From bibliometrics to altmetrics: An Australian study

Jayshree Mamtora and Gaby Haddow

Abstract

Bibliometrics and altmetrics are increasingly important tools for researchers wishing to demonstrate the impact of their work. To a large degree, the interest in impact has come about through the growth of national research evaluation systems, such as the Excellence in Research for Australia (ERA). The introduction of the ERA was the impetus for Australian academic libraries to reconsider their services to researchers in order to assist their academic community in a research evaluation environment. This chapter reports on a nationwide study carried out to determine how academic libraries in Australia are promoting bibliometrics and altmetrics, and the services they are offering to researchers relating to these measures. A content analysis of all Australian university library websites was performed to determine the extent and types of bibliometric and altmetrics tools being promoted, the nature of supporting materials that explain and discuss their use, and the implementation of these measures in institutional repositories. The findings show that Australian university libraries are committed to providing support to their research communities in the area of research impact. The majority have developed dedicated research impact pages, provided descriptive information about how bibliometrics indicators work, and more than 75% offer a research impact consultation service. All 39 universities have established an institutional repository with more than half of these having the capability to provide metrics for publication records. Finally, the research results suggest that academic libraries consider a number of recommendations for best practice to support researchers in a research evaluation environment.

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 has 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 a measure of a journal and not the articles published in a journal. The argument in this regard relates to assessing the quality of research outputs (e.g. journal articles) being judged by the channel in which it is 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 Australia in 2010, known as the Excellence in Research for Australia (ERA), that created a more urgent need for bibliometrics-related services. The ERA also brought with it an interest in the societal impact of research, and this coincided with increased use of social media tools, such as micro/blogs, by researchers to disseminate their work. Coinciding with the wider use of social media,

a new way of measuring impact, known as altmetrics or alternative metrics, emerged. Altmetrics are based on article level data and are defined as the "study of new metrics based on the social web for analyzing and informing scholarship" (http://altmetrics.org/about/). These metrics include data (DOIs, mentions and links) from a number of different sources such as Twitter, Facebook, blogs, academic networks (Barnes, 2015). 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. 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 (p. 901) recommends their use as a complement to traditional metrics and the peer review process, rather than as a replacement. In their examination of the presence of altmetrics for journal articles, Zahedi et al. (2014, p. 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 UK, and a report by the Higher Education Funding Council for England (HEFCE) to be released in July 2015, endorses Bornmann's recommendation that altmetrics are used as a complement to the 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; Corrall, Kennan & Afzal, 2013; Haddow, 2012). In the survey carried out by Corrall et al. (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 10 years ago the Federal Government took the initiative to fund the establishment of institutional repositories (Mamtora et al., 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 . . ." (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 has 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.

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 was 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.

A coding sheet for data collection was developed and separately tested 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 web pages, including the universities' 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 data recorded was a yes or no. For criteria relating to extent, the data recorded was limited or good. These data required judgements 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. 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.

Promotion

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 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.
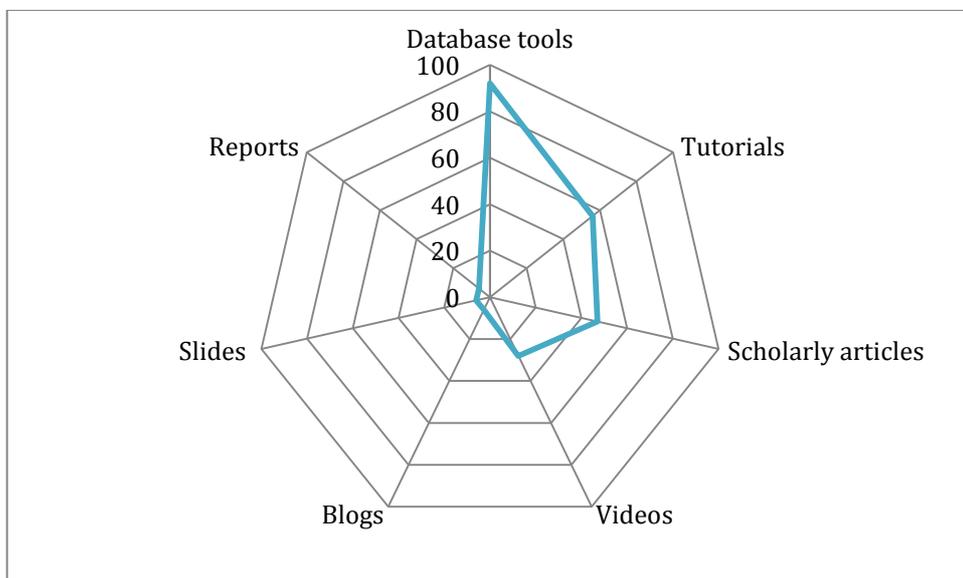
Extent of information about bibliometric indicators

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 SCImago Journal Rank (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 providing only 'limited' information.

The analysis looked for the existence of background information to the bibliometric indicators discussed on the 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 MyRI (Measuring *your* Research Impact) tutorial – an open access toolkit developed by a consortium of Irish universities to support bibliometrics awareness and training. Scholarly articles were provided as background information by 17 libraries (47%) and embedded videos by 10 libraries (28%). There were two instances each (6%) of blogs, downloadable PDF reports and slide presentations.

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

Extent of information about altmetric indicators

Altmetrics are a new and emerging area, and the results of this study indicate that Australian universities 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.

Services

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

Of the 36 libraries with research impact information, 31 (86%) provided details of research impact measures on their web site. 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.

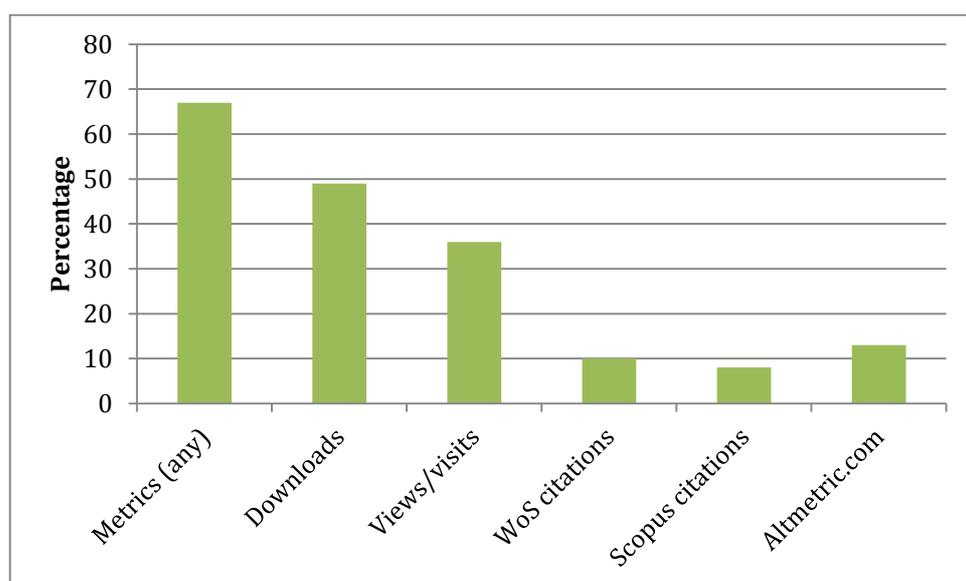Figure 2. Research Impact Information and Services (n=36)
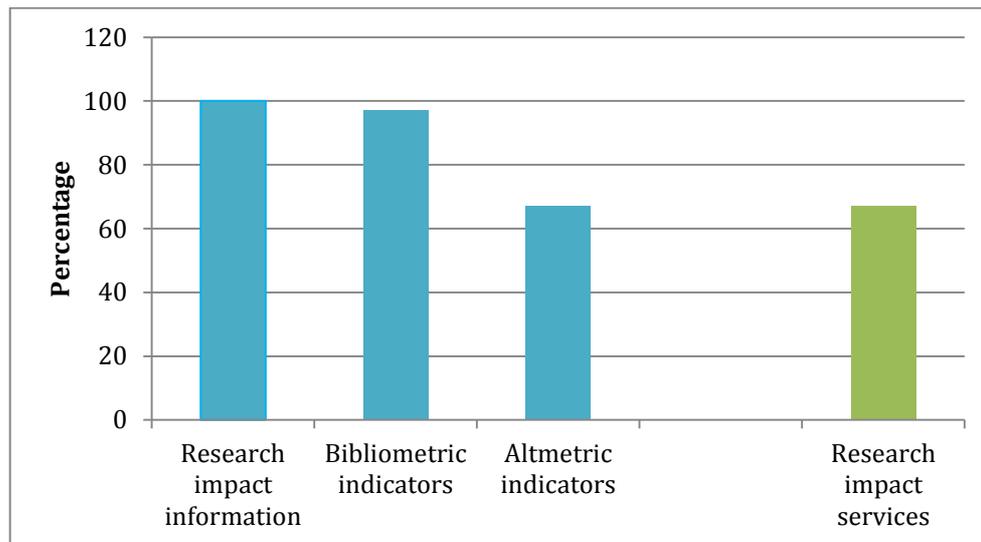
Use

In addition to identifying information about the use of bibliometric and altmetrics tools to measure research impact, the researchers examined the use of metrics, such as abstract views and downloads of full text content, that can be available in 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 confirms 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. Data relating to visits or views was available in 22 (85%) of the 26 repositories, download data was provided by 19 (73%) repositories, 5 (19%) provided data from altmetric.com, and 4 (15%) repositories incorporated citations data from subscribed databases in relation to publications.

Figure 3. Institutional Repository Metrics (n=39)

Discussion

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 altmetrics 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 et al. (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 impact 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 (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 altmetrics 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 are 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 qualitative study which will be carried out by the researchers. This study will involve a survey of academic librarians at the 39 universities 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

This study examined the extent and depth of research impact promotion, services and use to determine which aspects of research impact were being delivered to support researchers at Australian university libraries. 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 et al. (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.

References

ACRL Research Planning and Review Committee. 2014. Top trends in academic libraries: a review of the trends and issues affecting academic libraries in higher education. College & Research Libraries News 75(6), 294-302. [Online]. Available: http://crln.acrl.org/content/75/6/294.full. [Accessed 24 May 2015].

Altmetrics: about. [Online]. Available: http://altmetrics.org/about/. [Accessed 7 May 2015].

Auckland, M., 2012. Re-skilling for research: an investigation into the role and skills of subject and liaison librarians required to effectively support the evolving

information needs of researchers. Conducted for Research Libraries UK by Mary Auckland. [Online]. Available: http://www.rluk.ac.uk/wp-content/uploads/2014/02/RLUK-Re-skilling.pdf. [Accessed 24 May 2015].

Barnes, C., 2015. The use of altmetrics as a tool for measuring research impact. *Australian Academic & Research Libraries*, 46(2), 121–134.

Bornmann, L., 2014. Do altmetrics point to the broader impact of research? An overview of benefits and disadvantages of altmetrics. *Journal of Informetrics* 4, 895–903.

Cameron, B.D., 2005. Trends in the usage of ISI bibliometric data: uses, abuses, and implications. *Portal: Libraries and the Academy*, 5(1), 105–125.

Corrall, S., Kennan, M. and Afzal, W., 2013. Bibliometrics and research data management services: emerging trends in library support for research. *Library Trends*, 61(3), 636–674.

Department of Industry, Innovation, Science, Research, and Tertiary Education, 2010. Australian Scheme for Higher Education Repositories (ASHER) and the Implementation Assistance Program (IAP). [Online]. Available: http://www.industry.gov.au/science/ResearchInfrastructure/Pages/ASHERandIAP.aspx. [Accessed 7 May 2015].

Haddow, G., 2012, Research support in a research assessment environment: the experience of "new" universities. *Library and Information Research*, 36(113), 63–73.

Konkiel, S., 2015. What could altmetrics add to the REF exercise? [Online]. Available: http://www.altmetric.com/blog/altmetrics-and-ref/.
[Accessed 29 May 2015].

Mamtora, J., Yang, T. and Singh, D., 2015. Open access repositories in the Asia–Oceania region: experiences and guidelines from three academic institutions, *IFLA Journal* 41(2), 162–176.

Nicholas, D. and Ritchie, M., 1978. Literature and bibliometrics. London: Clive Bingley.

Universities Australia, 2014. *University profiles, 21 Jan 2014.* [Online]. Available: https://www.universitiesaustralia.edu.au/australias-universities/university-profiles - .VWAStWafwng. [Accessed 10 April 2015].

Zahedi, Z., Costas, R. and Wouters, P., 2014. How well developed are altmetrics? A cross-disciplinary analysis of the presence of 'alternative metrics' in scientific publications, *Scientometrics*, 101, 1491–1513.

Authors

Ms MAMTORA, Jayshree (Charles Darwin University)
<jayshree.mamtora@cdu.edu.au>

Jayshree Mamtora is the Research Services Coordinator at Charles Darwin University Library. Her research interests include bibliometrics, altmetrics, social media and open access. Jayshree is also the NT ALIA (Australia Library and Information Association) Manager, and a member of the IFLA Regional Standing Committee on Asia and Oceania.

Dr HADDOW, Gaby (Curtin University) <g.haddow@curtin.edu.au>

Gaby Haddow is a Senior Lecturer at Curtin University, teaching in the areas of research methods and information literacy. Her research interests include bibliometrics and research assessment, and the communication of research to practice. Gaby is a Co-editor of the journal, Australian Academic & Research Libraries.