The potential for the library to extend its role beyond traditional collection management and provision to include a range of new services relating to the management of research output was gathering momentum – an opportunity to create a much more central role. It was recognised that, in broad terms, the library could add value by:

- administering open access fees on behalf of the University;
- developing and managing policies relating to publishing options;
- providing training and advice on intellectual property (IP) and publishing/dissemination options;
- maintaining the Institutional Repository as a complete record of intellectual output;
- developing new services such as citation impact analysis, trend analysis et cetera;
- providing templates to simplify tasks for researchers.

To deliver the above, the library would have to increase the resources invested in it considerably, not something that would be possible given that no additional funding for staffing was available. Other equally important priorities for the team meant that switching resources to research support from other areas was also not possible. Responding to the demand would also have required further extending the breadth of skills and knowledge required by the team, again something that, given the current extensive range of responsibilities, was not a realistic proposition.

The way forward from a generic full-service model of support to a dedicated research role

The question faced therefore was whether it was possible to respond to the increasing demand within the existing staffing structure as increasing the pay bill and enlarging the team were not options. Our assessment was that it was not possible to expand the depth of knowledge and understanding required for research support and

expect that to be delivered alongside all other existing services for teaching and learning. Informed by investigations undertaken by Research Libraries UK (RLUK: Auckland 2012) and evaluated by Brewerton (2012a; 2012b), we concluded that the time had come to specialise and move away from the generic model that had served us well for more than a decade. Although this was primarily driven by workforce planning and job design factors it was also recognised that the development of a separate team with its own distinct identity provided some interesting opportunities for marketing and promotion that may have been more difficult if part of a bigger service offer. Notwithstanding all this, there was understandably a degree of concern at the breaking up of what had been a very successful service operation; and it was also felt to be important to be clear that the new research support remained firmly embedded within the overall library service, and was not seen as a 'free standing' team disconnected from the rest of the library service. This was a careful balancing act.

Having taken the decision to restructure there followed a very real and pressing need to respond quickly to the new needs of the University. This required the revised staffing arrangements and new services being in place more quickly than we would have ideally wanted, but it was considered important to be seen ready to respond to the timescales of the University and not the library. In reality the first full year of operation was always going to be something of a transition year, with two key priorities: first, to have some form of training support available to researchers from the start of the new academic year – so just a matter of weeks after the team had been established a programme of workshops and training events had been prepared, and secondly, to recognise and accept that to a large extent the upskilling of staff would have to take the form of 'learning on the job', with skills and knowledge being acquired and developed on a just-in-time basis, often only one small step ahead of it being needed. While it is undoubtedly possible to argue the merits or otherwise of this approach the reality was that we had no alternative.

A prerequisite to the above was, of course, the formation of the team itself, which was to contain four full-time staff from the original ALT team of twelve. We took the view from the very start that all members of the existing team were more than capable of carrying out the specialist research support function, and therefore the restructuring would be carried out on the basis of expressions of interest and mapping of personal interest in the new role. While this approach gives no guarantee of success, and is not always replicable elsewhere, when you have good reason to believe it will work then it much reduces the stresses associated with organisational change and allows the staff affected to focus on the outcome of the process rather than the process itself.

It was noted by Simons and Searle (2014) that they found no clear pathway for the acquisition of new library research skills, and this reflected our own experiences at NTU. However our experience (and good fortune) was that the hard/technical skills associated with the new role (for example, bibliometrics) although initially thought complex were actually relatively easy to get to grips with. The absence of quality external training to support the acquisition of the new skills was in fact not a major problem. We believe that to some extent this was thanks to the small size of the new team whose members were very supportive of one another and keen to share what information and skills they had acquired.

Equally, gaining a working understanding of the key developments in research (both in terms of policy and discipline) was relatively easy to achieve, with the main challenge matching and relating them to the local university context, and, in particular, to the needs of specific research groups and individual researchers. Active engagement in social media discussion regarding new initiatives was perhaps the most important contributor to the success of this strategy, proving to be considerably more valuable than any other channel of information.

Table 1: Link between 'old' activities and tasks and new role

Activity	Comment
Information literacy	Continues, but emphasis moves from teaching low level/basic skills to large groups to help with advanced techniques on a 1-1 or small group basis. Remains a significant element of job.
Subject knowledge	Continues, largely unchanged, but now includes awareness of key research trends including funding opportunities.
Social media understanding/awareness	Continues, but emphasis now on advising on management on researcher identity.
Managing information	Continues but emphasis moves from simple to complex/advanced in relation to bibliographic referencing, copyright compliance and citations. Remains a significant element of job.
Special Collections	Continues, but higher profile in new role and expected to actively engage with development and management.
Running of workshops and training events	Continues but with greater emphasis on alignment with external researcher frameworks such as the UK's Research Development Framework (RDF).
One to one help/advisory service	Continues, no longer providing an 'on demand' service but 1-1 appointments are offered.
Production of guides and online support material	Continues, same.
Collections management	Continues, but only in relation to research materials (was a major time consumer in previous role).
Reading list (creation, management etcetera)	Stops, was a major time consumer in previous role.
Study skills support/teaching	Stops, was an increasingly large part of previous role.
Data management	New to research role, providing advice and training.
Maximising and measuring impact	New to research role, compliance with institutional policies, citation tools, bibliometrics, social media engagement/promotion.
Publishing advice	New to research role, providing advice on where and how to publish (including OA options), funder requirements and mandates etcetera.

Table 1 demonstrates that although the application of the work may have changed substantially, when the old and new roles were considered from the standpoint of tasks and activities undertaken, there remained a good degree of match between them. The environment and context were clearly different between the new research team and the learning and teaching team in terms of institutional priorities and customer profile, but the new core activities continue to have much in common with the old role. Where new areas of activity were introduced (for example, bibliometrics) they were in broad terms matched by a reduction of a corresponding area (for example, reading lists). In general terms it could be said that while there were new skills and knowledge to be acquired (and some to be dropped) the skills, knowledge and competencies required were essentially the same, although, it must be acknowledged, likely to be tested to very high levels.

Informing an overstretched team that there were areas of skill and knowledge that they no longer had to apply was never going to be a hard sell and they were of course enthusiastic about developing the new skills and knowledge required. The key challenge, as previously noted, was finding a systematic way to complete the process. The external training support environment for these areas is not at the same level of

maturity as it is for other training needs, and therefore there was more difficulty in identifying suitable training courses than otherwise might have been the case. In reality the end result was a combination of product supplier demonstrations and presentations and a very large degree of self-directed investigation, study and on-the-job learning (with the librarians often just one small step ahead of the researcher they were supporting). The end result has been entirely satisfactory and the team's knowledge and skills are now at the required standard, but the team had been required to exercise considerably more initiative and resourcefulness in acquiring the expertise than had been anticipated originally. Turning now from the 'hard' skills to the 'soft' skills it is particularly satisfying to confirm that the core behavioural competencies of a librarian in a generic liaison role are exactly the same ones required in the specialised research role. This is what we had originally expected to be the case but it is very pleasing one full year down the line to have had that confirmed. It is undoubtedly true that the librarians have been tested and stretched to a very high level, which they have been able to respond to. The context in which they have been deployed is of course very different to that of the previous role, but we believe the evidence supports our view that the core skills can be successfully transferred.

Such behavioural competencies (team working, influencing skills and so on) are often characterised as 'people skills' and their importance cannot be overstated in relation to the development of the new team. While technical knowledge and skills are obviously needed to create and maintain credibility with the research community, they are of little value if the team and its members cannot gain the trust of researchers and demonstrate to them that they are 'on their side' and wanting to help. Such trust creates the outlet for their 'hard' skills to be effectively deployed. This is particularly important in relation to help with regulatory and compliance issues, in which it is not unusual for the researcher to have little personal interest and so they are particularly grateful for any support and assistance that can be provided.

Table 2 reproduces the core (or common) behavioural competencies that intentionally remained unchanged from the old generic role to the new specialist one.

Conclusions about best practice

While new skills and knowledge had to be acquired, some of which was challenging to organise, the transfer and adaptation of existing core behavioural competencies was fundamental to the success of the new team. Conversely, had the team comprised highly knowledgeable and skilled staff who were less strong with regard to interpersonal skills then its success might have been more uncertain. Based on the experience at NTU, the transition from generalist to specialist can work – and work exceptionally well – if those core transferable 'people skills' are already present and well developed. The new technical skills and knowledge required, while undoubtedly demanding, were not found to be overwhelming, particularly when matched with other technical areas which were being deleted from the job role. In terms of lessons learned by the experience at NTU, the key messages are:

- Assume that experienced generic liaison staff are entirely capable of transferring to a dedicated research role.
- Expect challenges in providing the new 'hard' technical skills and knowledge in a systematic way, and be prepared to be opportunistic about how they are acquired, but be confident that staff will be capable of rising to the challenge.
- Anticipate that the key determinant of the success of the new role will be largely down to the interpersonal / behavioural competencies of the individual, which are common to all library liaison roles and therefore likely to already present in any

Table 2: Behavioural competencies carried over from previous generic role

Competency	Description
Customer focus: provides the best quality services to internal and external customers, meeting their needs by working in partnership.	Provides a quality service that is regularly reviewed. Anticipates customer needs. Actively seeks feedback on services from customers and makes appropriate changes to service and to underpinning policy/strategy.
Organisation and delivery: adopts a clear approach to change. Planning, prioritising and organising work, making effective use of time and resources.	Takes account of organisational priorities to ensure that operational and strategic plans are being implemented and achieved.
Adaptability: adapts to new situations and areas of work flexibly and with enthusiasm, including recognition of, and work towards, addressing own development needs and those of others.	Embraces and manages change. Seeks opportunities for change, supporting colleagues in implementing new ways of working, effectively and supportively communicating the rationale for change.
Creativity and innovation: adopts a creative approach to problem solving and seeks opportunities to innovate.	Reviews, tests and implements new concepts, models and approaches to practice in support of service development and delivery.
Making informed decisions: analyses problems and uses a range of means to make well informed decisions.	Uses analyses, reports and data to test the validity of options and assess risk before taking decisions. Ensures optimum decisions are taken.
Communicating and influencing: gives and receives information effectively, negotiates and persuades to achieve the best possible outcome.	Communicates effectively with a wide range of diverse internal and *external* stakeholders, influencing and negotiating change. Networks internally to keep ahead of developments.
Team working Co-operates enthusiastically with others in own team and in other formal and informal teams.	Leads aspects of team work, seeking and implementing improvements to the team's outputs/service and developing colleagues within the team. Challenges colleagues.

high performing library team.

- Encourage the staff to concentrate on making contacts and developing new working relationships with key stakeholders as a priority.

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Chapter Six

Research Support by Subject Librarians in Selected State University Libraries in Zimbabwe: Accommodating New Trends

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Abstract

This chapter reports on a study which investigated how subject librarians gain the skills and knowledge required to support researchers in the new research landscape of higher learning institutions in Zimbabwe. An experience survey method was used, and results show that librarians gained skills through workshops, conferences, seminars, colloquia on research, personal development, partnerships, and through conducting research. It was discovered that subject librarians' support for researchers coalesces at the gathering and sharing stages of the research life cycle. Teaching information literacy, developing institutional repositories and mounting awareness campaigns were some of the activities undertaken by subject librarians in support of researchers. Academic librarians faced a number of challenges regarding the large size of the student bodies, lack of support from parent institutions and financial constraints.

Keywords: academic libraries; researchers; research support; state universities; subject librarians; Zimbabwe

Background to the study

Traditionally, universities have had the primary role of producing highly skilled labour for the service and production sectors of the economy. However, as demand from government and funding agencies for relevant research continues to mount, research has emerged as a dominant goal in most higher education institutions in Zimbabwe. Additionally, success in research has become a major component in various indicators of overall university performance according to the Research Information Network (RIN 2010). As a result, most tertiary institutions have adopted a research-based approach to education (learning through inquiry) which fosters an environment in which research undertakings (problem-driven) and academic studies demand attention in equal measure.

Zimbabwe's higher education sector comprises universities, polytechnics and teacher training colleges (Kotecha & Perold 2010: 34). There are 16 universities (List of Universities in Zimbabwe 2015) and 21 polytechnics and colleges in Zimbabwe, according to the Southern African Regional Universities Association (SARUA 2009). Of the 16 universities, ten are state funded and six are privately owned. At the time of their establishment, these institutions developed their niche foci according to the gaps that existed in the economy at that point (Kotecha & Perold 2010: 34). Between them, the universities offer a wide range of disciplines in the humanities, social sciences (library and information science included), business studies, architecture and the natural, health and pure sciences, and include engineering and agriculture (Kotecha & Perold 2010: 34). The majority of the universities are relatively new, having been established during the last decade. The institutions are generally at different stages of development, with the University of Zimbabwe being the only one that can be described as having reached full maturity status (SARUA 2009), having been established in 1952.

The core functions of Zimbabwe's universities have had a strong focus on teaching and learning (approximately 57% concentration), with research (approximately 28%) and community service (approximately 15%) (SARUA 2009), however, this has been changing with university leaders complaining that there is a strong bias towards teaching and learning. They have pointed out that this bias needs to be reversed with the 'aim of producing new forms of outputs able to adapt in the current global economy' (Wilson-Strydom & Fongwa 2012). Speaking in Parliament on July 2, 2015 the Deputy Minister of Higher and Tertiary Education, Science and Technology Development in Zimbabwe, Dr G. Gandawa (Sport FM Radio Station 2015) reported that the Government had taken measures to ensure that students in institutions of higher learning come up with products in their studies and research that can be used in industry rather than simply acquiring certificates. This speech demonstrates a shift in thinking at government level.

The establishment of central research units in Zimbabwean higher learning institutions such as the Research and Innovation Office at the National University of Science Technology (NUST); The Office of Research at the Midlands State University (MSU) and the Research Section of Lupane State University (LSU) demonstrates the considerable amount of attention research has received in recent times at the institutional level. According to Kotecha and Perold (2010: 45) NUST reported an increased level of confidence amongst staff following these interventions, and an increase in applications for external grants. Research areas have also been streamlined into clusters of multidisciplinary teams that were in the process of responding to requests for proposals in their respective areas of interest (Kotecha & Perold 2010: 45). This arrangement reflects a new mode of knowledge production and science characterised by 'context of application, trans-disciplinary, heterogeneity of practise and close interaction of many actors' (Hessels & Lente 2007: 4) and the generation of large amounts of data. These developments have affected almost everyone in the academic community. RIN (2010)

and the Consortium of University Research Libraries (CURL) (2007) report that the rise of e-research, interdisciplinary work, cross-institution collaboration, and the expectation of massive increases in the quantity of research output in digital form all pose new challenges to everyone in the academic sphere, the library included.

Consequently, this research-based approach to higher education has affected academic librarians regarding their skills, knowledge and the role they should play in the research process or/and knowledge production. This shift in approach to education has led to a debate around the world regarding the role of academic librarians, especially research support by subject librarians. In their submission, Raju and Schoombee (2013: 27) assert that within the new higher education paradigm, where education is mooted to be done collaboratively, libraries are purported to be at the core. Some academic librarians, however, 'fear that they are on the brink of extinction….' (Bourg, Colman, & Erway 2009: 1).

High-end research support has been heralded as an opportunity for academic librarians to move away from 'life support' to a more critical role in the new higher education environment. However, a preliminary investigation in Zimbabwe showed that academic librarians in higher learning institutions were providing research support around collection development and information discovery. The new higher education landscape requires a 'shift in the role of the librarian is from a supporter of the research process to a contributor to the process' (Raju & Schoombee 2013: 29). The involvement of academic librarians in research, however, has been questioned by some because of the 'level of technical know-how and domain understanding required' in supporting researchers according to Swan and Brown (2008) cited in Kennan, Corrall and Afzal (2014: 669). This scepticism is evident in some universities where all research responsibilities, including publishing and research records management – which are library specific, have been taken on by newly created research units. This scenario puts academic librarians in an untenable position.

In an increasingly tough economic climate characterised by budget cuts, being able to demonstrate impact and value is crucial for the survival of academic libraries. Bourg, Colman, and Erway (2009:1) argue that academic librarians must change radically to survive. The establishment of institutional repositories at the University of Zimbabwe in 2005, NUST in 2007, Africa University in 2008, and MSU in 2009, and the creation of research commons at the University of Zimbabwe in 2013 and Africa University in 2013 (Nyambi 2011; Machimbidza 2014; Mazhude 2015; Africa University Library Policy 2013; Maisiri 2015) demonstrates that libraries in Zimbabwe have been responding to and transforming with the changing nature of higher education and research. Research commons are an innovation that has been mooted to cater for the new research environment designed to emphasise knowledge creation. They provide a flexible, technology-enabled space for postgraduate students and researchers, which supports collaboration between students and academics, and between researchers and research communities (Raju & Schoombee 2013: 33). In addition institutional repositories are intended to showcase the research output of an academic or research institution (Machimbidza 2014). Despite such developments indicating a positive move in support of research, studies that were carried out in Zimbabwe state universities revealed that institutional repositories and research commons were characterised by slow growth and low usage (Machimbidza 2014; Mazhude 2015).

In this context Ellis, Rosenblum, Stratton, and Ames-Stratton (2014: 2) suggest that some of these roles and services are new and that there are no established best practices or organisational models to follow in developing these new services. Many of these roles entail acquiring new skills or knowledge. It is, therefore, essential that 'librarians gain a better understanding of the research process… [and] embrace new roles and

developments aimed at supporting researchers….' (Creaser & Spezi 2012: 15). It was from this standpoint that the current study was carried out to find out how subject librarians were gaining the knowledge, skills and expertise required to provide high-end research support.

Objectives

The study sought to find out:

1. the activities/ services subject librarians were undertaking for the purpose of enhancing research support services;
2. the kind of knowledge and skills required by subject librarians to support research services in Zimbabwe;
3. how subject librarians were gaining skills of deeper research support; and,
4. the challenges faced by subject librarians in gaining knowledge and skills.

Significance and scope of the study

From the literature reviewed it appears that there are no studies in Zimbabwe that cover research support as a broad concept. However, there are piecemeal studies which focus on institutional repositories (Nyambi 2011; Machimbidza 2014); information literacy (Chanakira & Madziwo 2013); research commons (Mazhude 2015) and open access (Kusekwa & Mushowani 2014). This study took a broader view of research support and it is hoped that the empirical data obtained will lead to the inclusion of Zimbabwe in the international discourse on research support in higher learning institutions.

The literature reviewed also indicates that studies that were carried out internationally on research support by librarians focused on: skills and knowledge gaps (Auckland 2012); tools and services for research support (Kroll & Forsman 2010; RIN 2010); services offered by libraries (Waseem, Corrall, & Kennan, 2012; Raju & Schoombee 2014). Kennan, Corrall and Afzal (2014) addressed how data scientists and curators were gaining skills. It appears there is a dearth of literature on how subject librarians are gaining the skills and knowledge required to support research activities of their institutions. This study focused on how Zimbabwe subject librarians were gaining skills and knowledge for effective research support. Its scope which embraces subject librarians in selected state university libraries in Zimbabwe is explained by the growing evidence of research taking place in universities rather than in other academic institutions such as junior colleges and teacher colleges.

Review of the literature

The literature review covers an overview of research support, the research process as the theoretical framework of the study, research support by academic librarians around the so- called research life cycle (which will be described in a later section), skills and knowledge required to support research and related studies.

Research support

Research support has been defined differently by different authors depending on the form of support referred to but they all point to the fact that research support is help given to researchers during the research process. The Institute of Germanic and Romance Studies (2010: 1) defines research support as the assistance provided by subject specialists to diverse faculties in the academic community to enhance their research skills. Parker (2012) defines it as a set of services and facilities which assist in increasing research productivity and scholarship. Raju and Schoombee (2013) add that research support is the proactive engagement of the librarian with the researcher. From Parker's definition it is clear that research support can come from anywhere within the academic community while Raju and Schoombee (2013), and the Institute of Germanic and Romance Studies (2010: 1), define research support in the context of the library.

A researcher is a scholar who can, or will in time, through learning and experience, demonstrate: specialised knowledge or expertise; conceptual and intellectual capacities; academic skills such as the ability to produce high quality,

scholarly research papers, and will demonstrate research skills such as: the ability to use sources effectively; gather and organise information, as well as analyse text, data and theory (Institute of Germanic and Romance Studies 2010: 1). According to Auckland (2012: 14), there are categories of researchers in academic institutions which are: master's students, doctoral students, contract research staff, early career researchers, established academic staff, senior researchers, and experts/research fellows. It follows that researchers are not a homogeneous group. Auckland (2012: 2) notes that 'their activities, discourse, approaches to research, and their information needs differ, in particular in relation to their discipline and/or subject and its culture and praxis, and the stage of their career'.

The research process as a theoretical framework

In order to understand the skills and knowledge requirements as well as the current services offered by academic librarians, as with most of the previous studies that addressed research support, this study considered the research life cycle as an appropriate theoretical lens. Auckland (2012: 16) points out that it is crucial to have an understanding of the activities that researchers generally engage in during the research life cycle. It is where many library services intersect and support researchers' work and where the potential for new services can be identified. The research life cycle brings insights about where research support is required at various stages. It is important to note that while the activities involved in research support are similar, scholars vary in their views of the stages, elements and phraseology. Auckland (2012: 17) identifies:

- conceptualising new research, developing proposals, and identifying funding opportunities;
- seeking new information;
- information management;
- research data collection; research data discovery, management and curation;
- sharing, discussion, and online collaboration;
- analysing and reflecting on information and research data;
- writing up and dissemination;
- compliance, intellectual property, copyright and other statutory requirements;
- preservation;
- quality assessment and measuring impact;
- commercialisation; and,
- emerging technology.

Schoombee identifies six stages that are followed in the research life cycle namely: prepare, gather, create, preserve, share and measure.

Under **preparation,** researchers are involved in background reading/looking for ideas, deciding on a topic, formulating a research question, securing funding, planning the project, identifying skills deficits and planning for workshops.

During **gathering**, researchers are involved in literature reviewing, research design, research methods, research proposal, ethical compliance, and data collection.

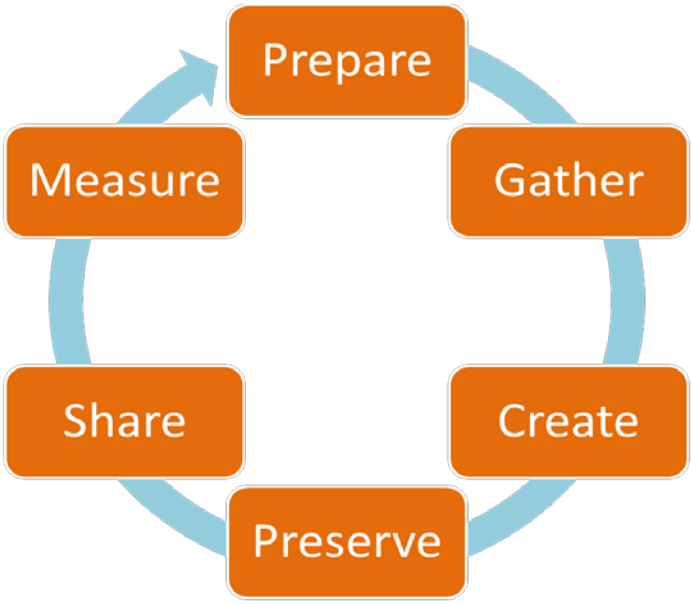
In **creation** researchers analyse data, write edit/proofread, managing bibliographic details, comply with copyright, and avoid plagiarism.

At the **preservation** stage, researchers are involved in managing and preserving research output and data.

During the **sharing** stage researchers are involved in publishing through books, journals, open access platforms, conferences and social media.

Activities under **measurement** include strategic research management (showcasing, funding, and collaboration), determining journal impact, author productivity and impact reports, profiling to increase visibility, and considering collaboration opportunities (Schoombee 2013: 16-21).

Figure 1: Research life cycle (Schoombee 2013: 15)



Library research support around the research life cycle

Case (2008) cited by Oakleaf (2010: 47) notes that academic libraries contribute to research productivity in both straightforward and subtle ways. The research life cycle approaches of Schoombee (2013), the Centre for Information Behaviour and Evaluation in Research (CIBER 2010) and Auckland (2012) were reconciled and condensed for the current Zimbabwean study. The resulting model which was used as a framework for this study comprises seven stages: preparation, gathering, creation and preservation, sharing, measuring, commercialisation and emerging technologies.

At the *preparation* stage, Auckland (2012: 17) found little evidence that subject librarians were actively engaged in this phase. However, Auckland noted that subject librarians at Melbourne University were offering support and providing assistance with grant applications, and at the University of Leeds they occasionally co-author funding bids as part of a research team.

At the *gathering* stage, one of the ways in which subject librarians were supporting researchers in their information discovery activities was by demonstrating a detailed knowledge of information resources in their subject areas and the skills needed to find the resources required efficiently and, by providing advice and training, to enable researchers to find relevant resources easily (Auckland 2012: 19). According to Auckland, many libraries report that subject librarians use traditional means, such as the creation of online guides and tutorials to help researchers learn how to use new information resources, and information literacy sessions of various kinds support researchers' information discovery needs. However, Auckland (2012: 19) notes that there is evidence that the role of subject librarians is being transformed in some libraries to provide more targeted services for researchers which are tailored to their specific needs such as developing effective search strategies, and undertaking literature searches for individual researchers or research teams (Auckland 2012: 19). Garner (2006: 2-3) reveals that Australian universities were providing for multi-format scholarly resources, document delivery, online reference services for researchers, training, and support for grants applications as well as provision of physical space for researchers.

At the *creation and preservation* stage, Auckland (2012: 22) notes that the services to support the management of research data are still to a certain extent in their infancy, and their nature

and who should provide them are questions that are being actively debated. Auckland (2012: 22), however, points out that librarians can engage in determining the best home for data, and in the manipulation required to make them reusable by others; consulting with researchers at the point of data creation and advising on standards applicable to their needs. He further notes that librarians can assist with the compilation of a data management plan, and creating and organising strategies for documentation, files, and backups; with collecting and making available data sets for reuse, and with research data curation and management.

At the *sharing* stage, Auckland (2012: 25) points out that there may be an opportunity for subject librarians to play an advisory role in identifying, promoting and, indeed, developing virtual networking forums, especially for niche research areas not currently catered for elsewhere. Auckland (2012: 25) states that several participating libraries report that subject librarians already are, or will be, advising and/or training researchers on dissemination and publishing options, including scholarly communication and open access. They are supporting lecturers in understanding and/or utilising new and different dissemination means and helping them to understand open access as a sustainable model of scholarly communication. Raju and Schoombee (2013: 34) identify the need for advice and support for lecturers in open access publishing through the open journal system (OJS).

At the *measurement* stage, Auckland (2012: 30) notes that this area is where subject librarians are becoming increasingly involved. It seems that many libraries report providing, or anticipate providing, advice on bibliometrics, for example, citation scores, publication counts, and h-index measures.

At the penultimate stage of *commercialisation*, Auckland (2012: 31) reveals that at the University of Toronto some of subject librarians, who were embedded and working directly with the science faculty at non-library sites, were involved in commercialisation through market research. One area where subject librarians could offer support for commercialisation is regarding the need for researchers to pay attention to copyright and other mechanisms for preserving intellectual property rights in this context.

At the final stage - *emerging technology,* Auckland (2012: 31) points that there is an opportunity for subject librarians to introduce researchers to the potential emerging technologies such as Web 2.0 applications, text messaging, mobile/phone devices, presentation software, podcasting, and handheld devices.

Academic librarian skills and knowledge for research support

Corrall, Kennan, and Afzal (2012) identify bibliometrics and research data management (RDM) skills for subject librarians while Auckland (2012: 35) identifies a set of skills and areas of knowledge that subject librarians currently need, or will need in the future in order to be involved in deep research support around the research life cycle. These skills and knowledge from both scholars were merged, condensed and presented in Table 1.

Related studies

A number of studies that have been carried out around the world seem to indicate that academic librarians are offering and emphasising research support at different stages of the research life cycle. RIN (2010) used a desk research approach to determine the extent of academic librarians' research support in four UK universities. Focusing on the tools and services researchers used in the course of the research lifecycle, the study found that the information-based research support services provided by the four universities tended to focus on the initial and the latter stages of the research process. The case study by Raju and Schoombee (2013: 27) at Stellenbosch University, South Africa, examined academic libraries' attempts to establish the 'deeper meaning' of the librarian for the researcher and the research

Table 1: Skills for research support

The skills and knowledge set
1. Data curation and preservation skills – to maintain research data for the long term such that it is available for reuse and preservation.
2. Technical and information communication technologies skills (ICTs) – various tools to help link users with information (such as really simple syndication (RSS) feeds and other emerging Web 2.0 technologies), and to pick and adapt appropriate tools to assist researchers manipulate and manage their data.
3. Subject and/or disciplinary knowledge – to understand and apply the vocabulary, the taxonomy.
4. Knowledge of research methods – for evaluating research reports, collaboration with researchers.
5. Knowledge of research processes – to better understand the needs of researchers.
6. Knowledge of bibliometrics – for citation analysis, research impact calculation, h-index calculation.
7. Knowledge of publishing – for editing, uploading research output into institutional repositories, author rights, copyright act, intellectual property (IP), patents, and publication targets including open access.
8. Teaching skills – for designing and delivering information literacy training programmes and bibliometrics training.
9. Literature searching skills – coming up with search strategies, choosing appropriate searching tools, and knowledge of relevant databases.
10. Marketing skills – for appropriate library services to researchers.
11. Metadata skills – for creating and editing records, and metadata schema.
12. Information literacy skills – for synthesis, and analysing discovered information.
13. Collaborative skills – for building relationships and establishing collaborations internal and external to one's institution.
14. Knowledge of research landscape – to understand current and changing local research interests.
15. Knowledge of sources of research funding – assisting researchers to identify potential funders.

process. They found that librarians were providing a new and expanded set of services which included, *inter alia*, RDM, curation and preservation, facilitation of open access and bibliometric analysis research support at different stages of the research life cycle. RIN (2010) used a desk research approach to determine the extent of academic librarians' research support in four UK universities. Focusing on the tools and services researchers used in the course of the research lifecycle, the study found that the information-based research support services provided by the four universities tended to focus on the initial and the latter stages of the research process. The case study by Raju and Schoombee (2013: 27) at Stellenbosch University, South Africa, examined academic libraries' attempts to establish the 'deeper meaning' of the librarian for the researcher and the research process. They found that librarians were providing a new and expanded set of services which included, *inter alia*, RDM, curation and preservation, facilitation of open access and bibliometric analysis. They discovered that librarians were taking an active part in research by engaging in all the stages of the research cycle. Tenopir, Birch and Allard (2012) undertook a study to assess the current state of, and future plans for, research support services in academic libraries in the United States of America and Canada and found out that only a small minority of academic libraries offered research support services, but a

quarter to a third of all academic libraries were planning to offer such services soon. Garner (2006) conducted a survey which led to the discovery that the most common services among Australian universities were the provision of multi-format scholarly resources, document delivery, online reference services for researchers, training, support for grants as well as provision of physical space for researchers.

Methodology

The researcher made use of an experience survey which 'gathers and synthesises the experience of specialist and or practitioners in a particular field' (Connaway & Powell 2010: 108). The experience survey helped the researcher to establish the knowledge of practitioners regarding their skills, and knowledge of gaps in research support. A survey was appropriate for studying subject librarians in the selected state university libraries because it is a method which is 'best when getting a snapshot of the current state of affairs in a given group or population, what researchers call descriptive work' (Janes 2001:419). This method was suitable for the study as the researcher was also interested in identifying the activities and/or services that subject librarians were currently offering. The study was carried out in March and April, 2015 with subject librarians in four Zimbabwe state universities namely NUST, the University of Zimbabwe, LSU and the MSU libraries, to establish how subject librarians and the subject teams were gaining the skills and knowledge required to be involved in 'deep research support'. Each faculty in the selected state universities had a faculty librarian. In the end, a total of 26 subject librarians were identified. The study worked with a sample of 16 librarians who were chosen for their availability on social media platforms. Social media platforms such as Facebook, LinkedIn and WhatsApp were instrumental in interviewing subjects in order to get detailed information on the research activities that they were undertaken.

The interview questions were informed by the findings from the questionnaire that was sent prior to the interviews. An email platform was used to distribute copies of the questionnaire to subject librarians in order to collect data on activities undertaken for research support purposes, skills and knowledge gaps, as well as methods used to gain skills and knowledge for research support. Data from the questionnaire instrument also informed the interviews that were carried out with academic library managers in the selected university libraries. The interviews were conducted in order to establish the short and long term strategies being used by library management to redress the assumed gaps in research support.

Results

All 16 subject librarians who were contacted for the purpose of this study responded on at least one of the following platforms: email, LinkedIn, WhatsApp, and Facebook.

Demographic data

The responses reveal that subject librarians held different qualifications and were at various stages of their professional development. It was established that eight had a degree in library and information science (LIS), one had a degree in developmental studies, one had an English degree and six had a master's degree in LIS from NUST. The experience of these respondents in LIS ranged from one to ten years. Between them the subject librarians offered support in disciplines ranging from the humanities, communication and information science, commerce, education, law, built environment, development studies, health and pure sciences, engineering and agriculture. Only two had a qualification in the area in which they were working. The rest held librarianship qualifications only. Dale, Holland and Mathews (2006) report that many librarians do not necessarily have a qualification in the subject they support and librarians are asked increasingly to cover a wider subject remit.

Activities undertaken for research support

Subject librarians were asked about the re-

search support activities that were being undertaken in their respective institutions in a seven stage research life cycle. Findings from the questionnaire distributed to the 16 subject librarians in the four Zimbabwe state university libraries are summarised in Figure 2 (see Appendix). The results show that the activities for research support by subject librarians in these selected state universities in Zimbabwe were varied and distributed across the research life cycle. However, it was discovered that at the *preparation* stage there were no activities or services that were offered by the librarians as all 16 subject librarians did not indicate any services offered at this stage. Findings also showed that the activities were concentrated at the *gathering* and *sharing* stages with the majority indicating that they were involved in one or all the activities that were presented to them on the questionnaire.

At the *gathering* stage, creation of research guides, online referencing and provision of physical space were the most popular with all 16 subject librarians reporting such activities. Information literacy sessions and literature searches were being undertaken by seven of the subject librarians.

At the *creation* stage, creating backups received prominence with 15 subject librarians indicating that they undertook the activity. The rest of the activities did not receive much attention namely collection (four responses); research data curating (four), and there was no attention given to creating and organising strategies for documentation.

All the activities expected at the *sharing* stage were indicated by all the 16 subject libraries, save for the activity, advising on new dissemination methods, where the respondents were equally divided with eight responding that they undertook advertising and eight answering they did not.

At the *measurement* stage where librarians are expected to do citation analysis, publication counts and h-indexing, all 16 subject librarians did not report any activities being undertaken. However at the *commercialisation* stage, all 16 subject librarians were involved in marketing research and, ten indicated that they advised on copyright and property rights. Communicating the benefits of using emerging technologies in research was being undertaken by eight subject librarians while the other half indicated that they did not undertaking such a task.

The above findings from the closed questions on research support activities in the questionnaire were triangulated with findings from open ended questions in the interviews which revealed that subject librarians were teaching information literacy to all students, focusing particularly on 'first year undergraduate and postgraduate students'. Subject librarians were also involved in the publishing process through the development of institutional repositories using software such as 'DSpace'. The aspect of marketing was undertaken using a number of techniques including 'student library ambassadors' to create awareness of services that are offered by the library. The document delivery service (DDS) was also mentioned as a platform currently available whereby users can request for a document from the library and is delivered to them.

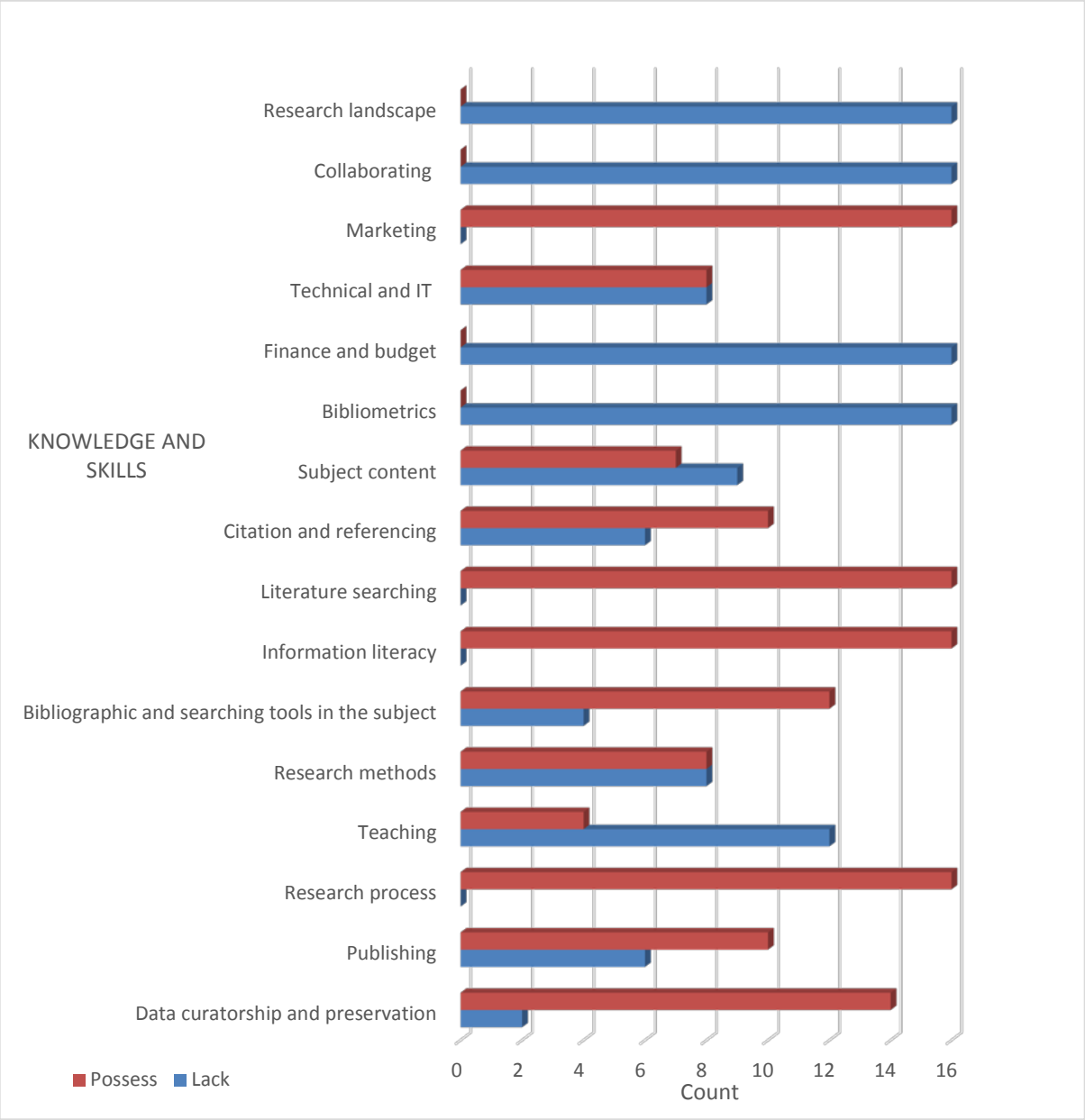
Skills and knowledge gaps

The skills and knowledge gaps were important for this study because they provided the direction in which efforts were to be directed in an endeavour to accommodate new trends.

Subject librarians were therefore asked to indicate their knowledge and skills gaps. They were presented with a table which reflected important skills and knowledge for research support which has been derived from the literature surveyed. Figure 3 depicts the findings from this question.

Figure 3 shows that the majority of the librarians lacked most of the skills presented to them. All 16 subject librarians indicated that they lacked knowledge of bibliometrics, finance and budget skills, collaborating skills, and knowledge of the research landscape. The majority, that is, 12 lacked teaching skills for information literacy. Half of the librarians, eight, indicated that they lacked

Figure 3: Subject librarians' skills and knowledge gaps

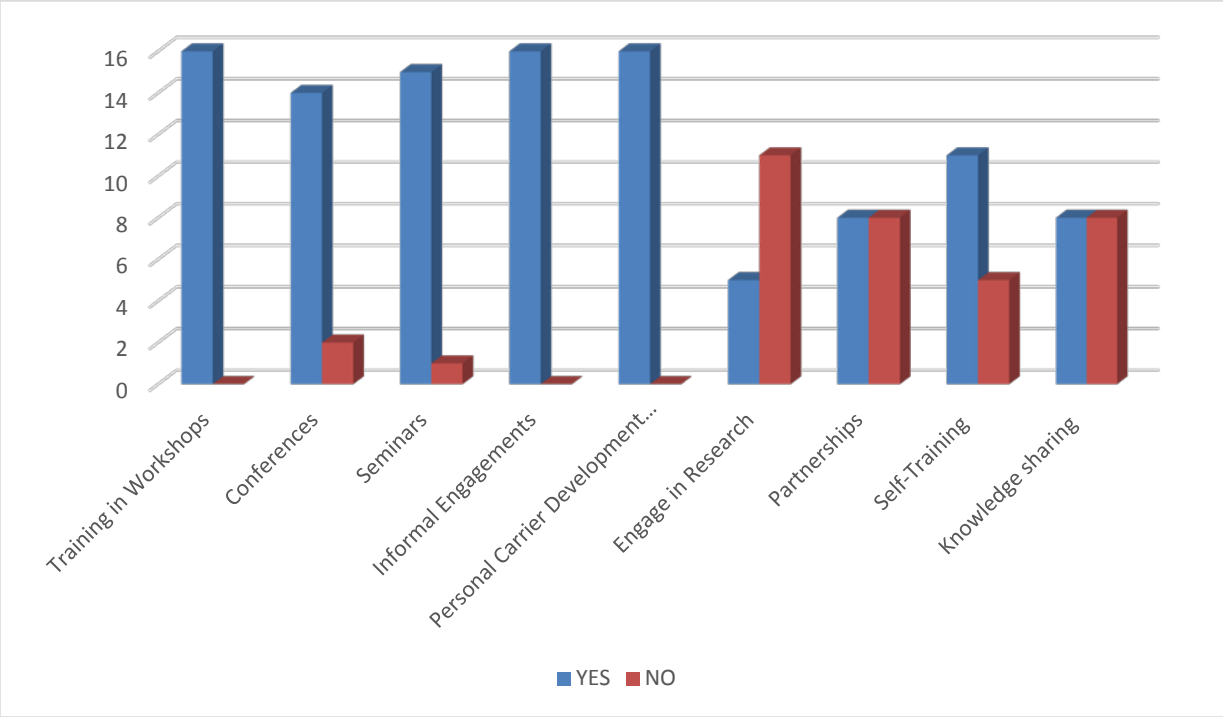


knowledge on both research methods and ICT skills. All 16 possessed knowledge of research processes, information literacy skills, literature searching, and marketing, while six lacked publishing knowledge and two lacked preservation skills. Knowledge regarding research methods was possessed by half of the respondents. They were also equally divided regarding their knowledge and skills of subject content and citation and references.

Methods of gaining skills and knowledge

Knowing how subject librarians were gaining skills and knowledge for research support was important for the study because it indicated how subject librarians were seeking to accommodate the new trends in higher education. These trends are part of the dynamism required of academic librarians and are also as a way to redress library support that was skewed towards teaching and learning. Results show that workshops, informal engagements and personal development initiatives were the most popular methods to gain skills with all 16 subject librarians. Responses for other methods popular with the subject librarians were seminars (15), conferences (14), and self-training (11). Eight of the respondents used

Figure 4: Methods of gaining skills and knowledge



partnerships and knowledge sharing with fellow librarians as methods of gaining skills and knowledge. However, engaging in research [five] was the least popular method among the subject librarians.

Interviews with the subject librarians conducted via the social media platforms WhatsApp and LinkedIn revealed the experiences they went through while gaining skills and knowledge for research support. It was discovered that some subject librarians had attended workshops. The following verbatim quotes give examples: 'a workshop on subject guides using [SubjectsPlus] under eIFL at the National University of Science and Technology for ZULC [Zimbabwe University Libraries Consortium] members in 2011'. Another had attended:

> INASP [International Network for the Availability of Scientific Publi cations] and eIFL [Electronic Information for Libraries] sponsored workshops covering Open Access aspects such as the construction of digital libraries using DSpace and Greenstone software respectively, developing Open Access policies, content harvesting, metadata issues and management of institutional repositories including sensitization to and marketing of the institutional repositories.

Libraries were also partnering with associations and professional organisations, for example, 'INASP and the Midlands State University (MSU) have a partnership on conducting research'.

It was also discovered that subject librarians engaged in research by publishing in refereed journals such as *Library Hi Tech* (one librarian). Peer to peer or peer groups were used for knowledge sharing between and among subject librarians. Subject librarians also revealed that they attended annual conferences within the field including those organised by the Zimbabwe Library Association (ZimLA), the International Federation of Libraries and Associations (IFLA), and the Library and Information Association of South Africa (LIASA). One respondent indicated that 'trainings have been done and are still being done for professional development and as well for enhancing research output on areas such as Reference Management Software, Research skills'.

Regarding continuous professional development, subject librarians were attending universities to attain higher qualifications than those they

held when they first gained employment. All the subject librarians indicated that at any given time there are two or more people pursuing higher education at universities and other institutions of higher learning.

Strategies by library management on research support

Four librarians at the management level were interviewed to establish the short and long term strategies that they had for research support in future. They indicated that they were all planning to train their existing staff so that they would be able to be of greater value in supporting researchers. However, they all indicated that they had no plans to hire new staff for the purposes of research support, due to financial constraints and freezing of posts by the government.

Challenges faced in gaining skills and knowledge for research support

From the data gathered, it was established that funding is a major stumbling block for subject librarian to gain the skills required to support research. The majority of the subject librarians interviewed indicated that the major stumbling blocks to their development were their institutions which were 'reluctant to provide money to staff to embark on personal development due to shoe-string budgets'. Another issue which was raised is that university policies for non-teaching staff deterred self-development; one subject librarian stated 'I cannot embark on studies before I serve the university for a certain period'. However, those who managed to attain higher degrees point to gaps in library schools curricula which according to one subject librarian 'do not address specific research support skills and knowledge'. Another pointed to the 'lack of exposure to facilities and appropriate technologies for research support which would allow us to learn on the job'.

Challenges experienced in supporting researchers by subject librarians

All 16 subject librarians acknowledged that they were too focused on providing services for teaching and learning. The reason was that researchers did not cooperate with librarians. For example, a low submission rate of articles for uploading on to institutional repositories by academics was singled out. One subject librarian mentioned 'lack of support from the parent institution in terms of legislation that "enforces" research practices, for example, policies that define how I should provide research support'.

It was also mentioned that 'financial constraints' inhibit librarians from sourcing materials that were required by researchers. Another challenge pointed out is that subject librarians' own initiatives to support research seem to be getting 'shot down' as in the case where some academic libraries tried to introduce the teaching of information literacy but to no avail. Some pointed out that 'library authorities fail to clearly plan and communicate plans and activities with the relevant authorities' which hindered subject librarians in supporting researchers. It was also mentioned that 'the size of the student body can present challenges when it comes to providing tailored research efforts'. Massification of higher education is increasingly making it difficult for librarians to attend to the researchers individually.

Discussion of results

Currently, the visible activities undertaken in support of research in the selected state university libraries in Zimbabwe have been identified as information literacy sessions and training, referencing, institutional repositories, open access initiatives, marketing as well as the use of subject guides as pathfinders to knowledge repositories. A critical look at the research support activities demonstrates that these libraries are still mostly providing traditional research support services. As observed by MacColl and Jubb (2011: 5), academic libraries in recent years have been struggling to make a positive impact on the scholarly work of researchers. The finding of the concentration of services around the gathering stage, where librarians are responsible for creating research guides, online referencing and provision

of physical space points to the fact that the librarians in the study were providing a natural extension of their traditional roles. These findings differ from those of Raju and Schoombee (2013: 27), who found out that Stellenbosch University librarians were providing a new and expanded set of services, which included, *inter alia*, RDM, curation and preservation, facilitation of open access and bibliometric analysis. It is at the sharing stage that subject librarians in these selected university libraries were providing services that seem to suit the new higher education and research landscape which is characterised by use of ICTs in teaching and learning, collaboration and new science.

The overwhelming support given to the development of institutional repositories, and open access demonstrates the effort the librarians are making towards supporting research in a new way. However, lack of support in new areas that librarians are supposed to venture into points to the fact that the concept of research support has not been fully embraced and given the attention it deserves to match the commonly accepted teaching and learning support. According to Surprenant and Perry (2002), quoted by Raju and Schoombee (2013: 29), the library 'must now assume the role of being a highly interactive, proactive, digitally based, cyber mix of staff'. Librarians are now expected to move out of the library and began to provide support at the preparation, creation and measurement stage of the research life cycle.

It is worth noting that the lack of support for these areas has not been a deliberate act on the part of subject librarians but rather a lack of requisite skills and knowledge necessary to support such services. Subject librarians pointed out that they lacked a number of skills, namely bibliometrics, collaboration skills, budget and finance, and teaching skills, among others. However, it is encouraging to observe that librarians were making efforts to improve themselves professionally so that they close the knowledge and skills gap through personal career development, attending workshops and informal engagements, despite lack of support from their institutions in terms of funding, and restrictive staff development policies. Auckland (2012: 70), however, doubts the suitability of conferences and workshops in imparting practical technical skills needed for research support. This supports the view of Hisle (2002: 1) who notes that 'ensuring education of new librarians and re-educating existing librarians with skills and knowledge to support new roles… is a challenge for the profession'.

Library management were supportive of the strategy to re-train the existing staff as opposed to hiring new staff. Findings revealed that despite the best intentions by subject librarians to accommodate new trends, their efforts were hindered by lack of policies that guide how subject librarians should provide research support. Librarians also pointed out that researchers did not cooperate with users. This appears to support MacColl and Jubb's (2011) finding that institutionally-provided research support services are not appreciated by researchers in universities who consider them marginal at best and burdensome at worst. In the researcher's view, this kind of situation takes away the confidence and experience necessary for librarians to be fully engaged in deep research support.

Conclusion

It is evident from the findings that research support in academic libraries in Zimbabwe is limited. The study found that subject librarians in state universities were providing traditional forms of research services despite the fact that they were now evidently operating in a new educational and research landscape. In the new research landscape the focus has shifted to new science and new modes of knowledge production and librarians must provide high-end research support which represents a newer and more involving task. This task must be embraced not only with an extension of traditional roles but with taking on new roles and responsibilities such as research evaluation, citation analysis, RDM, grant

applications, among others. However, the evident concerted efforts by Zimbabwean subject librarians to strategically align and balance their services to suit new academic landscapes through the building of new research facilities such as research commons, and institutional repositories, among others, demonstrates that they were transforming themselves professionally, albeit at a slower pace compared to the developments in higher education. In addition, the acquisition of new skills and knowledge by way of attending workshops, conducting research itself and informal engagements demonstrate a commitment to change and accommodate new trends.

Recommendations

From the study's findings and conclusion, the following issues on research support were found to be important going forward:

1. Academic institutions must craft policies that govern how research activities must be supported by everyone within the academic community and especially by the library. This will assist in ensuring that everyone is clear on the role they must play.
2. University libraries should create research support units within the library to ensure that research activities are given appropriate attention together with the teaching and learning support.
3. Library schools should review their curricula regularly so that courses that address challenges of the day are incorporated, research support included. This will give practising librarians a place where they can upgrade their skills.

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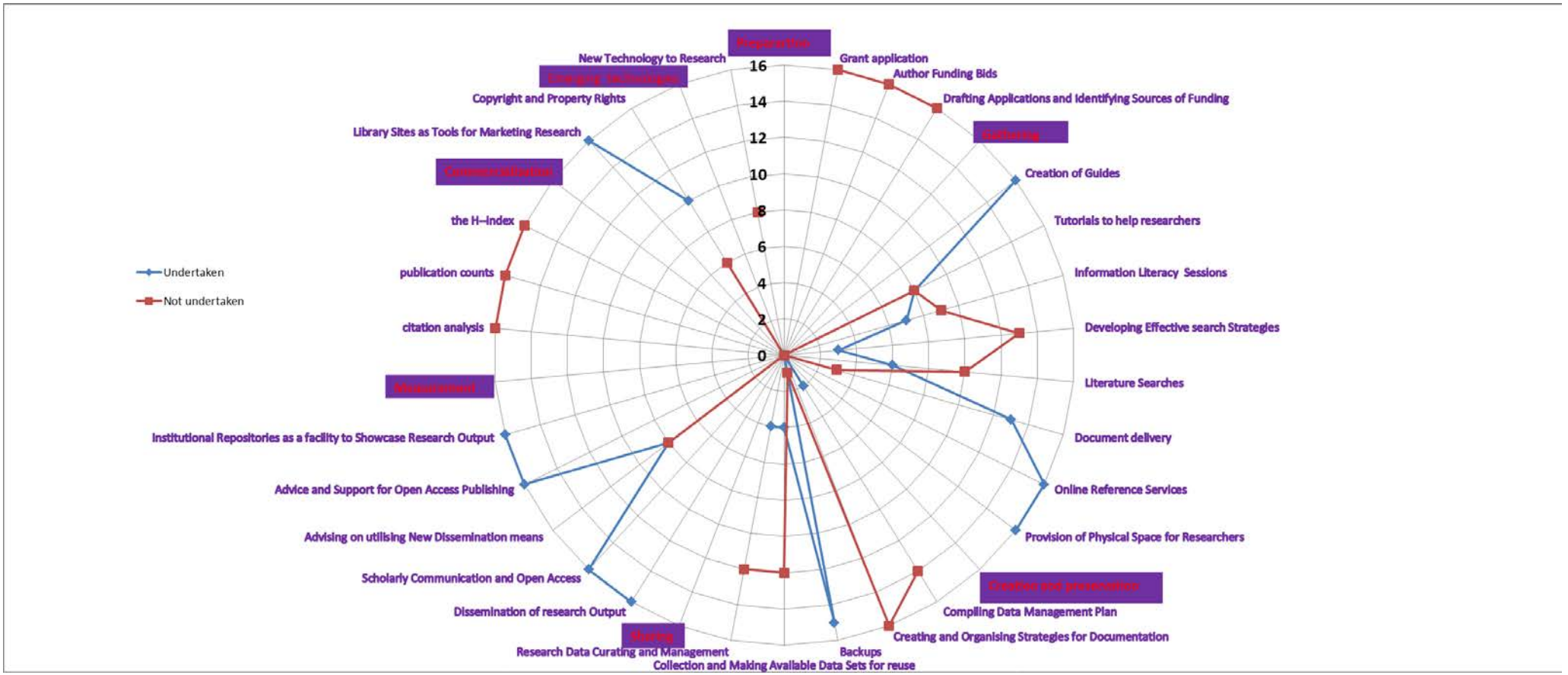
Appendix

Figure 2: Activities undertaken for research support



Chapter Seven

Australian Academic Libraries and Research Support

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Abstract

This chapter reports on a nationwide study into how university libraries in Australia are supporting researchers with information and services relating to research impact measures, specifically bibliometrics and altmetrics tools. A content analysis of all Australian university library websites was conducted to determine the extent and types of tools being promoted, the nature of supporting materials, and the inclusion of research impact tools in institutional repositories. The findings show that the majority of the libraries have developed web pages that provide descriptive information about research impact measures, and many offer research impact services. Two-thirds of the institutional repositories incorporate research impact tools. A number of recommendations are presented to guide best practice in supporting researchers in a research evaluation environment.

Keywords: bibliometrics; altmetrics; academic libraries; research impact; Australia

Introduction

Bibliometrics, by its original 1969 definition, was rooted in a world where communications were 'written' and printed (Nicholas & Ritchie 1978). For many years, citations and the journal impact factor (JIF), key tools of bibliometrics, dominated as the method that researchers and authors used to measure, in quantitative terms, the influence of journal articles, journals and conference papers. Bibliometrics remained important and gained a new audience as the digital information environment took hold in the academic and research community, in a large part due to the easily accessible data made available through the main database at the time, Web of Science. This period also heralded new sources of bibliometric data, such as Scopus, alternatives to the JIF, such as the SCImago Journal Rank (SJR), and measures of an individual's impact, such as the *h*-index.

The main tools and uses of bibliometrics as a measure of research impact have been criticised. Typically, the criticisms centre on the nature of the impact that is being measured by citations, which is restricted to scholarly communication rather than impact in the wider community. In addition, journal ranking tools, such as the JIF and SJR, are measures of a journal and not the articles published in a journal. The argument in this regard relates to assessing the quality of research outputs (for example, journal articles) being judged by the channel in which they are published. More recent tools like the h-index have come in for criticism due to the unstable nature of the index's calculation when applied across time and individuals. While debate about using bibliometric tools grew (Cameron 2005), there was something reassuring about these quantitative tools – we knew how they were calculated.

Armed with knowledge and experience in citation databases, academic librarians in Australia began to respond to these new metrics by extending their expertise in the use of bibliometric tools. However, it was the introduction of a national research assessment initiative in 2010 in Australia, known as the Excellence in Research for Australia (ERA), which created a more urgent need for bibliometrics-related services. The ERA also brought with it an interest in the societal impact of research, coinciding with growing use of social media tools, such as micro/blogs, by researchers to disseminate their work. With the wider use of social media, a new way of measuring impact, known as altmetrics or alternative metrics, emerged.

Altmetrics are defined as the 'study of new metrics based on the social web for analyzing and informing scholarship' (Altmetrics: about n.d.). These metrics include data (DOIs, mentions and links) from a number of different sources such as Twitter, Facebook, blogs, and academic networks (Barnes 2015), gathered as a result of researchers distributing their work, part of their work, or links to their work through social media. Altmetrics provide an alternative and/or complement to traditional forms of measuring research impact, such as citations. They indicate a level of wider societal impact or 'user engagement' with research (Bornmann 2014). Academic librarians were familiar with some forms of altmetrics in the guise of downloads and abstract views from institutional repositories, but the new tools go far beyond this capacity and provide a measure of social engagement that operates across all disciplines. However, unlike bibliometric tools, an acknowledged problem in using altmetrics is how data are calculated and what these measures actually mean.

Altmetrics were listed amongst the top trends in academic libraries in 2014 by the American Association of College and Research Libraries (ACRL 2014). Bornmann (2014) provides a comprehensive review of the advantages of altmetrics as being: broadness, diversity, speed and openness; and disadvantages as: commercialisation, data quality, missing evidence and manipulation. Whilst Barnes (2015) recommends a cautious approach to the use of altmetrics in the research evaluation process, Bornmann (2014: 901) rec-

ommends their use as a complement to traditional metrics and the peer review process, rather than as a replacement.

In their examination of a large publication set, drawn from Web of Science, and the altmetrics available for the publications, Zahedi, Costas and Wouters (2014: 1510) note: 'since altmetrics is still in its infancy, at the moment, we don't yet have a clear definition of the possible meanings of altmetric scores'; and conclude that more research needs to be carried out. More recently, Konkiel (2015) discusses the role that altmetrics can play in the Research Excellence Framework (REF), the national research assessment exercise in the United Kingdom (UK); and a report by the Higher Education Funding Council for England (HEFCE), released in July 2015, endorses Bornmann's (2014) recommendation that altmetrics be used as a complement to the journal peer review process.

As several studies have shown, librarians have an increasingly important role to play in the success of their institutions in a national research assessment exercise (Auckland 2012; Haddow 2012; Corrall, Kennan & Afzal 2013). In the survey carried out by Corrall, Kennan and Afzal (2013), Australian university libraries were asked about the bibliometric support services that they were providing and those that were planned for the future. The services reported by participants included: training/literacy in bibliometrics, citation reports, calculations of research impact, grant application support, evaluation of candidates for recruitment, promotion or tenure, disciplinary research trend reports, and *h*-index calculations. Of the 35 participating university libraries, 51.5% indicated that they were providing research impact support, with 21.5% planning to do so; 55.9% were providing citation reports and 20.6% planned to do so. This study did not investigate the delivery of research support services relating to altmetrics.

An opportunity to provide altmetrics data, such as views and downloads, was open to Australian universities in their implementation of institutional repositories. Australian universities were fortunate in that more than ten years ago the Federal Government took the initiative to fund the establishment of institutional repositories (Mamtora, Yang & Singh 2015). The introduction of Australia's first research assessment exercise, the Research Quality Framework (RQF), saw further injection of funding 'to assist institutions to establish and maintain digital repositories … allow institutions to place their research outputs, including journal articles and less traditional outputs . . . in an accessible digital store . . .' according to the Department of Industry, Innovation, Science, Research, and Tertiary Education (DIISRTE 2010). Between 2007 and 2010, the Implementation Assistance Program (IAP) was available 'to assist institutions to develop and implement data gathering and reporting systems for bibliometric and other data' (DIISRTE 2010). This support meant that Australian academic libraries were familiar with the repository systems they managed and had developed some familiarity with measures of use available to those systems.

The increasing awareness of altmetrics as a measure of impact is the impetus for the research reported here. It is the first nationwide study of research support services, focusing on services relating to bibliometrics and altmetrics, provided by Australian university libraries to their academic community. The research aimed to determine the extent and types of bibliometric and altmetrics tools currently being used by Australian universities; and to assess the nature of supporting materials that explain and discuss the range of metrics being used to assess impact. Furthermore, the research findings raise a number of issues relating to research support services that Australian academic libraries need to consider and generate some guidelines for best practice.

Study methods

A content analysis of the library web pages of all 39 Australian universities (Universities Australia 2014) was carried out to gather data for the

study. Quantitative and qualitative data were gathered from the web pages to identify trends and to arrive at a deeper understanding of the quality of information provided by university libraries to their academic and research community. While the primary data were collected from library web sites, the researchers also followed links that led to other institutional and external sites.

A coding sheet for data collection was developed and tested separately on five university library web pages by the two researchers. Following this pilot, some refinements were made to the coding sheet and the researchers discussed their recording of qualitative data to achieve consistency and ensure inter-rater reliability in the data. The researchers were each responsible for analysing the content of half the university web pages. Subsequent discussion between the researchers took place to clarify any interpretations and to finalise the data for analysis. Descriptive statistics were generated in the analysis for the quantitative and qualitative data.

Data for each university library were collected from the information available on the library's web pages, linked university web pages, and the university's institutional repository web pages. Beginning with the home page for each university library, the researchers explored links and read content to determine:

- ease of access to the library research support page;
- availability of a dedicated research impact page(s), the form of the page(s), and the extent and clarity of information provided;
- availability of background and explanatory information on bibliometrics and altmetrics, the types of indicators, and the extent and clarity of information provided;
- availability of information about the research impact support offered by libraries, the type of support offered, and contact information; and
- evidence of metrics used in the institutional repository.

For some criteria, such as availability of dedicated web pages about research impact and background information, the researchers recorded a *yes* or *no*. For criteria relating to extent (the amount of information), they assessed it as *limited* or *good*. These assessments required consistency in the judgements made by the researchers that were fully discussed during the pilot stage of the project and on completion of the full data collection. Judgements relating to clarity were made from the perspective of non-library staff by checking that 'library' and research impact terminology was explained and supported with background information. Other data, such as the bibliometric tools mentioned on web pages, were recorded by their name.

The data were analysed in three broad categories: Promotion, Services and Use relating to research impact. The definitions used by the researchers were:

- Promotion: relates to awareness-raising, which includes the availability and accessibility of research impact information that each university library provides and the depth and breadth of this information.
- Services: relates to the availability and visibility of the research impact support services being offered by the university library.
- Use: relates to the inclusion of metrics in the institutional repository.

In the context of this study, 'research support' refers to the information and services provided by the university library to its research community. 'Research impact' refers to the bibliometric and altmetrics tools and measures that are used to determine the influence of an author, article or journal, such as the *h*-index, citation and download counts, and the JIF.

Results

The results of the study are presented below under the three categories within which the data

were analysed: Promotion, Services and Use relating to research impact.

Promotion of research impact information

This section reports on the availability and ease of access, the types and forms, and the depth and breadth of research impact information provided by the university libraries.

Awareness-raising and ease of access to research impact information

Taking into consideration the significance of research support in the context of the ERA, it is important that researchers are able to discover the information and services being provided by their university library. To determine whether this is occurring, the researchers investigated the availability and ease of access to information on the web pages of the 39 Australian university libraries.

All Australian universities in the sample are involved in research activities and 36 (92%) had dedicated research impact pages on their site. The visibility of research support promotion was less effective, with only 29 (74%) providing a direct link from the library home page to a library research support page and in 12 (33%) cases this information was not easy to locate. For example, the researchers located research impact information only by searching through the general list of subject guides or the information was spread across multiple pages. In other cases the information was buried in pages with titles such as 'Get published' or 'ERA', which reduces the likelihood that research impact information will be found.

Presentation and extent of research impact information

The 36 university libraries that provided information about measuring research impact through their web pages, presented that information in different formats. The most popular method was in the form of a 'LibGuide', which was used to present the information by 23 (64%) of the libraries. Only six (17%) libraries used a web page to present the information and six (17%) used a web page and a LibGuide. One university library provided a LibGuide as well as a downloadable PDF.

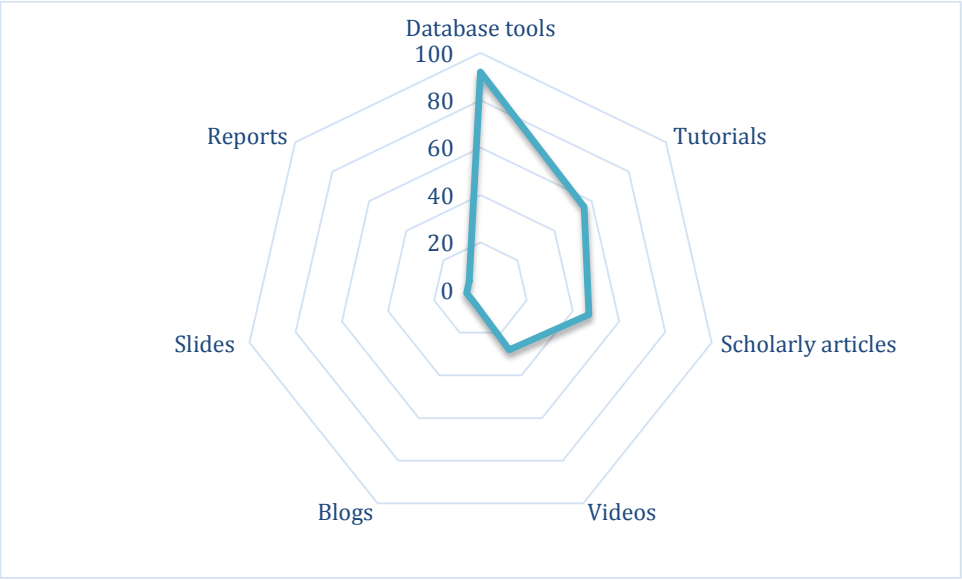
The majority of guides and web pages provided extensive information on impact measures such as citation analysis, journal impact and ranking. Of the 36 university libraries, 25 (69%) provided extensive information, which was easy and clear to read and understand. The remaining libraries provided limited information.

Extent of information about bibliometric indicators

Of the 36 libraries, all except one (35, 97%) provided descriptive information about how bibliometric indicators, such as the *h*-index, the JIF, and the SJR, were used. Only two libraries (6%) did not provide information about how these indicators worked. The extent of the information provided about bibliometrics indicators was classed as either 'good' or 'limited'. The classification of 'good' was assigned to information that provided some detail about the indicators included on the web pages, in a style that was clear and easy to understand. 'Good' information was provided by 22 of the 36 (61%) libraries with research impact information. The remaining 14 (39%) libraries provided only 'limited' information.

The analysis (Figure 1) looked for the existence of background information to the bibliometric indicators discussed on the library web pages, in the way of links and further readings. Links to further information was provided by 33 (92%) of the 36 libraries. The most common link was to the database tools that are subscribed to by libraries (33, 92%), such as the Web of Science, Scopus and Journal Citation Reports databases. Links to tutorials were provided by over half the libraries (20, 56%), of which 14 were to the Measuring your Research Impact (MyRI) tutorial – an open access toolkit developed by a consortium of Irish universities to support bibliometrics awareness and training. Scholarly articles were provid-

Figure 1: Background information about bibliometric indicators (n=36)



ed as background information by 17 libraries (47%) and embedded videos by ten libraries (28%). There were two instances each (6%) of blogs, downloadable PDF reports and slide presentations.

Extent of information about altmetric indicators

Altmetrics are a new and emerging area, and the results of this study indicate that Australian university libraries are incorporating information about altmetrics into their research impact pages. Of the 36 university libraries with research impact information, 24 (67%) mentioned altmetric indicators; 12 (33%) libraries did not provide information about altmetrics. In relation to the extent of information provided about altmetrics, 12 (50%) libraries provided a detailed description of altmetrics, while the remaining 12 provided minimal information.

All 24 libraries provided links to further information, such as altmetric tools and sites that incorporate altmetrics like Altmetric.com, ImpactStory, Plum Analytics, PLoS, and Mendeley. Links to web pages (13, 54%), articles for further reading (12, 50%), and tutorials such as MyRI (8, 33%) were also provided in the university libraries' web pages. A small number of libraries included links to blogs, Twitter, webcasts and institutional repositories.

Research impact support services

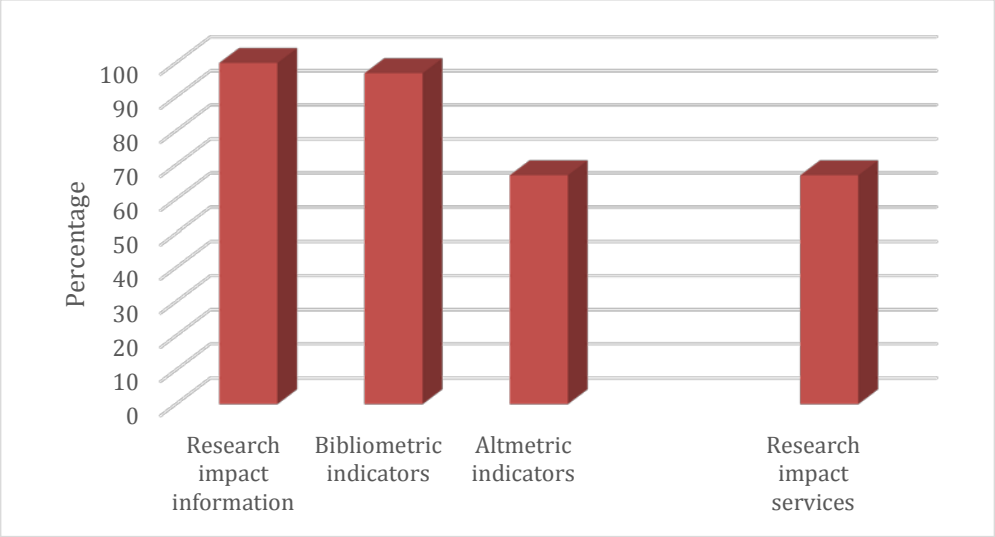
The data relating to the availability and visibility of research impact support services being offered by the university libraries were analysed to determine the extent and types of services that the libraries have incorporated into their support for researchers.

As Figure 2 shows, of the 36 libraries with research impact information, 31 (86%) provided details of research impact measures on their website. Of these, 24 (77%) promoted an accompanying consultation service, with links to contact information directly from the research impact pages. The specific types of services being offered include consultations on cited reference searching, identifying journal impact factors, workshops on research metrics, and where to publish. A small number of universities also promoted these services through other library web pages, such as the pages relating to general support for researchers.

Use of metrics in institutional repositories

In addition to identifying information about bib-

Figure 2: Research impact information and Services (n=36)



liometric and altmetrics tools to measure research impact, the researchers examined the use of metrics such as abstract views and downloads of full text content, available in the universities' institutional repositories. In some cases, these metrics included traditional citation data from sources such as the Scopus and Web of Science databases. The researchers also explored the availability of altmetrics data in repositories using tools such as altmetrics.com and ImpactStory.

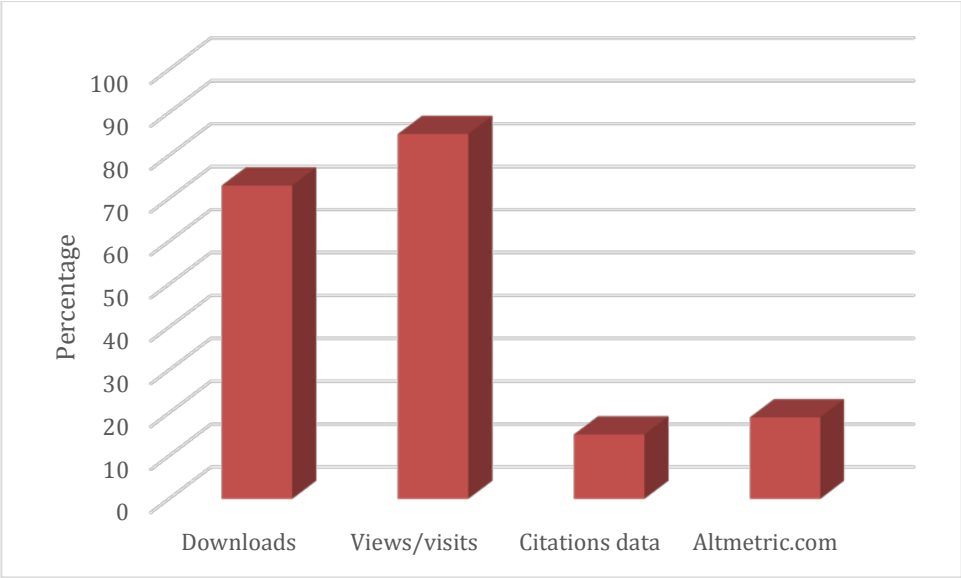
Given the investment in institutional repositories in Australia, it is not surprising that the findings of this research study confirm that all 39 universities have an established repository; although there was difficulty accessing one of the repositories during the investigation. Of the total, 26 repositories (67%) have the capability of providing one or more types of metric pertaining to the publication records. As seen in Figure 3, data relating to visits or views was available in 22 (85%) of the 26 repositories, download data was provided by 19 (73%) repositories, five (19%) provided data from altmetric.com, and four (15%) repositories incorporated citations data from subscribed databases in relation to publications.

Discussion of findings

The overall findings of this research indicate that the majority of Australian academic libraries are aware of the need to provide research impact support in the way of information and services to their researchers. From the information available on the libraries' websites, it appears only three of the 39 institutions are not engaged in promoting research impact.

The extent of information about research impact varies across the Australian academic library community, however, most of those with dedicated research impact web pages provided background information and links to tools and further reading about bibliometric indicators. For the more recent altmetrics, a smaller proportion of the libraries provided information about different altmetric tools, and only half of these gave detailed information about the tools. Most of the libraries have developed LibGuides to present this information. When considered alongside the results of the study by Corrall, Kennan and Afzal (2013), which was based on a 2012 survey, there has been a substantial increase in the number of academic libraries providing research impact support. This is evident in the proportion: 36 (92%), of libraries that are providing research im pact support in 2015, compared with 18 (51.5%) in the 2012 survey. In addition, the 2012 survey found that just over half of these libraries were providing citation reports, whereas in 2015, 31

Figure 3: Institutional repository metrics (n=26)



(86%) of the 36 libraries were offering services, including citation reports, relating to research impact.

Australian academic libraries were fortunate in gaining government funding to establish institutional repositories, which is reflected in the findings that all the institutions were operating a repository to provide access to the research outputs of their academic community. In most of the repositories the availability of views, visits and downloads provides altmetric data that can be used to demonstrate research impact. A smaller proportion of the libraries have incorporated citations data drawn from the primary citation databases as evidence of impact. The inclusion of metrics in repositories is influenced by a number of factors, including the available functions of the software being used and the technical capacity of an institution to create additional functions that draw data from external sources.

Content analysis is, by its nature, limited by the information provided in the content being examined. An issue faced in this study was the regular updating of web pages, so that information unavailable one week might be added the following week. While demonstrating that research support services are considered sufficiently important to undergo regular updates, these changes made data collection a challenge for the researchers. It also means that the results of the study are a snapshot of research impact promotion, services and use at April 2015. Another challenge for the researchers relates to the structure and organisation of web pages generally. Information was spread across web pages at the universities and checking every page was beyond the capacity of this study. For this reason, the researchers followed and checked the most obvious links to find content relevant to the study, which may have resulted in some information being missed.

The 'snapshot' results provide a benchmark with which future researchers can test developments in university libraries' engagement in research impact promotion, services and use. They also provide a foundation for a survey of academic librarians with responsibility for research support at the 39 universities. This more qualitative study will seek to gain a deeper understanding of the factors that influence the availability of research impact information presented and research impact services offered on the libraries' web pages.

Conclusion

Academic libraries are well placed to play a

major role in the provision of information and services relating to tools that can be used to measure research impact and this study examined the degree to which this was occurring. An important consideration in the study was to understand the difficulties researchers might encounter in relation to access and becoming better informed about research impact tools and measures. As Corrall, Kennan and Afzal (2013) noted, and this research confirms, the involvement of university libraries in research support is increasing. However, there are opportunities for further engagement with the academic community in relation to research impact promotion, services and use. In particular, easy access is critical for researchers to locate information and contextualisation of that information is important to ensure researchers gain an informed understanding of the use of metrics for research impact.

On the basis of the study's findings, recommendations for best practice in the promotion, services and use of research impact information are proposed. University libraries should consider providing:

- a clear link to research support pages from their home page;
- clear information about different tools and metrics, using examples to illustrate their use;
- background information using links to tools, web pages and scholarly articles;
- a menu of available research impact services; and
- contextual information about specific research impact services.

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Chapter Eight
Research Partner and Search Methodology Expert: the Role of the Librarian in Systematic Reviews

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Abstract

The systematic review is a relatively new methodology using rigorous, standardised methods for locating and assessing studies and explicit and transparent methods to minimise bias. Originating in the health sciences systematic reviews are increasingly adopted in other disciplines to synthesise research and inform decision-making. This chapter describes how the skills of the librarian make a significant contribution to the success of the systematic review and how the academic librarian's role in this type of research is changing from support to partner. It also considers some of the challenges and opportunities the increased use of this methodology is presenting in existing service models.

Keywords: Academic libraries; reference services; librarians; research; systematic reviews

Introduction

Systematic reviews, which differ from literature reviews in their rigour and explicit methods to eliminate bias, are produced increasingly and are expanding to disciplines beyond the health sciences. Systematic reviews benefit from librarian's involvement and they provide opportunities for the professional development of librarians and for recognition of the academic libraries' relevance to universities. This chapter aims to demonstrate that because of their expert role in systematic reviews, librarians have evolved from supporters of research to research partners.

This chapter discusses systematic reviews mainly from a health sciences standpoint. This discipline was responsible for the initial ground breaking investigations using this type of review and continues to be a leading contributor to its advancement. The chapter begins with a description of the methodology and current state of systematic reviews. It then explores the role of the librarian generally, and the academic or special librarian, in particular. It identifies the skills required and discusses some of the challenges and opportunities presented by this method of review to existing reference services. In particular it draws attention to the impact the librarian and academic research collaboration has on existing reference services.

The importance of systematic reviews

Gough, Oliver and Thomas (2012: 4) state 'so influential has the use of research through Systematic Reviews become that their development can be considered one of the turning points in the history of science'. Systematic reviews critically appraise existing research and thereby identify poor quality research or gaps in research. They help prioritise what research needs to be done, synthesise best practice and add to the subject's knowledge base. Systematic reviews have been described as:

> the application of strategies that limit bias in the assembly, critical appraisal, and synthesis of all relevant studies on a specific topic. Meta-analysis may be, but is not necessarily, used as part of this process. Systematic reviews … use rigorous, standardized methods for selecting and assessing articles. A systematic review differs from a meta-analysis in not including a quantitative summary of the results (Porta 2008: 217).

Higgins and Green (2011: 1.2.2) add

> A systematic review attempts to collate all empirical evidence that fits pre-specified eligibility criteria in order to answer a specific research question. It uses explicit, systematic methods that are selected with a view to minimizing bias, thus providing more reliable findings from which conclusions can be drawn and decisions made.

Background

In 1979 a call for better evidence for clinical decision-making was made by British epidemiologist, Archie Cochrane: 'It is surely a great criticism of our profession that we have not organized a critical summary, by specialty or subspecialty, adapted periodically, of all relevant randomized controlled trials' (Grant & Booth 2009: 92). This call also gave rise to the evidence based medicine (EBM) movement, and ultimately to the creation of the Cochrane Collaboration. This Collaboration was formed in 1992 'to provide an expanding resource of updateable systematic reviews of randomized controlled trials (RCTs) relating to health care' (Grant & Booth 2009: 92) and has created the gold standard for systematic reviews.

Systematic reviews are the mainstay of EBM, which Sackett, Rosenberg, Gray, Haynes and Richardson (1996: 71) define as 'the conscientious, explicit and judicious use of current evidence in making decisions about the care of individual patients' and it means 'integrating individual expertise with the best available external clinical evidence from systematic research'.

The distinction of systematic reviews is that they 'have an integral role in research knowledge

and are an essential part of the process of interpreting and applying research findings to benefit society' (Gough, Oliver & Thomas 2012: 13). They are identified as the highest level of evidence in the EBM pyramid and in the Centre for Evidence Based Medicine evidence tables and are used in the creation of clinical practice guidelines and knowledge syntheses for clinical decisions as explained in a report by the Institute of Medicine (IOM), a division of the National Academies of Sciences, Engineering, and Medicine, in Washington, DC:

> Healthcare decision makers in search of the best evidence to inform clinical decisions have come to rely on systematic reviews (SRs). Well-conducted SRs systematically identify, select, assess, and synthesize the relevant body of research, and will help make clear what is known and not known about the potential benefits and harms of alternative drugs, devices, and other healthcare services (Eden 2011: 1).

Systematic reviews differ from literature reviews in a number of ways. Essentially the traditional literature review presents research findings related to a topic of interest, providing a summary of what is known, and details of the studies included without explaining the criteria used for their inclusion. The systematic review by contrast, has an explicit, rigorous and accountable method and is 'productively focused on answering questions rather than addressing topic areas' (Gough, Oliver & Thomas 2012: 6). Harris (2005: 82) explains that 'the systematic review is designed to remove bias by employing a scientific methodology to comprehensively identify, critically appraise, and synthesize all of the potentially relevant literature on a given topic'.

Bias is an inherent issue in research. Eden (2011: 87) states that publication bias presents 'the greatest obstacle to obtaining a complete collection of relevant information on the effectiveness of healthcare interventions' and describes the different forms this takes in language, location, citation selection and time-delay in publication and indexing. A key characteristic of systematic reviews is the attempt to eliminate bias in the inclusion and selection of studies reviewed. This amelioration of bias is addressed by transparency and reproducibility, which include:

- clear objectives and inclusion criteria for studies;
- explicit and reproducible search and screening methods;
- systematic search strategies to identify all eligible studies;
- assessment of studies found; and
- a systematic presentation of the synthesis of research and the review findings which address the specific question.

The systematic review process

The process used for a systematic review follows a common set of stages:

- Initiation – creation of a team knowledgeable about the question, the process, and stakeholders.
- Definition of the research question – the team then refines the research topic question, defines the conceptual framework and approach, and decides on the inclusion and exclusion criteria for evaluating the studies which will form part of the review. The question is structured using a framework that includes the elements Patient/Problem, Intervention, Comparison/Control and Outcome, and is known as PICO. This conceptual framework helps focus the parameters of the question, guides the identification of concepts and suitable search terms, and provides the basis on which to construct a logical search strategy.
- Locating studies – based on the question, a search strategy is devised which consists of appropriate keywords and subject headings as well as planning which sources to use. The search is run in topical databases appropriate to the question or

topic as well as alternate sources such as the grey literature, including theses, conference proceedings, government reports et cetera, and by contacting authors for unpublished material. These steps are necessary in the amelioration of bias. To achieve an exhaustive search, additional searches are done by forward and backward chaining of references and manual searching of major journals in the field. The results of the searches are captured in bibliographic software and duplicate records are eliminated.

- Screening – the review of the results is preferably done by teams of two, who separately first review the records at the title and abstract level, and then the full text, to determine whether they should be included using a predetermined set of inclusion and exclusion criteria. Conflicting decisions are tie-broken by a third reviewer.
- Data extraction and synthesis – the full text of the final set of studies are further examined and the data or other results are synthesized.
- Knowledge translation – the findings are published and disseminated to inform practice, research and policy.

Standards, tools and checklists

In addition to the Cochrane Collaboration's handbook and the University of York's Centre of Reviews and Dissemination's (CRD) guide, there are a number of other manuals or handbooks published by organisations and agencies that use high quality systematic reviews for their decision making, the creation of clinical practice guidelines, assessment of technology, or policy. Among these are: the Agency for Healthcare Research and Quality (AHRQ), Scottish Intercollegiate Guidance Network (SIGN), National Institute for Health and Clinical Excellence (NICE) and Canadian Agency for Drugs and Technology in Health (CADTH).

In 2011, IOM released an extensive set of methodological and reporting standards in their report, *Finding What Works in Health Care*. The report:

> …recommends 21 standards with 82 elements of performance, addressing the entire Systematic Review process, from the initial steps of formulating the topic, building a review team, and establishing a research protocol, to finding and assessing the individual studies that make up the body of evidence, to producing qualitative and quantitative syntheses of the body of evidence, and, finally, to developing the final Systematic Review report (Eden 2011: 4).

Over time a variety of tools and checklists have been developed to assess and standardise the quality and reporting of reviews and their search processes. To assist with critical appraisal and ensure the integrity of systematic reviews the CRD's handbook, mentioned above, provides the following checklist of criteria that need to be satisfied by a review:

- Was the review question clearly defined in terms of population, interventions, comparators, outcomes and study designs (PICOS)?
- Was the search strategy adequate and appropriate? Were there any restrictions on language, publication status or publication date?
- Were preventative steps taken to minimise bias and errors in the study selection process?
- Were appropriate criteria used to assess the quality of the primary studies, and were preventative steps taken to minimise bias and errors in the quality assessment process?
- Were preventative steps taken to minimise bias and errors in the data extraction process?
- Were appropriate methods used for data synthesis? Were differences between

studies assessed? Were the studies pooled, and if so was it appropriate and meaningful to do so?

- Do the authors' conclusions accurately reflect the evidence that was reviewed (Centre for Reviews and Dissemination 2009: Box 1.1)?

The CRD also provides examples of how to describe the search process in Appendix 3 of the guide.

The identification of sub-optimal reporting of reviews by several studies prompted the creation of the Preferred Reporting of Systematic Reviews and Meta Analysis (PRISMA) approach, in order to standardise and improve reviews. PRISMA provides a 27- point checklist of items to include in the report and requires a flowchart to depict the flow of information through the different phases of a systematic review. It records the number of studies identified, included and excluded (Moher, Liberati, Tetzlaff, Altman, & PRISMA Group 2009: 332-336). The checklist has been endorsed by over 170 journal publishers as a requirement for systematic review submissions. Other methodological quality tools are: Meta-analysis Of Observational Studies in Epidemiology (MOOSE), and Assessment of Multiple Systematic Reviews (AMSTAR).

Sparse and inconsistent reporting of the search strategies used in reviews have led to the creation of the Peer Review of Electronic Search Strategies (PRESS) checklist (Sampson, McGowan, Cogo, Grimshaw, Moher, & Lefebvre 2009: 944-952) and a forum of librarian peer reviewers helps to evaluate search strategies in progress.

Use of systematic reviews in other disciplines

Although originally developed for summaries of effectiveness using randomised controlled trials, systematic review methodology has been adopted and adapted for the other study domains relevant to medical research: diagnostic, prognostic and causative studies, and also other areas of health research such as public health and epidemiology. It has also evolved into synthesised reviews in qualitative studies, and extended into subject areas such as the social sciences and policy. For example, Gough, Oliver and Thomas (2012: vii) list the additional fields in which the Evidence for Policy and Practice Information and Co-ordinating Centre (EPPI Centre) conducts systematic reviewing and synthesis: The topics include: crime and justice, education, employment, health promotion, social welfare, transport and the environment.

The results of the following search strategy further illustrate the burgeoning number of disciplines employing systematic reviews. This search, using synonyms for systematic reviews, was run by the author in Web of Science on June 24, 2015:

> TS=("systematic review" OR "scoping review" OR "knowledge synthesis") OR TI=("systematic review" OR "scoping review" OR "knowledge synthesis")

The results were analysed by research area which revealed that systematic reviews were found in subject areas, unrelated to health or social research, including forestry, materials science, computer science, engineering, economics, and business, among others.

As the standard systematic review methodology does not exactly meet the needs or purposes of these other domains, the systematic approach has exploded into a number of different types of review. Grant and Booth (2009) identify and describe14 different types of reviews. In the area of policy research Arksey and O'Malley (2005) have written a seminal paper on the scoping review. More recently debate has arisen about the emergence of the rapid review (Featherstone, et al 2015).

While each of these different reviews adheres to a systematic approach, their process and level of rigour differ. According to Gough, Thomas, and Oliver (2012: 28) the 'proliferation of types of systematic reviews [is creating] challenges for the terminology for describing such reviews' and to

clarify the distinctions they identify three major types of determinants of difference. As systematic reviews continue to be undertaken by other disciplines, it is anticipated that new forms of reviews will increase and the debate is set to continue.

Rate of increase in the use of systematic review methodology

The same search for systematic reviews and syntheses in the Web of Science described above was limited to the 10 years, 2005-2014, and yielded a total of 52,380 results. The breakdown by year of publication demonstrates the exponential growth in this type of review (Table 1).

Skill sets of librarians in systematic reviews

McKibbon (2006: 205) noted that systematic reviews are important to librarians and librarianship for the following reasons. Library professionals conducting systematic reviews in the library field 'help us build and make sense of our own research base' and thereby help make the case to either implement or justify services that are effective, or eliminate those that are not. Additionally, the librarian's role and application of skills on systematic reviews in research areas beyond library and information science ensures the quality of evidence gathered for analysis. Rethlefsen, Murad, and Livingston (2014: 1000) agree:

> Medical librarians bring expertise to the review process based on their understanding of the medical literature, search methods, and review guidelines and standards. Their neutrality and expertise can help minimize bias in the review process, leading to more robust and unbiased review articles.

Health Sciences librarians are increasingly involved in systematic reviews. Figure 1, depicts the stages of the systematic review at which librarians are typically involved.

In addition to this role in individual systematic reviews, librarians have also contributed to the development and improvement of the methodology as a whole. Librarians have created and validated hedges and filters, including a qualitative filter in PsycINFO (McKibbon, Wilczynski, & Haynes 2006: 440-454). Through assessments, they have identified compliance issues regarding process. Examples are: the examination of the quality of reporting in Cochrane Systematic Reviews (Yoshii, Plaut, McGraw, Anderson, & Wellik 2009: 21-29), and the identification of the need for a tool to assess search strategies. The latter has been satisfied by the creation of the PRESS checklist for conducting the search strategy quality review (Sampson, McGowan, Lefebre, Moher & Grimshaw 2008).

In a case study, Harris (2005) identified a number of skills required by librarians, or information scientists, when working on a systematic review. These, together with practical examples, are listed below.

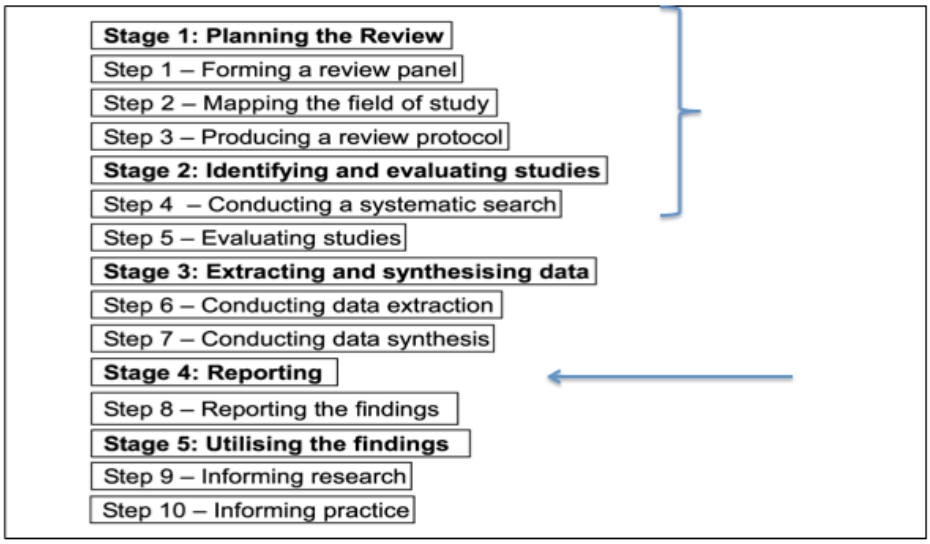
1. ***The ability to interact with investigators and researchers***

It is essential to the success of the systematic review for the librarian to be confident and an effective team player. The process of identifying questions and concepts, and the iterative nature of search strategy development, requires clear communication and exchange of ideas. The librarian adds value to the discussion by using reference interview techniques to assist the team, or individual researcher, to gain improved insight into what the specific question is and provides knowledge about how to translate this into search concepts. For example, in a question involving exercise and cognitive function, this process will elicit suitable search terms for the broad concept 'cognitive function', as well as for specific cognitive abilities such as perception, memory, decision-making, et cetera. Furthermore, a librarian well versed in systematic reviews should have the confidence to advise on conducting a question analysis and on which conceptual framework to use. While PICO is suitable for therapeutic interventions, and is the most well-known, other frameworks have been developed for other subject areas or study types. Examples of alternative

Table 1: Number of systematic reviews by year (Web of Science 2015)

Publication Date	Record count	% of total count (52380)
2014	10925	20.86
2013	9375	17.90
2012	7503	14.32
2011	5945	11.35
2010	4749	9.07
2009	4155	7.93
2008	3225	6.16
2007	2727	5.21
2006	2077	3.97
2005	1699	3.24

Figure 1: Librarian involvement in the systematic review process. Based on Tranfield (2004)



frameworks include: Person, Environments, Stakeholders, Intervention, Comparison, and Outcomes (PESICO) in speech pathology (Schlosser & Pirozzi 2006: 5-10) and Sample, Phenomenon of Interest, Design, Evaluation, Research type (SPIDER) for qualitative studies (Cooke, Smith, & Booth 2012: 1435-1443).

2. *A solid knowledge of how to develop a comprehensive search strategy*

The need for an effective and robust search strategy to conduct an exhaustive search requires deductive reasoning to effectively translate the operational definitions of concepts into the appropriate combinations. It also requires judgment and search experience to balance sensitivity (recall) and specificity (precision) when deciding which inclusion and exclusion criteria need to be accounted for in the search strategy. Recognition that the development of the initial search strategy is a time-consuming and iterative process requiring experimentation and frequently referring the target research back to the team helps lower unrealistic expectations and stress. Several organisations, which are involved in the production of practice guidelines, health technology assessment or aiding effective and quick searching in evidence based decision-making, have created hedges, or search filters, to facilitate searching. Examples of these organisations are: Scottish Intercollegiate Guidelines Network (SIGN), Health Information Research Unit (HIRU) at McMaster University, and Canadian Agency for Drugs and Technology in Health

(CADTH). These hedges are useful for hastening search strategy development, but they need to be applied judiciously and the librarian can advise on which to use. In general, by staying abreast of database changes, best practices and new tools, the librarian brings efficiency and effectiveness to the review.

3. ***Expert knowledge of the content, date coverage and indexing conventions of databases***

This knowledge is fundamental to ensuring the correct retrieval of suitable studies. The successful development of the search strategy requires practical knowledge of the different databases, as well as the different applications of subject headings and keywords in each. Typically, in health related systematic reviews, a 'blueprint' search is created in Medline. After testing and validation, this is then 'translated' for searching in other databases and on different platforms. This translation is necessary in subject heading searching to account for the differences in thesauri and controlled vocabulary among the databases. In keyword searching it is vital to use the appropriate truncation, wildcard and proximity symbols for the specific search engine.

An understanding of indexing conventions in the different subject databases is crucial for developing an accurate strategy. For example, Medline's Medical Subject Heading (MeSH) database has a medical focus and its controlled vocabulary is less refined or specific for rehabilitation concepts than the Cumulative Index for Nursing and Allied Health Literature (CINAHL) thesaurus, which has a more developed vocabulary for allied health concepts. Likewise, the strength of terminology in PsycINFO for psychosocial topics is stronger than that in Medline. Researchers are generally unaware of these variances and librarians' knowledge of these differences and their expertise in applying them provide a unique contribution for the accurate retrieval of appropriate studies and thus to the success of the review.

Multi-file searching and discovery tools, such as Summon, while seeming to offer efficiency, are not adequate for comprehensive searching or for the accurate recording of the process. The librarian can advise accordingly.

4. ***The identification of appropriate resources***

This includes the selection of databases as well search tools. Knowing which suite of databases is needed ensures comprehensive coverage of the topic. Databases differ in the journals they cover and since many research topics are interdisciplinary in nature and researchers publish in journals outside their own discipline, a broad range of databases needs to be considered. For example, at a minimum Medline/Pubmed, Embase and CINAHL need to be searched for rehabilitation topics. Depending on the area of interest, additional databases may also need to be consulted. For school related topics, the Education Resource Information Center (ERIC) database might be added and for studies about motivation, PsycINFO.

Monroe-Gulick, O'Brien and White (2013) describe how they used an evidence-based approach to identify suitable databases. By using pre-identified significant papers in their research area they searched *Ulrichs Periodical Database* to identify in which databases the journals were indexed. They then used this information to reduce duplication and to identify unique, or little known source.

Citation tracking is important as reference lists and in-text citations can provide leads to relevant, unique or elusive items. 'Cited by' searches are invaluable in locating recent and subsequent studies. A number of citation tracking databases have become available recently. In addition to Web of Science, there are Google Scholar, Scopus and PubReMiner. Publishers are now offering tracking within their stable of journal titles. Knowing that each captures unique results and that there can be little overlap among them, the librarian is able to advise on which to use.

5. ***The ability to identify and search sources beyond electronically available published literature***

This ability is important in the amelioration of bias. As mentioned earlier, there is inherent bias in the published literature. Saleh, Ratajeski, and Bertolet (2014: 30) state that, 'The IOM standards 3.2.1 and 3.2.4 call for the inclusion of grey literature searches in all systematic reviews and handsearching of selected journal and conference abstracts …[and librarians] must be prepared to search the grey literature or at least provide guidance on resources and search strategies'. By including information found in less successful trials, and in government reports, dissertations and theses, or conference proceedings the accuracy and quality of the review is improved.

6. ***Use of information management skills to manage the results and document the process***

In accordance with PRISMA, the information flow for each stage of the review needs to be described. This requires the results of each of the searches to be captured in bibliographic software and tallied before and after duplicates are removed. For transparency and reproducibility, each stage of the search and retrieval process is documented and written up in the methodology in the final report. This documentation includes the full description of the databases and other sources searched, and the search terms, techniques and strategy used.

Subsequent studies and recommendations reinforce the applicability and importance of these skills. Their impact has been noted in recent systematic review assessments which suggest that in those reviews in which a librarian, or some other professional searcher was employed, had better reporting of the process and used more complex search strategies (Rethlefsen, Farrell, Osterhaus Trzasko & Brigham 2015: 617-626). Librarians' involvement is 'strongly associated with the use of many recommended search methods and could improve the quality of the review, [by] contributing to the replicability and robustness of meta-analytic findings' (Koffel 2015: e0125931).

The appreciation of the skill set and its value to the process is evident in the following recommendations from the various authors of the Cochrane Collaboration Handbook, Institute of Medicine Standards, Agency for Healthcare Research and Quality (AHRQ) and Canadian Institutes of Health Research (CIHR) respectively:

- Seek the guidance of a local healthcare librarian or information specialist, where possible one with experience of conducting searches for systematic reviews (Higgins & Green 2011: 6.1.1.1).
- Standard 3.1.1– Work with a librarian or other information specialist trained in performing systematic reviews to plan the search strategy.
- Standard 3.1.3 – Use an independent librarian or other information specialist to peer review the search strategy (Eden 2011: 8).
- Librarian involvement in the initial stages of the process, including reading the background materials that are prepared as the topic is developed, is an essential first step to understanding the key questions and crafting a pilot search (Relevo & Balshem 2011: 1170).
- Your team should have the required skills for each area of the project. It is strongly recommended that each team includes an expert in the content area(s) covered by the synthesis, an expert in synthesis methods and an information scientist or librarian (Canadian Institutes of Health Research 2013: 2.2).

Role of the academic or special librarian

In addition to the roles outlined above, the academic librarian's specific involvement in systematic reviews can be instructor, advisor, consultant or member of a research team. At universities, systematic reviews are conducted for reasons of

education and for research. They are viewed as an important part of the education process for masters and doctoral students. As such, systematic reviews are frequently assigned as a research project, or as the methodology for the dissertation's literature review. Systematic reviews are also undertaken as original research for knowledge syntheses and for information gathering preparatory to a research project. Liaison, or reference, librarians are involved in both types to varying degrees.

Instructor

According to Gough, Oliver and Thomas (2013: 28) 'systematic reviews are a relatively new method and are not taught on most research methods courses. Many academics do not have such specialist training and skills'. In consultations with masters and doctoral students, the librarian is instructor as well as consultant and advisor. It is often necessary to teach the methodology of the whole systematic review as well as those processes related to the location of studies. Instruction includes advising on checking that the proposed project is unique, submitting the protocol to Prospectively Registered Systematic Reviews in health and social care (PROSPERO), advising on PRISMA and how to manage the recording of the review, guiding the expression of the research question into a conceptual framework and teaching how to build effective searches in databases and other resources. Reviewing search strategies and troubleshooting access issues provide further support.

Many research coordinators hire undergraduate students as research assistants to do systematic reviews. Most of these students have minimal searching and research skills and need to be coached on elementary search techniques, the existence of databases, and even lateral thinking. The role of the academic librarian in these instances is to clarify the research topic (often from a secondary source); advise on the variety of sources to use, and help brainstorm the concepts and relevant search terms. It is also necessary to provide training on the intricacies of developing sensitive search strategies with subject headings and keywords combined with Boolean operators, and the judicious application of limits, filters or hedges. In addition the assistants often require training on bibliographic software to manage the process.

Research partner

As noted above it is clear that librarians' involvement in systematic reviews is integral to the production of the review. On grant funded projects, such as the knowledge synthesis grants from the Canadian Institutes of Health Research (CIHR), a liaison librarian often assists with the initial grant application by doing the preliminary scoping search to confirm the topic is unique and to ascertain the scope of work and range of resources required for the project's budget. If the grant is successful, the librarian may be on the team as the information specialist, or may be involved in an advisory and training role. In either capacity, the librarian's intellectual input to develop the search strategy, to know which sources to use, to guide the management of the results, and the writing up of the search methodology in the report, make for a unique and significant contribution. By staying abreast of best practices the librarian is also advisor on emerging processes and new tools and software.

The unique expertise and skills required for the exhaustive search to locate studies elevate this participation to a partnership, rather than a supporting role. This level of inclusion is underscored in CIHR funded projects where the librarian, or information specialist, is designated the role of 'collaborator'. It can be argued that, even where the actual search and management of results is undertaken at a remove by students, or research assistants, the contribution of expertise, the intellectual input and the commitment of time positions the librarian as partner.

Co-author

It is clear that 'the individual nature and inherent complexity of each systematic review de-

mands close collaboration between librarians, academics and clinicians' (Swinkels, Briddon & Hall 2006: 248). Tannery and Maggio (2012: 143) conclude that as a librarian's 'efforts are a necessary component of the research … a librarian who takes responsibility for the design and execution of a literature search should be included as an author of the publication' in accordance with the authorship guidelines of the International Committee of Medical Journal Editors (ICMJE).

The impact of systematic reviews on existing academic library reference services

The rise of the systematic review and the increasing involvement by librarians presents both challenges and opportunities to existing academic library reference services.

Increasing demand

As already mentioned many systematic review standards recommend the involvement of the librarian, or information scientist. This puts additional pressure on academic reference services already experiencing staff reductions (Campbell & Dorgan 2015: 11-19). Systematic reviews, no longer the preserve of health care, are becoming increasing prevalent in other disciplines and the increases seen in health and social research are likely to be experienced in other areas too.

A poster presented at the Canadian Health Libraries Association annual conference in 2014 reported on a study conducted at the University of Waterloo. The aim was to gain a better understanding of the systematic review environment and the possibilities for librarian involvement. Of 83 faculty and doctoral students who responded 80% anticipated authoring or co-authoring a systematic review in the next five years and 90% of the faculty surveyed claimed that they would include liaison librarians to some degree (Stapleton, Gordon, Davies, & Hutchison 2014).

Opportunities for continuing education and professional development

Systematic review methodology demands that librarians be knowledgeable in all aspects of their production, including the process, tools, databases, search methods and trends. A recent survey by Murphy and Boden (2015: 74) on Canadian health sciences librarians' participation in systematic reviews indicates that knowledge is 'pretty good' or 'extensive' in the traditional librarian type roles, namely those of search strategy developer, database selector, research question formulator, citation manager and document supplier.

Health sciences librarians have contributed to, and avail themselves of, a growing knowledge base. Training opportunities present themselves through increasing continuing education (CE) opportunities. As demonstration in 2014 Saleh Ratajeski and Bertolet (2014: 28) counted eight CE offerings in the Medical Library Association Education Clearinghouse and as of June 2015 this has increased to eleven. These CE opportunities are available at conferences, local institutions, or online. Content varies widely, from developing expert search skills in specific databases to the process of conducting a systematic or other type of review. An example described by Conte et al (2015: 72):

> … prepares librarians to understand the role of systematic reviews in evidence-based health care and provides training in 'conducting an exhaustive and reproducible literature search, documenting the search process, and delivering organized and complete results'. Additionally, the development of a personalized strategic plan prepares librarians to promote their skills in systematic reviews in their home institutions.

In addition to training opportunities, participation in systematic reviews also provides prospects for professional development. Beverley, Booth and Bath (2003: 65-74) describe ten possible roles for information specialists in the systematic review process namely: project manager, literature searcher, reference manager, document supplier, critical appraiser, data extractor, data synthesiser, report writer and disseminator. In the

survey mentioned above, Murphy and Borden (2015) included these and added two more, research question formulator and database selector. While respondents in the survey claimed that lack of training in these 'newer' roles was a barrier, Murphy and Borden (2015: 76) state that 'it is significant to note that some level of assistance or participation [by librarians] was reported for all SR roles'.

Time constraints

Like Murphy and Boden (2015: 73-78), Crum and Cooper (2013: 278) report that time is a barrier to expanding librarians' roles. The development of a search strategy is an iterative and time-consuming process and requires dedicated time. As a team member, the librarian is at the behest of the research team's timetable making it difficult to co-ordinate meeting all team members concurrently. In addition, liaison librarians' teaching responsibilities, when integrated in professional and graduate curricula, are often in conflict with the workflow and time commitment required for a research project.

Estimating time on systematic reviews and their related reviews is an important question for project management as well as for estimating librarian time. Saleh, Ratejeski and Bertolet (2014: 28-50) provide a useful exposition of time reporting studies. The results from their literature review demonstrate that these studies are highly variable and are influenced by the type of study, specific actions, and searcher skill or expertise. Their own study to investigate the time it takes to include grey literature searching as part of the process revealed that 'the average total time spent searching electronic databases and hand searching the literature for a systematic review was 24 hours with a range of 2-113 hours' (Saleh, Ratejeski & Bertolet 2014: 36). As is evident from the widely different range identified, no definitive time can be pre-determined.

Anecdotally it is common for systematic review consultations to average three hours over two or more sessions. With follow up email and search strategy review this can increase to five hours and for a more broad scoping review, which attempts to map the literature, this involvement can expand to over ten hours.

Changes in service model

Increased demand and expansion of the systematic review methodology to other disciplines means the current reference models need to be reviewed in order to embrace this opportunity. Suggestions and strategies include those of:

- Swinkels, Briddon and Hall (2006: 248) who found collaboration between researchers and librarian to be mutually beneficial, stating: 'in addition to enhancing the reviews themselves, there are many other personal and institutional benefits of collaborative working. Consideration needs to be given to library staff structures and roles if these benefits are to be maximized and sustained'.
- Murphy and Boden (2015: 77) who suggest that 'Canadian university health sciences library administrators need to acknowledge this new role and determine ways to manage its growth (e.g. inclusion in job descriptions, adjustments in assigned duties)'.
- Monroe-Gulick, O'Brien and White (2013: 386) who propose that researchers need 'to appreciate the value and expertise of librarians to their projects and to begin to create line items in their budgets for libraries'.

Campbell and Dorgan (2015: 11-19) describe an action plan consisting of eight strategies undertaken at the John W. Scott Health Sciences Library at the University of Alberta. These include freeing librarians' time, building searcher capacity in the library community, lobbying for positions, redefining service policies, improving the organisation of support services, liaising with faculty about systematic review assignments, requiring users to come prepared to consultations and providing systematic review workshops for researchers. While many of these strategies have

had an immediate effect in streamlining processes and freeing librarians to focus on complex searching to meet internal users' needs, the authors conclude that it is not known when the demand for these services will peak and that 'it will be necessary to continue applying these strategies, adapting them and evaluating them as we go forward' (Campbell & Dorgan 2015: 13).

Like the University of Alberta, Woodward Library, University of British Columbia offers systematic review workshops two to three times per year. These are well attended and attract researchers from a wide array of disciplines and programs. In addition, in response to increasing demand for participation in knowledge synthesis projects, Woodward Library launched the Enhanced Consultation Research Support Service (ECRS) on a trial basis. The aim of this service is to be able to respond to the needs of the research community on a grant-funded basis and create a self-sustaining position over time.

Conclusion

The increasing and growing evolution of systematic reviews in academic research provides the library with an opportunity to prove its relevance to the academic mission. The importance of reviews done systematically and well is the foundation of clinical, social and policy decision-making. As members of the systematic review team, librarians have specialised knowledge and skills which contribute to knowledge creation and the body of research. Their role has changed from supporter to partner. Increasing demand and expansion of systematic reviews methodology to other disciplines is impacting current reference models and changes to these models need to be explored.

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Chapter Nine
Information Management Solutions for Modern Research and Innovation: Interoperability & Why It Matters

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Abstract

Global trends and research information systems development are extremely dynamic and a continuous changing landscape. In this context, where more and more institutions and researchers manage information, the channels increase such that the research information needs to be exchanged between systems. We see this as a digital ecosystem of research information. It is pertinent to advocate the use of standards to facilitate the exchange of data to ensure that the information can flow seamlessly through the ecosystem and be reused to its maximum capacity. In addition to this streamlining the process will reduce the administrative burden faced by researchers and administrators. The paper provides personal insights whilst exploring the current landscape and methodologies.

Introduction

Exploring trends and developments in the changing landscape as well as various standards and platforms such as CERIF-XML, VIVO, ORCID and CASRAI is essential in modern day research management. The research information management landscape has shifted from home-grown stand-alone systems to a complexity of systems and adaptations to allow for the seamless flow of information (Moreira, 2013).

Many institutions take time to make such decisions, as the cost-benefit analysis at the onset seems very high. Institutions or countries showing rapid adoption of standards and systems with a clear set of criteria have seen much better results (Moreira et al., 2015).

This synchronization framework used in the Portugal PTCRIS project has recently been prototyped. The clear project objectives and criteria for outputs ensured that the system achieved excellent results. The first stable and detailed specification of the synchronization framework will be made available soon as an open-access report. (Moreira, 2013) (Moreira et al., 2015)

A recent report produced by JISC and Association of Research Managers and Administrators (ARMA) in the United Kingdom considered various factors in Institutional ORCID implementation and Cost-Benefit Analysis. The report consulted with a number of different stakeholders in the research and scholarly communications process. It was found that the adoption of ORCID would be greater based on funder mandates. Eight pilot institutions participated in the project and early engagement with senior management was key to the success. The velocity of decision-making within an institution becomes a critical success factor. As stated by Henderson et al. (2015) perhaps surprisingly, technical issues were not the major issue for most pilot institutions. A range of technical solutions to the storage of researchers' ORCID iDs were utilised during the pilots. Four institutions used their institutional research information system (CRIS): two used Pure; one Symplectic; and one Converis. Two other institutions developed in-house systems, one used Agresso Business World and one the student portal of SITS e:Vision. Of the eight pilot institutions, only one chose to bulk create ORCID iDs for their researchers, the others opted for the 'facilitate' approach to ORCID registration. The institutions found it relatively easy to convey the benefits to senior management; however, researchers and staff seemed to see this as another level of bureaucracy. In summary, the project unveiled that the cost of implementation was negligible and the potential benefits far exceed the cost. (Henderson et al., 2015).

The skills and systems that are required by the modern researcher are extremely diverse. Institutions need to evaluate the following key functional areas whilst providing the environment for the researchers to grow and position themselves as leaders in their fields. Common challenges for institutions are as follows:

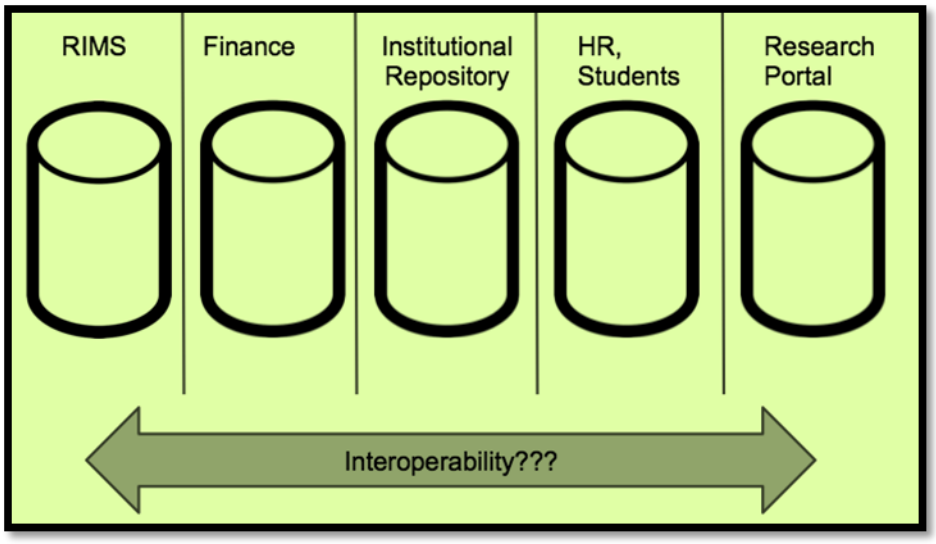
- Research and Innovation Performance of Universities: Africa and the rest of the World;
- Competitive Intelligence for strategic research management, encouraging collaboration, capacity building and training
- Enabling technology transfer and commercialization;
- Measuring and Benchmarking (including ranking for modern university management), using the right tools to measure;
- Using the right research tools, creating a personal brand, measuring performance;
- Finding possible collaborators;
- Where to publish – and how to innovate.

Whilst the list may seem limited, these are critical pain points that the research digital ecosystem should address (Mouton, 2014). In bringing this together, the key functional aspects of a digital eco system should be scalable and interoperable.

The silo effect

One point that I have found resonates with all institutions currently is the hindrance to research administration presented by siloed systems and

Figure 1: Lack of interoperability across the research digital ecosystem



data sources. This takes a large amount of the researchers' time in data capturing due to lack of interoperability.

Institutions are exploring the increasing need for data sharing, and the opportunities presented in using standard data models and unique identifiers in building bridges between systems. This occurs on both a macro and micro level across the digital ecosystem. Persistent identifiers such as ORCID, allow for the seamless flow of information across this system whilst using existing standards. By building persistent identifiers into the workflows there will be the notion of entering data once and using it many times (Otjacques et al., 2007).

Increasingly is interoperability required across all enterprise systems and not the standalone research information management system. The key to interoperability is in identifying vendors that make use of persistent identifiers and standards. This will ensure that the silo is broken down and that information can flow seamlessly across the digital ecosystem.

Scalability is extremely important to avoid the silo effect in the future. Similarly without interoperability, the system renders itself standalone and the information lost within a digital vortex.

Research information management

There are many trends driving the needs for increased professionalization of research management.

Governments are increasing the frequency of national research performance exercises. This not only allows for accurate resource allocation but also increased visibility for the country and the region. Complex research information management systems, allow for government bodies to manipulate the data into meaningful charts and tables.

Funders around the globe have complex application processes which creates ongoing challenges for the researcher when applying for grants. In addition to the complex application process, reporting back on projects and linking research outputs to projects is not always simple. There is often a disjuncture at this point.

Universities are looking to conduct benchmarking both internally and externally. These exercises allow for internal performance reviews, faculty activity reports. In addition to other key functions such as accreditations, compliance (ethics reviews), attracting talent or collaborations and generally increased efficiency in the research workflows.

Finally from the researcher point of view, the research information management system should allow for less administration, more research. In this sense, it should break down the silo and create an interoperable research ecosystem.

Skill sets in research management: Africa

There is an increasing need for skilled individuals within research management. Many research information management systems (RIMS) vendors provide comprehensive technical support, however, there is still a need to have in-house skill sets. These skillsets vary by stakeholder but essential skills are basic programming and API knowledge. This is one of the key challenges, which I have found when discussing these systems in Africa.

The evolution of information systems has meant that most programming code has become open source. As an example, ORCID who serve as a hub to connect digital information post all the code openly to the community. In the same sense, many members of ORCID create codes that either read or write information from the hub and in turn post this openly to the community. Sharing of use cases and web services code certainly is a positive step, however, there is still the need to for someone in-house to be able to make use of this code.

In addition to hard skills, research management is also moving towards dissemination of knowledge and skills. Researchers are demanding specific training on systems and the creation of guides to navigate this now, complex digital ecosystem. The skillset in research management should be able to breakdown the complexity for the individual users and showcase the benefits.

Interoperability and persistent identifiers

Interoperability only becomes possible when information systems use a common language (or data dictionary as it is commonly referred as). In this sense, one does not need to change the source code but rather build adaptations on the periphery of these systems to create a common language web services interface.

According to (Zhao and Xia, 2014) their literature review indicates that interoperability has never been formally examined in prior empirical studies of interorganisational systems. It is unclear how interoperability should be conceptualized and operationalised in the context of digital value networks. Also under researched is how interoperability is formed and whether it can lead to organizational performance gains.

If one can make use of standards and a common language, interoperability becomes possible despite the heterogeneity in software. These common languages and standards in the research digital landscape are as follows:

(i) CASRAI

The Consortia Advancing Standards in Research Administration Information (CASRAI) is a non-profit organization that is dedicated to reducing the administrative burden on researchers and improving business intelligence capacity of research institutions and funders (CASRAI, 2015).

Their approach is simply to improve the flow of information and the various stakeholders in the digital research ecosystem. CASRAI serves to change the source code of systems but rather provide adaptations through the CASRAI common data dictionary. This enables system-to-system interoperability and seamless flow of information (CASRAI, 2015).

There have been several organisations that have adopted CASRAI common vocabulary (from the data dictionary) and used it to produce compliant CVs for researchers. This aids the funders in receiving data in a compliant format and streamlines the process.

CASRAI develop and maintain a common and extensible dictionary of terms and exchangeable business objects that form bridges in our shared work processes. In addition CASRAI provide a forum and the mechanisms required to standardize the data that researchers, their institutions and their funders must produce, store, exchange and process throughout the lifecycle of research activity (CASRAI, 2015).

(ii) euroCRIS CERIF

euroCRIS is the European organisation responsible for publicising work on current research information systems (CRIS). The CERIF task group maintains a standard for CRIS systems to enable interoperability. Its focus is in Europe, however, it serves to address global challenge (euroCRIS, 2015).

The primary objective of euroCRIS is to serve as a common platform for dialog and discussion of common issues within research information management.

- Promote and improve communication and interaction between global CRIS;
- Maintain and publish the CERIF (Common European Research Information Format) recommendation and any standards endorsed by euroCRIS;
- Organize and run the CRIS series of conferences with associated workshops and other events;
- Provide a source of expertise in CRIS to members and to others under business arrangements made at the time;
- Develop euroCRIS guidelines;
- Nurture the CRIS community by events, a monthly newsletter, an online discussion forum and other appropriate mechanisms;
- Provide a forum for exploring and exploiting new and emerging concepts and technologies (including data quality, standards, etc.);
- Establish a one-stop portal / gateway to international CRIS resources.

(euroCRIS, 2015)

The premise for interoperability is that it requires a structures schema. CERIF serves to act as a model for a standalone (homogenous) system as well as adaptations for heterogeneous systems to facilitate data exchange and create a common data warehouse (Zhao and Xia, 2014).

(iii) VIVO

The VIVO project allows for researchers across institutions to be discovered and information to be shared. Institutions within the VIVO network set up local installations that will then allow for transfer of data amongst other institutions on the network. VIVO works with a range of stakeholders across the research lifecycle and include data such as researcher interests, activities, and accomplishments. This enables seamless discoverability of research information (VIVO, 2015).

Whilst standards are fundamental, it is as important to incorporate a persistent identifier into the research workflows. Name ambiguity has become a major challenge in research information management (Gilchrest and Blalock, 2014). It has been found that algorithms are simply not enough to create a profile. This is due to any number of the following issues when publishing:

- Different versions (full name versus initials)
- Shared names
- Transliteration
- Accents and other ALT characters
- Name changes
- Multiple family names

(Haak et al., 2012)

This creates a challenge across the entire research lifecycle, as metadata is either incomplete or incorrect. The use of a unique persistent identifier assists with flow of information between systems and improve the integrity of the data. This creates retrieval issues for users. *Name disambiguation, the process of identifying, merging, and making names accessible in one standard form, is a vital process repository staff should incorporate into their workflow to address these issues* (Walker and Armstrong, 2014).

ORCID is also works to build trust in research profiles. It serves to be a hub connecting information across the research digital ecosystem. In allowing this interoperability, the source of information can affirm the credibility and therefore reducing the self-claiming procedure. The source

as an example would be CrossRef. In addition this allows for data to be entered once and reduce the administrative burden of the researcher. ORCID is working closely with CrossRef and DataCite towards a metadata round up. This process will allow for the following:

1. ORCID persistent identifier to be capture through authentication at the publisher.
2. ORCID persistent identifier to be built into the production workflows and send with the metadata to either CrossRef or DataCite.
3. DOI and other metadata then pushed into the researchers ORCID profile.
4. ORCID will then push this data into various member integrations such as the institutional repository and institution profile system.

(Paglione, 2015)

The road ahead: it takes a village

The road ahead requires community involvement where all stakeholders work together. Publishers are beginning to use persistent identifiers in their workflows. The key is to ensure that these identifiers are pushed through to production and then associated with a digital object identifier (DOI). This allows for seamless tracking of the research output and almost zero administrative burden on the researchers. Through notifications and interoperable systems the institutions could pull data into their repositories. An example of such notification would be a new publication in which the institution then sources full text for their repository, effectively enhancing the integrity of the repository. Once the data enters the institutional digital ecosystem, systems should be able to push and pull data seamlessly through the use of standards and common data dictionaries. Finally, funders can associate research outputs to projects whilst also tracking the peer review process (Allen et al., 2014).

I see there to be three key pillars to building a scalable research digital ecosystem:

(i) Persistent identifiers

Persistent identifiers cannot simply exist to serve as an identity but also need to be built into the workflows of the research community. This will enable seamless tracking of information for the administrator and clear visibility for the researcher.

This process should be managed by systems in its entirety and avoid any manual entry whatsoever. Information should be self-created or by the system, however, ensuring compliance with privacy requires a digital "handshake" and authorisation from the researcher.

Bi-directional flow of information through identifiers is the most important aspect as without this it renders it as a simple identity lost in a digital vortex. Building trust is enabled through the flow of information, allowing institutions to affirm an affiliation or research output in the researcher's profile (Gilchrest and Blalock, 2014, Walker and Armstrong, 2014).

Finally use cases for researchers such as populating their CV automatically and seamlessly applying for funding start to become key positive outcomes. This allows for simple and accurate benchmarking, linking funding to projects and research outputs, and improving the integrity of the data throughout the research digital ecosystem (Haak et al., 2012).

(ii) Research Information Management Systems (RIMS)

There are a number of RIMS providers that offer varying levels of service and functionality. It is important to clearly define the scope and objectives of the system. There are a couple key aspects that I would recommend an institution should evaluate:

- Functional workflows – the system should allow for customisation of workflows and approval processes without changing in source code;

- Standards and adaptability – the data model should be extensible and offer a degree of customisation, whilst still adhering to various standard employed;
- Support – there should be round the clock support and maintenance for such a system. It is pivotal in most research organisations and should something go wrong there must be a quick turnaround on resolving the issue;
- Scalability – this is one of the key aspects of any modern day system, as to how scalable is this for the future. There are so many legacy systems within the digital research ecosystem and it has become increasingly costly (and resource intensive) to maintain these systems. A truly scalable system has the three previous aspects; functional workflows, standards and adaptability, and extensive support.

Standards assist to break down the silo effect and allow for better interoperability and flow of information.

(iii) Standards

In this context, where more and more institutions manage research information; funders and national research performance assessment exercises, the channels increase where the research information needs to be exchanged between systems. This is a digital research ecosystem.

It is therefore important to advocate for the use of standards across all systems and hubs. This allows for future scalability and also importantly better interoperability across systems (Zhao and Xia, 2014). The benefits are ten-fold and not only realised by the institution but also the researcher due to the reduced administrative burden. Data can be entered once and re-used many times.

Summary

Researchers want to be read, acknowledged and quoted. The digital framework of the research ecosystem should be enabling of the basic researcher needs and reduce their administrative burden; allowing researchers to spend more time on their research and less on administration.

Scalability and interoperability for the future are two key terms that should be synonymous with research management. The key benefits of a truly interoperable research ecosystem will provide the following outcomes:

- Save time for researchers (applying and reporting);
- Improve access to quality data for institutions and funders;
- Simplify the measurement of research impacts on society;
- Provide peer networking opportunities for teams tackling admin data issues. (CASRAI, 2015)

Together the research community can build an open access framework for the digital research ecosystem. The technology is fast moving and stakeholders across the research lifecycle should attempt to share ideas for better interoperability in the future.

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Chapter Ten

Fostering Collaboration in the 21st Century Research Library

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Abstract

The 21st century research library can no longer exist in isolation. In today's world, the challenges of providing access to and preserving research content, as well as supporting new educational models, requires entering into deep relationships and collaborations with other libraries and stakeholder communities. Research data management, scholarly communications, digital preservation, content licensing, MOOCs, digitization- the success of all of these services will be determined based on our ability to work successfully with others.

In 2014, the Association of Research Libraries (ARL), an association with 124 members from research libraries in the US and Canada, began a profound transformation in order to foster greater collaboration and innovation amongst its members. A key component of the new approach involves catalyzing action within the broader ecosystem of higher education, through a "system of action". A system of action is made up of interrelated components that affect the way people do things. These components are also interdependent. A change to one component affects the response of all the other components. Through collaboration within this system of action, ARL aims to catalyze collective action.

Introduction

This article describes the results of strategic thinking and design work that was undertaken by the US-based Association of Research Libraries from the fall of 2013 through the spring of 2014 which has resulted in a new Strategic Framework and innovative approach to the work that ARL undertakes on behalf of its members. This article draws significantly and builds on a report published on the ARL website documenting the process to develop the strategic framework.

The Association of Research Libraries (ARL) is a nonprofit organization of 124 research libraries at comprehensive, research institutions in the US and Canada.

In these times of rapid change, libraries must become adaptable and responsive in order to offer relevant services to their user communities. Networked technologies, in particular are profoundly transforming all aspects of our society, including research and education, libraries and users, the nature of our collections, resource discovery and so on. David Weinberger, a senior researcher at Harvard's Berkman Center for Internet & Society, describes the near term future as looking like this: "There will be full, always-on, 360-degree environmental awareness, a semantic overlay on the real world, and full-presence massive open online courses."[1] Internationalization of research is another important trend that cannot be ignored by libraries. This growing internationalization is shifting us to a "global knowledge and innovation geography" that diminishes the importance of international boundaries and increasingly requires libraries to collaborate across jurisdictions, geographies and language. Further related trends include greater openness and inclusivity, and the shrinking distinction between formal and informal publications. In the words of Carla Hesse, Professor of History at the University of California, "in the future, it seems, there will be no fixed canons of texts and no fixed epistemological boundaries between disciplines, only paths of inquiry, modes of integration, and moments of encounter."[2]

The ARL Strategic Thinking and Design (ST&D) Process was fuelled by the deep desire of the ARL members to rise up to the challenges facing libraries and higher education in the 21st century, and was funded by grants from the Institute of Museum and Library Services and the Andrew W. Mellon Foundation.

This was an unprecedented project for ARL because, unlike most typical strategic planning initiatives, the process did not list the challenges and trends that research libraries face and then try to meliorate them. In fact, it was specifically not a planning exercise, because the notion of planning in the 21st century is likely a futile exercise. The word planning itself assumes stability and slow change – we used the terms thinking and design to denote what we were aiming for. The process—which engaged more than 360 people drawn from the library community in Canada and the United States and from other important stakeholder communities- used a technique called "worldbuilding," coupled with deep research into the strategic planning in which higher education institutions have already invested heavily, to fashion a "System of Action" for ARL to achieve its desired future.

The genesis of the ST&D process was a 2012 ARL Fall Forum lecture, "Changing How We Think About and Lead Change"[3], delivered by John Seely Brown, Visiting Scholar, University of Southern California, in which he warned the audience about the competency trap: because we are experts in what we know, when we confront problems, we do more of what we already know, rather than look to the larger context for completely new solutions. The moral of his story: "incremental change lands you on the rocks."

Dr. Seely Brown's lecture challenged ARL to

[1] http://www.pewinternet.org/2014/10/09/killer-apps-in-the-gigabit-age/#link2

[2] http://www.arl.org/storage/documents/publications/ff12-brown.pdf (pg. 7)

[3] http://www.arl.org/storage/ documents/publications/ff12-brown.pdf

design meaningful experiences that tap into intuition more than reasoning, to encourage innovative practices around authorized ones, and to do this in a rhythm that balances the dramatic with the systematic by conceiving of a vision that is compelling, strategically ambiguous, positive, and aspirational.

ARL embraced these ideas by embarking upon an extensive, broadly engaging strategic thinking and design process that aimed to frame the critical work of the Association and define ARL's role in higher education. Focusing on these two elements will enable the association to be more responsive to rapidly changing priorities and member institutions' needs. The timing intentionally coincided with new leadership for ARL, and also reflected the evolutionary path of research libraries and the need to align ARL with contemporary contexts and issues of its members.

The Context

ARL has historically played the role of enabling individual research libraries to operate more effectively within parent institutions. Programs have helped inform and educate the membership and stimulate advocacy within individual institutions and within contexts ranging from scholarly communication and publishing to public policy.

ARL's mission and those of its member institutions are, by definition and intent, deeply intertwined. In the latter part of the 20th century, ARL and its member libraries were focused on and structured around library functions such as collections, access, preservation, and so on. In 2005, a new ARL strategic plan shifted the organizational focus toward three primary strategic directions: Advancing Scholarly Communications, Influencing Public Policy, and Transforming Research Libraries. Throughout its history, ARL has also provided enabling resources and support for organizational capacities such as diversity and statistics. And now, the association has turned its attention to a new type of relationship among and with its member libraries. With a change of leadership at ARL and a strategic plan that was initiated about eight years previously, the Association decided that it was time to fashion ARL into a force for getting things done.

The ST&D process was framed by Dr. Seely Brown's compelling articulation of the environment in which organizations exist today: Change is frequent, and previous strategies are no longer effective.

Three issues were noted:

1. The challenges we face are both fundamental and substantial.
2. We have moved from an era of equilibrium to a new normal—an era of constant disequilibrium.
3. Our ways of working, ways of creating value, and ways of innovating must be reframed.

In the last several years, ARL and its members began to recognize that the traditional committee structure at ARL, whereby members convened to discuss topical issues two times a year, was not a suitable mechanism for addressing many of the challenges for research libraries in the coming years.

Shaping a Framework for ARL

Working with a design consultant, the ST&D process incorporated content analysis of library and institutional strategic plans, 10 regional meetings attended by over 360 participants (Figures 1 and 2), and five "design studios" to give shape to a new action-oriented framework for the organization. The initiative was led by an architect – Ann Pendleton-Jullian – who scaffolded for us a process that allowed the best thinking to emerge.

The ST&D process used a distant time horizon, 2033, to design for longer-term changes and the evolutionary path forward for research libraries, while acknowledging the changing nature of planning in the context of the contemporary dynamic environment. Rather than creating a static plan, the design process recognized the need for a more organic framework that would reflect the

agile structure and more active roles necessary for research libraries and for ARL.

An ST&D Working Group was tasked with creating a framework based on the information gathered in the process above. The group described the context in which planning for both ARL and for research libraries must be situated:

- Research libraries are intimately engaged in and support the full life cycle of knowledge discovery, use, preservation, and sharing in diverse contexts of the university's mission.
- Within two decades, the research library will have transitioned its focus from its role as a knowledge service provider within a single university to become a collaborative partner within the broader ecosystem of higher education.
- ARL enables and catalyzes research libraries to leverage and mobilize individual assets toward the collective advancement of learning, research, and societal impact.

The ST&D process surfaced a rich array of metaphors to capture the ways that technology and associated changes in research and learning have transformed the research library's role. The language that emerged during the process spoke to the ubiquity and pervasiveness of knowledge construction in contemporary times. Changes within disciplines, requirements for productive research and learning, and societal pressures on the academy are drivers of change. There is evidence of critical evolutionary change within the knowledge environment, moving farther down the path from largely disciplinary lines toward more inquiry-driven, individually motivated, and collaboratively constructed teaching, learning, and research. These changes have had and will continue to have profound impact. ARL was then challenged to transform these compelling metaphors into a plan for collective action.

Several principles guided the ST&D working group's progress toward a new ARL Framework.

- The framework should recognize the emergent roles and historic strengths of the organization and its membership.
- The framework should articulate a vision for the organization (in the context of the future of research libraries and their institutions), and it should reflect new, more active roles for ARL.

As noted by the working group during the process: "ARL is our vehicle for getting things done together with key partners." These emergent roles characterize a set of actions in which ARL may inspire, introduce, and catalyze efforts to improve the research library ecosystem. ARL might in some cases broker, connect, and mediate partnerships. Or it might facilitate, scaffold, structure, or support new developments. The association may work toward shaping, designing, influencing, or even building new coalitions or new infrastructure that it might manage, run, or spin off. These new roles will be balanced on the bedrock of ARL's historic strengths in policy and advocacy, diversity and leadership, and statistics and assessment.

The rationale for this thinking is that if the research library shifts from its role as a knowledge service provider within the university to become a collaborative partner, then it becomes a more valuable knowledge and service partner for the university, which is becoming more distributed and more connected. And if we can change our thinking from libraries as single units serving an individual institution and more as a collective then they can take on other roles and other partners and have a much more profound impact on our environment.

ARL Strategic Framework 2015+

Out of this process emerged the ARL Strategic Framework 2015+, which contains the following vision and principles:

In 2033, the research library will have shifted from its role as a knowledge service provider within the university to become a collaborative partner within a rich and diverse learning and research ecosystem.

From Incremental Change to Systems of Action

The ARL Strategic Framework aims to take organizational roles to a more active level, facilitating work across institutional boundaries, enhancing impact, and improving efficiency by making ARL's resources work better for member institutions. ARL's engagement is not singular, but will be increasingly collaborative with other related organizations and stakeholders.

A key component of ARL's new approach involves catalyzing action within the broader context—or ecosystem—of higher education, through a "system of action". A SoA initiative is "made up of interrelated components that affect the way people do things. These components are also interdependent. In their forthcoming book, Seely Brown and Pendleton-Jullian explain that a change to one component affects the response of all the other components. And they are interactional, meaning that single actions or events can reverberate throughout the entire system. It may be easier to conceive of ARL's investments in the future as individual initiatives within discrete systems. However, each initiative affects different parts of the research library ecosystem in ways that are ultimately interrelated. Strategies to address the System of Action have a critical characteristic—they scale.

A System of Action affects the way people do things in order to close the gap between the current state and the imagined/goal state. A good example of a System of Action is El Sistema, a music education program started in Venezuela in 1975 by economist and musician José Antonio Abreu.[4] El Sistema started as one school that gave children a productive place to be every day, rather than on the streets. The program does not simply teach music, it forms orchestras, teaching children how to work together as a community. The system is credited with giving its members ambition and positively changing the communities in which it operates. El Sistema is a model of how a music program can both create great musicians and dramatically change the life trajectory of hundreds of thousands of a nation's neediest kids.[5]

So, the challenge of the new ARL framework is to develop system of action initiatives that impact the system in ways that create positive and profound progress to achieve the vision.

System of action initiatives will fall into one or more of five domain areas that were defined during the ST&D process. The domains for each initiative within the system of action reflect areas for collective action as well as areas for individual institutional attention. The scope of each domain area, outlined below, will be further refined and developed by ARL design teams over the summer of 2015:

Collective Collections: ARL will motivate the creation of deep and wide platforms for ensuring that knowledge resources are accessible and sustained through federated networks of print, digital, data, and artifactual repositories, created and managed by collectives of institutions in North America and beyond. In all cases, the work of supporting the most effective access, retention, and preservation will take place through a collective investment that respects and supports local interests, while leveraging collective collections. ARL's work will not only seek to guide the creation of governance, shared protocols, best practices, trusted relationships, and financial models, but will in some cases extend to convening parties to pursue the creation of new entities that conduct work in this space.

Scholarly Dissemination Engine: In order to promote wide-reaching and sustainable publication of research and scholarship, ARL libraries will mobilize efforts to achieve collaborative infrastructure and financial models for publishing. These efforts will ensure that the publications produced retain and enhance rigor and quality, embed a culture of rights sympathetic to the scholarly enterprise, and use financial models that are sustainable. These publishing efforts will

[4] http://www.elsistemausa.org/el-sistema-in-venezuela.htm

[5] Ibid

focus on the widespread and critical dissemination of scholarship as a permanent record of research institutions.

Libraries that Learn: ARL-organized enterprises will incubate the design, funding, and building of coalitions of libraries that make decisions through evidence-based investments enabling the creation of new concepts, theories, and operational designs in support of research and learning environments. These projects will seek to employ integrated analytical strategies that will mine data for guidance in transforming those environments.

ARL Academy: ARL will foster the development of an agile, diverse workforce and the inspiring leadership necessary to meet present and future challenges. Requisite expertise and skills will come from new as well as traditional domains, stimulating opportunity and challenging existing research library culture. Coordinated action within ARL will continue to focus on critically important diversity initiatives and leadership programs. To ensure the development of the talent and expertise necessary for future success, ARL will seek partners in establishing a formal, potentially credentialed curriculum for library professionals and for those new to libraries. ARL could further explore partnerships to develop agile research nodes or centers of excellence that would engage leading academic librarians and faculty to take on research and develop projects.

Innovation Lab: ARL will develop an Innovation Lab, an incubator for new ideas and the seeds of change. A fluid, multi- institutional enterprise, the Innovation Lab will take the form of coordinated, collective activity that supports principled opportunism regarding new developments. ARL, through its coordinating role, may secure new capital and use investment to spur innovation.

System of action initiatives can cut across a number of domain areas. Indeed, the overlaps are important as they encourage collaboration across silos of interest and activity. This paper will present the conceptual framework underlying this new approach and provide some examples of the kind of collaborations made possible for research libraries by this approach. System of action initiatives will be managed and actualized in the context of these broader domain areas to ensure appropriate organization support and resources are provided.

Essential Capacities

Cross cutting the topical areas, ARL also recognized that there are a number of important enduring and new capacities that are needed to be able to support system of action initiatives.

These essential capacities serve as the foundational elements that support ARL's future directions. The capacities reflect work that must be done in order for ARL to successfully implement current and new activities. The capacities are not stand-alone in scope and action. Rather, they will be considered and integrated into future initiatives.

The six essential capacities are:

Advocacy and Policy covers a wide and expanding range of activities that advance and promote research libraries and their growing portfolio of roles. While this capacity includes analysis of legal and legislative public policy issues, it also encompasses advocacy for issues of timely importance to the higher education community.

Assessment incorporates existing and new strategies that support ARL's work. Data will be collected that offer information and support decision-making (e.g., annual statistics). Processes for collecting and disseminating analytics and metrics will be created. Some ARL initiatives will include a research and development element that will be instituted in this capacity.

Communication and Marketing is an ongoing activity of ARL that will be strengthened. This capacity includes basic activities such as the ARL website and communications disseminated to ARL members and the larger community. Marketing will further fuel the organization's advocacy potential in new realms.

Issue Incubator recognizes ARL's role to surface trends and opportunities of importance to

research libraries, leveraging expertise and early intelligence of strategic partners, such as CNI and SPARC, as well as other organizations.

Membership is critical to the Association's success, and the roles that members play are likely to evolve over time as members set the direction of the organization. The scope and criteria for membership in ARL may change over time as the ecosystem of research continues to expand.

Partnerships, including higher education, library, and other scholarly and research organizations, play an important role in ARL's success achieving its goals. Partnerships will be developed based on the scope and parameters of initiatives. The ongoing development and nurturing of partnerships is a responsibility of all ARL members, the executive leadership, and staff.

Case Study: SHARE

One example of a system of action initiative is SHARE (SHared Access Research Ecosystem). SHARE was launched in 2014 by three higher education organizations in the United States: the Association of Research Libraries (ARL), Association of American Universities (AAU) and the Association of Public and Land-grant Universities (APLU).

The aim of SHARE is to develop the tools and workflows that will allow us to better track the wide array of research outputs. SHARE will collect, connect, and enhance scholarly metadata in the context of a single registry or index, and therefore simplify how various research activities and outputs—from journal articles, to research datasets, to data management plans and grant proposal information—can be identified as elements of a single research project, institution, or funder.

Unlike commercial services, such as SCOPUS and Science Citation Index, SHARE will aggregate the metadata from a wider range of sources and research outputs including journal articles but also datasets, software code and so on. In addition, it will connect information about these types of outputs to other information related to research data management, such as proposals, data management plans, researcher bios, and funder and institutional information. The SHARE index will be completely open allowing any user to mine and use the information for their own purposes.

By creating an open, comprehensive data set, SHARE will present opportunities for innovation in communication, visualization, and dissemination of information about research for the advancement of scholarship. As with El Sistema, SHARE has a short-term objective, but it is also anticipated that SHARE will have a more profound impact on the scholarly communication environment by advancing openness, and improving the discoverability and recognition of a wide range of research outputs have to date been ignored in our formal assessment and evaluation processes.

As with all system of action initiatives, SHARE is being developed with the issue of scale in mind. SHARE began initially by aggregating metadata from information providers in the United States and Canada, however, SHARE is expand and ultimately, the aim is to collect comprehensive metadata from major information providers from around the world.

SHARE is funded in part by a joint $1 million grant from the Institute of Museum and Library Services (IMLS) and the Alfred P. Sloan Foundation. SHARE has partnered with the Center for Open Science (COS), a non-profit technology company that provides free and open services to increase inclusivity and transparency of research, for infrastructure development.[6]

Conclusions

As stewards of some of the most significant repositories of the story of human civilization, library leaders are by the nature of their work sensitive to the long-term responsibilities that they carry: shepherding these carefully crafted institutions into the future while being mindful of their

[6] http://centerforopenscience.org/

crucial legacy. However, in an era of constant disequilibrium, libraries and their related associations need to develop new strategies in order to manage and adapt to these changes. Furthermore, libraries must be responsive, while also retaining their traditional roles serving as the long-term preservers of societies collective knowledge.

To that end, ARL is crafting and implementing a comprehensive program through which the association can go beyond incremental change toward more profound impact via system of action initiatives. Some initiatives, such as the SHared Access Research Ecosystem (SHARE), are already in play or in exploratory phases, and others will be identified and nurtured over the coming years.

The prologue to this process is completed—and given the nature of the process, the association is currently actively engaged in transforming itself into an instrument that can effectively, flexibly and with agility, be an agent of change. It wants to allow itself to try large and small scale collaborations, looking to effect the higher education ecosystem in positive ways. To act decisively, quickly and purposely to translate the symbolic legacy of the research library into the dynamic world of linked information technologies.

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