

# Informing decision-making in libraries: Informetric research as input to LIS education and practice

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Informing decision-making in libraries: Informetric research as input to LIS education and practice .....	1
Abstract.....	2
Introduction .....	3
Informetrics: What is it? .....	3
Literature Dynamics of Informetrics vis-à-vis LIS.....	4
Method.....	4
Results .....	4
Informetrics in Australia.....	4
The BIRG Research Program at UNSW .....	5
Research Challenges in LIS.....	6
Research useful to issues in Library Service and Management.....	6
Research useful to understanding Communities of Users .....	9
Research useful to understanding Values, Resource Provision and Neutrality .....	9
Research on Theoretical Foundations of Informetrics.....	11
Addressing the Research Challenge: Where do we go from here?.....	12
Conclusion.....	13
Acknowledgements .....	14

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## ***Abstract***

Findings from informetric research represent an important background resource to add to the mix of information useful for resolving difficult and ongoing problems in specific library environments or information service settings. This paper provides examples of informetric research that can be useful input to decision-making in the field of library management and information service provision. This overview takes four of the challenges that Michael Buckland outlined for Library Research as a way of guiding the discussion of ways that informetric work can be used to inform library decision-making.<sup>1</sup> References are made to relevant informetric work undertaken or conducted in Australia, by Australian researchers, or with Australian data.

Informetrics includes both quantitative and qualitative methods, which when used in combination can provide a rounded set of findings that has great validity for management, policy and service applications. Quantitative methodologies are generally based on bibliometric techniques, such as mining and analysis of data from various bibliographic and textual databases; qualitative methods include survey, case study and historical approaches. Used in combination, each set of findings adds richness and other perspectives to an analysis.

## **Introduction**

In his article about the challenges for library research, Michael Buckland emphasises the importance of gaining deeper understanding of important, but inadequately understood, phenomena that might improve library service, theory, design, or values, or for library communities that require and use information.<sup>2</sup> This paper addresses the way informetric research has contributed to several of these challenges, particularly to issues in provision of library service, theory of informetrics; and to understanding more about communities, first readers and library users, and second, communities of researchers, authors and their publishers, who read, create and use the specialist and scholarly literatures.

## **Informetrics: What is it?**

Informetric research is one of the fields that focus on understanding how specialists (i.e. communities of interest) build the discourse pertaining to specific communities through use of language, through writings and through specific communication channels, both formal and informal. The examination of the formal channels of communication among scholarly communities provides insights into what is read and used, and into reader preferences and choices in printed (journals, books and monographs) and electronic media, (databases, and through Internet sites). Such research identifies the range of journals that cover certain topics or fields and describes the boundaries of specific literatures and domain-based literatures (albeit at a certain point in time). Informetric work of this kind can begin to provide answers to such complex questions as: how and why specialties arise, expand and wither, and where the boundaries of fields intersect with that of other fields or disciplines. Understanding the use of materials within various scholarly communities, what is core, and what is peripheral, the extent of or limits to use of informational materials, is important input for collection management in an era of budget and storage constraints and its corollary, selective and targeted collection development.

The term informetrics has come into greater prominence and usage over time from its earliest usage in the 1970s.<sup>3</sup> It is now mainly used as a generic term that covers all quantifiable aspects of information science and includes bibliometrics, scientometrics and citation analysis, as well as aspects of related fields with which it exchanges information, such as, information retrieval theory and scholarly communication studies. For this paper, informetrics is taken in its broadest meaning – to encompass the measurement of information, from its scientific production, publication, its use, and networks of scholarly communication. The following section illustrates the strong connection between informetric research and library-related applied research by the bibliometric analysis of the literature described below.

### ***Literature Dynamics of Informetrics vis-à-vis LIS***

To illustrate the interplay between informetrics and LIS, we conducted a search of the three citation databases of the Institute of Scientific Information (*Science Citation Index*, *Social Science Citation Databases* and *Arts and Humanities Citation Index*). The result of this small bibliometric analysis provides a view of the growth of the literature of informetrics vis-à-vis the broad aspect of Library and Information Science (LIS).

### ***Method***

The Dialog search set for informetrics is: “bibliometr? OR informetr? OR scientometr? OR citation (3n) analys? OR webometric? OR netometr?”, while that for broad aspects of LIS is: “librar? OR (digital (3n) collection?) OR (core (3n) journal? OR serial?) OR (journal (3n) evaluation?) OR (journal? OR serial? (3n) acquisition?)”. The two sets were intersected and duplicates removed. The final set yielded 1343 documents when the search was done in early September 2004. An update a year later added 45 more documents for 2004 – a total of 1388. The Dialog ranking algorithm was used and Figures 1-3 were produced to show yearly productivity, journal ranking, and country ranking; the Zipf form of display (in log-log) was used to illustrate the hyperbolic distribution of journals (Figure 2) and countries (Figure 3). Only Figure 1 (yearly productivity) has been updated to show the distribution of the 1388 documents from 1973 to 2004, inclusive.

### ***Results***

The number of publications (Figure 1) shows a general upward trend with a peak of 105 documents in 2004 when the search was updated in September 2005. Not surprisingly, the journal *Scientometrics* has the most number (264) of papers (Figure 2); *Scientometrics* is the only journal totally devoted to publishing documents “concerned with the quantitative features and characteristics of science”. The journal’s subtitle is “an international journal for all quantitative aspects of the science of science, communication in science and science policy”. However, there are a number of LIS journals with more than 10 documents, e.g. *Journal of the American Society for Information Science & Technology*, *Journal of Information Science*, *Journal of the Medical Library Association*, *Information Processing & Management*, *Journal of Documentation*, *Library & Information Science Research*, *College & Research Libraries* and *Libri*. Excluding the USA with 531 publications, Australia (37) is among the top ten productive countries; 10 (27%) of the documents, with at least one author from Australia, are from the University of New South Wales.

### **Informetrics in Australia**

There are a number of informetrics researchers working in various universities around Australia. In general, these centres of informetric research are small and each has a distinct research

profile. At the Australian National University in Canberra, the Research Evaluation and Policy Project (REPP) has been conducting research since the early 1990s with a focus on analysis of Australia's scientific performance and the organisational structure of Australia's research landscape.<sup>4</sup> This group uses the classic scientometric and bibliometric methods but also combined with frameworks, methods and ideas from the sociology of science. Another group at the University of Wollongong examined the performance of Australia's Cooperative Research Centres in a project titled 'Qualitative and Quantitative Outcomes of the Cooperative Research Centres Program'. In the 1990s, Wollongong University's Centre for Research Policy and Innovation Studies did considerable work on the role of journals in Australia's research productivity.<sup>5</sup> Other groups using scientometric methodology are situated in the University of New England, Centre for Higher Education Management. Much of the work in Australia is directed to science policy and research management issues related to funding and government planning.<sup>6</sup> Much of this work is also informative for library services policy work.

Up to the time of writing, no Australian university has courses that teach informetric methodologies. In 2001, UNSW introduced a course in the School of Information Systems, Technology and Management (SISTM) that was taught only for one semester.<sup>7</sup> The course was dropped in subsequent years because of insufficient enrolments to justify its continuity on economic grounds. However, within SISTM there is an active research group, BIRG, that hosts seminars, supervises research students and conducts various projects using informetrics as its principal methodological stance. At UNSW, the BIRG research strategy and agenda was based on the capacities, interests and experience of current staff in information management to supervise research students within certain frameworks and topics.<sup>8</sup> To promote this plan, a formal research group, Bibliometric and Informetric Research Group (BIRG) was established in 1998 where both staff and students could develop critical research expertise in the fields of informetrics, bibliometrics and scientometrics. This has allowed a research culture to evolve over time and to have students participate in regular seminars and meetings as an integral part of the group.

#### ***The BIRG Research Program at UNSW***

BIRG research strategy identifies specific thematic strands in which to concentrate its effort, and on which to plan a range of projects.<sup>9</sup> Most of the work of both academic staff and our research students has been accommodated within the major themes. BIRG's research includes investigations on the nature and characteristics of scientific research particularly research collaboration and its effects on institutional or group performance, scholarly publication activity specifically among institutions and national groups or communities, author characteristics and research careers of elite research groups. Other themes that are pursued relate to the use of scientific literatures and include investigations on core and periphery literature and publishing

in disciplines and designated research fields, journal characteristics and their impact, including journal citation impact and its relation to measured and perceived journal quality, and the use of web information, its flow and influence in research fields. A thread running through research undertaken is the mapping of growth, structure and composition of large domains, and how disciplines, specialties, or fields fit or overlap with them. These themes also allow for examination of the complex structures required for multidisciplinary and interdisciplinary projects. Underlying all the work is a continued interest in the history and foundations of bibliometrics and informetrics, and the nature of informetric laws to describe and define systematic regularities.

### ***Research Challenges in LIS***

This paper attempts to illustrate instances where Australian informetric research has provided new insights into important, but inadequately understood, phenomena that are relevant to issues in librarianship. Michael Buckland identified a number of challenges for library and information science research that are worth examining.<sup>10</sup> Only four of these challenges are highlighted in the discussion that follows.

- ◆ Library Service – making library service more meaningful
- ◆ Library Communities – how communities' usage patterns differ
- ◆ Library Values – resource provision and neutrality
- ◆ Library Theory – who knew what, when

The issue of Library Design is not addressed because this matter is less amenable to informetric techniques. The question as Buckland puts it (Have digital libraries been designed backwards?) is nevertheless of great interest and should be pursued in other research contexts.

Australian librarians and others over many decades have been conducting research that is helpful in gaining a broad picture of what people want from libraries, what they use, the journals they select for publishing – in short, what has been found to be meaningful to individuals and for specific library user groups. Informetrics more specifically has provided deeper understandings about user communities, the boundaries of specific fields, and characteristics of Australian academic performance in a variety of fields. For this paper, we use examples of Australian informetric work to illustrate how such research might give insights for library service provision in Australia.

### **Research useful to issues in Library Service and Management**

Among the more difficult problems for libraries today is the need for tight fiscal management, particularly in research resources such as academic and scholarly journals. Decisions relating to which journals to acquire and which titles to cancel, whether to purchase print as well as electronic access, how to deal with the bundled suites of journals offered by publishers, are all

issues critical to fiscal management of university collections. Journals have been rising in cost for over 20 years and library budgets are continually under constraints in their ability to purchase new materials. Thus, library managers need objective information on which to base collection development decisions.

Informetric research has been shown to assist in decision-making relating to the selection and provision of adequate periodical services libraries. In reviewing policies on acquisitions at Monash University,<sup>11</sup> a formula was applied to questions of budget allocation based on weighted factors for a range of quantitative data e.g. student numbers weighted by level, academic staff numbers, cost of resources, and library circulation. Linda Butler examined factors that influence Australian researchers' judgements about journals chosen to submit their work<sup>12</sup>. She found researchers less likely to include journals that were only highly ranked for a short period, and that they favoured longer established titles more than recently established ones. UQ Library obtained a rather similar result during a journal cancellation exercise in 1999. Great care was taken to annotate lists sent to Schools and Departments highlighting journals that, according to ISI data, were considered to be top-ranking titles in the field. UQ Library also indicated a reluctance to cancel these top-ranking titles. Contrary to expectations, it was found that academic staff did *not* always consider the designated core titles to be essential to their research, and they were keen to preserve subscriptions other than those ranked highly by ISI. Butler's study and the informal (unpublished) results of UQ's deselection exercise have salience for library decision-makers; both expert evaluations together with other objective statistics such as ISI impact factors need to be considered rather than relying only on one source of information.

Because the journal literature devours more of a library's budget in academic libraries than other resources, critical questions relate to decisions to acquire or to cancel certain journals and to satisfying the needs of all constituencies that use a library including competing user groups. Informetric research provides findings at a deep level that will inform with objective and reliable data which of the Faustian choices (e.g. buy, print or online, cancel, off-site storage) will be the more advantageous for the user community. However, if managers are asked to cut dollars of any magnitude from the library budget by the end of the month or financial year, informetric research will not necessarily be of immediate help.

Anecdotal evidence suggests that libraries have great difficulty in keeping up with research interests and changes in fields where a multi- or inter-disciplinary focus is important. In the UQ exercise above, although School X was often able to identify titles in which it was no longer interested and was quite content to cancel, School Y protested vigorously that these titles were essential for their research. No doubt informetric analysis could have confirmed such changes in the focus of the journals in question or in the research priorities of fields in which the academic staff were engaged. Many informetric studies focus narrowly on specific specialties or

single disciplines, whereas libraries often have to provide resources for a multidisciplinary community and thus need to cover a broad range of materials.

Studies of journal usage and identifying high impact journals in the humanities are particularly challenging. ISI has long realised that the methodologies used to rank journals in the sciences and social sciences are poorly adapted to the arts and humanities. A criticism often levelled at informetric work is that analyses of literature are narrow with focus on small specialties that, although of interest, need to be repeated from time to time, particularly as fields shift focus and change. The point to make here is that findings from informetric studies are time specific; studies need replicating to provide updated data. There is no quick fix to gaining all the relevant data for decision-making and policy development; these activities require patience to accumulate evidence and to synthesise. Managers need to build their strategies on good experience and expert advice, judicious use of research results, and attention to client needs.

Citation analyses of journal literature have long been shown to provide information that is useful in assessing actual and potential journal use among heterogeneous clientele.<sup>13</sup> Nisonger, in his monograph *Management of Serials in Libraries*, devotes a chapter to discussing the application of citation analysis to serials collection management.<sup>14</sup> Citation data from tools like the ISI citation indexes and *Journal Citation Reports* can inform collection management decisions because the data are scientists' cumulative use (via citations) of specific articles. Bibliometric research is able to pinpoint lists of core journals by identifying those journals most frequently cited. Citation analyses provide objective data about which fields cite a specific journal, how frequently its articles are cited, as well as providing a list of other journal titles in which its articles are currently cited. Such citation work sheds light on usage and prestige of current journal holdings;<sup>15</sup> by linking citation data on holdings to survey data on readership requirements and citing practice, studies can assist with identifying where a collection might be weeded with least detriment to users, and which new titles might augment the relevance of the journal holdings.<sup>16</sup> Some studies have used combinations of factors for deselection, such as ISI impact factors, ISI cited half-life, frequency of citation, linked to journal coverage in A&I services, language, and local usage and requests.<sup>17</sup> The results of such studies are often augmented by data from surveys or discussions with users, for example with specialist communities, scientists, or faculty members.

Recent studies to identify relevant resource material in Web environments have employed a range of new metrics and modified bibliometric methods.<sup>18</sup> Such studies seek to identify new web-based resources relevant to specific topics and to reveal 'deep' relationships among web sites that enhance relevance.<sup>19</sup> Others are using web logs as sources of information to reveal distribution levels of articles in electronic journals and their use.<sup>20</sup> Data derived from web logs for this purpose is becoming more reliable. The adoption by an increasing number of publishers of the COUNTER (Counting Online Usage of Networked Electronic Resources)

program, has been welcomed by library managers. While UQ has been assessing web logs for at least five years, the data has been found to be inconsistent and incompatible when comparing sets of data produced by different vendors.

### **Research useful to understanding Communities of Users**

Defining communities of interest for library service is an important element in effective management of library service. Informetric research methodology is a useful tool for examining current as well as past trends in usage of journals in publications via the citing patterns of specific fields or within institutions. Bibliometric data of journal usage is deemed to be objective because it is gathered unobtrusively without recourse to the subjectivism of individual opinion statements. Survey methods rely on subjective personal assessments to measure usage and needs of library users/patrons. When both methods are used together in examinations of journal usage, each method validates and strengthens the findings.

Research done by BIRG members has taken both methods separately and in combination to investigate the use of journals and other resources in the field of Australian ophthalmology,<sup>21</sup> clinical neurology,<sup>22</sup> and of people with chronic illness<sup>23</sup> to mention some recently published work. Useful data on the characteristics of user communities are another outcome of informetric work, for example, work such as that by Royle and Over on research productivity of Australian academics,<sup>24</sup> and of psychologists' access to and use of information.<sup>25</sup>

Staff and student journal use and reading patterns is the focus of a study by the University of New South Wales (UNSW) in association with Carol Tenopir of the University of Tennessee.<sup>26</sup> A linked survey was also undertaken by University of Queensland in early 2005. Findings of the two studies will provide useful comparisons between readership patterns and preferences in two Australian university sites with those in the United States and other countries. BIRG members are also currently investigating the 2003 DEST C1 publications by UNSW researchers to see, *inter alia*, where UNSW researchers publish and what they cite in their publications. This study will give novel comparative information about journals that researchers publish in and the source journals that they reference in their publications. The results will be correlated with the qualitative results from the 'Tenopir survey' and provide another measure of the use of library resources (especially print and/or electronic journals) and indications on the extent to which the library is providing adequate resources and service to its researchers.

### **Research useful to understanding Values, Resource Provision and Neutrality**

Akin to library management and user communities, this area is a separate issue connected to the matter of neutrality in libraries. It is questionable how far libraries can be neutral when neutrality may well be modified by externalities of political pressure, funding bodies, or by the

implicit purposes of the institutions which libraries serve. Institutional decision-making relating to agenda restructuring and direction is not neutral but is driven by perceived institutional advantage, by economics and market forces, and, to some extent by political conditions and government policy. In research libraries, neutrality is heightened by a commitment to open inquiry and the necessity for researchers to have full access to the literature. Despite valuing neutrality, research library collections cannot remain static but must adapt periodically to accommodate changing institutional conditions, shifts in disciplinary structures and user demand. Over time, library acquisition programs require small and large adjustments to the mix for tailoring resources to current requirements.<sup>4</sup>

Disciplinary boundaries are continually being modified by practice, as well as by technological and research developments. Such changes can be based on (appropriate) objective and relevant information. Up-to-date data on the changes in knowledge formation are necessary for decision-making, given the increasing interdisciplinarity of research, and the formation of large domains of knowledge where many fields, specialties and disciplines interconnect and overlap. The nature and scope of knowledge domains, and of specific fields can be identified through various informetric methods. Studies that describe core and peripheral journals in subject areas or topics can be used to monitor current library holdings through comparisons of core titles with current listings of frequently used resources. Changes to the pool of frequently cited materials can be tracked; changes in focus of users' requirements can be discovered through data mining of library statistics and other forms of aggregate data, such as web logs on use of electronic journals for example, inter-library loans, or use of external A&I databases. For example, UQ Library has been tracking usage of its e-journals since 1998.

Australian research on investigations of domains of knowledge, such as the study on the development of gerontology discipline,<sup>27</sup> scholarly development of strategic management,<sup>28</sup> or the field of family therapy,<sup>29</sup> provide quantitative data on the role journals play in the evolution of disciplines, and the shifts in content and focus over time. Studies on the domain of the vision sciences show Australia's role in the hierarchy of the world literature in the fields of optics and ophthalmology.<sup>30</sup> The extent and content of cancer research in Australia is documented by Wilson.<sup>31</sup> Work into the structure and dynamics of the field of consciousness is still ongoing;<sup>32</sup> other work on journal citation impact in the field of clinical neurology has been extensively examined.<sup>33</sup>

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<sup>4</sup> We have all heard anecdotally of examples where university or research libraries have had to drastically modify collections by the introduction of new programs (expansion) or of the discontinuation of specific areas of study (truncation) for whatever reason.

## Research on Theoretical Foundations of Informetrics

A paper on the foundation, history and future of bibliometrics by Wilson shows three stages in the development of bibliometrics models (Figure 4).<sup>34</sup> ‘Classical Bibliometrics’ in Stage I includes some of the BIRG contributions in the sections on *User Communities* and *Field and Domain Structures*. Research done in Stage I looks at various bibliographic fields (e.g. author, publication year, journal name, title words, institutional addresses) to gauge, for example, collaboration between institutions, authors, output of subject domains over time, concentration of subjects in journals, etc.

Stage II, Citation Analysis, includes most of the remaining research undertaken by BIRG members or research-in-progress. Citation analysis uses the references from and citations to documents to measure, inter alia, the influence or importance of documents, authors, institutions and journals. Citation counts are used as measures of e.g. obsolescence of journals, transfer of information between countries, institutions and journals. Joint citations or cocitation of documents, authors and journals help delineate the development of subject domains, provide network structures of authors, etc. Besides Yue and Wilson’s 2004 study on citation impact,<sup>35</sup> there was also an attempt by Yue, Wilson and Rousseau to understand the relationship between two ISI derived journal measures: the Immediacy Index (II) and the Impact Factor (IF).<sup>36</sup> The study concluded that in almost all disciplines, the two journal measures are highly correlated and therefore the Immediacy Index can predict (and substitute for) the Impact Factor. The first author, Weiping Yue has just completed her PhD dissertation on the citation impact of clinical neurology journals using structural equation modelling with partial least squares.<sup>37</sup>

The work by Orsatti and Wilson looked at citation behaviour and explores the relationship between the Gini Index of concentration and the inverted citee-citation ratio.<sup>38</sup> A follow-up paper combined sociological and informetric theories of citation to help explain variations in citation behaviour.<sup>39</sup> The first author is pursuing both themes in the subject domain of Consciousness for her research master’s thesis. Her work grades into Stage III of the developmental model of Informetrics, that of ‘Full-text Analysis’ using a variety of software for content analysis.

As Wilson states, Stage III Informetrics “... will increasingly interact with additional fields from other lineages which have their own special tasks in the study of ‘full text’. Those most like Informetrics in performing quantitative analyses of specifically interpreted classes of symbol strings include: Content and Coverage Analysis (with a Communication and Media Studies lineage), Statistical/Quantitative Linguistics (with a Linguistics lineage), and Stylometrics (with a Literary Analysis lineage)”. Stage III work currently underway at UNSW concerns a cocitation analysis of journals in Information Systems, cocitation analysis of authors in Australian ophthalmology, and cocitation analysis of documents in the global subject area of

ophthalmology. Another stream of research is using content analysis for handbook descriptions and newspaper ads to study, the changing facets of LIS education in Australia.

The extent of new directions in Stage III Informetrics points to the involvement of yet other fields such as Syntactics, Discourse Analysis, Computational Lexicography, Knowledge Management, Software Metrics, and Rhetoric. As Wilson notes "... the notion of text can also be broadened. It is hard to avoid wondering how Informetrics, and more generally Information Science, will adjust to the new neighbours. Will we see the gradual development of some integrated science of text, and more particularly, of a science of public knowledge?"<sup>40</sup>

### ***Addressing the Research Challenge: Where do we go from here?***

In 1995, Warning and Emerson highlighted the potential of cocitation analysis and bibliometric techniques for collaborative research between academics and librarians.<sup>41</sup> Yet, progress generally has been slow and often research done within large library systems remains internal rather than reaching a wider audience through formal publication. However, signs of change are emerging. A new emphasis on active participation in research by the library systems in Australia is beginning. ALIA has been discussing how to stimulate research through its Research Committee and has established a forum for discussion with its REAP service. La Trobe University Library, through its Library Research & Development Committee (LRDC), has promoted critical thinking for many years about library services and procedures and has actively funded investigations since 1989.<sup>42</sup> LRDC has a policy of actively encouraging library staff to undertake research and publication and its web site shows the work already achieved. In 2004, RMIT University Library is setting up a program to encourage staff to write conference papers and journal articles, and to support any staff member engaged in research activities. Another initiative is at the UNSW Library through its Online Services Department. In 2003 a regular series of "ad hoc" public seminars was introduced to explore innovations and practices being developed and employed by members of the UNSW community.<sup>43</sup> Many of the topics discussed are library related, for example, on copyright law; privacy, rights and obligations; information literacy; information, communication and technology training; and most recently, a review of papers given at the 2004 Australian Library and Information Association (ALIA). Informetric research approaches are used for planning at the University of Queensland Library. Library practitioners are certainly interested in all aspect of informetrics. The rapid changes in publication, including the continually changing e-environment; the different patterns of use, both in the way students learn and how researchers are informed and kept up-to-date, and the increasing interdisciplinarity of research and the scholarly networks consequently formed, are all trends that need to be constantly monitored by libraries. Libraries certainly draw upon log analysis of the use of their different web-based services, and products such as *Web of*

*Knowledge* and *Journal Citation Reports* (JCR) to assist in making informed decisions about core journals to acquire - and for that matter quarantine from cancellation, and to identify those journal titles that receive little if any use and may be candidates for cancellation. New purchase decisions are also informed by document delivery or interlibrary loan data.

## **Conclusion**

The paper has illustrated with Australian research examples how informetrics, as a methodology, can feed into useful answers and understandings for the management of library service. Informetric research applied to problems in the field of library and information services is increasing worldwide, particularly to the evaluation of journals and for journal collection planning and management. New areas of informetric research applied to problems of creation and management of digital library services and for identification of resources in the Internet. The graphs showing the increasing use of quantitative informetric methodology are based on data from ISI-selected journals. However, if it were possible to collate all LIS and other journals that publish informetric research relevant to library applications, planning or management, the evidence would be far stronger. Although many of the studies are not conducted with a library or management perspective, the informetric research we have identified has applicability and relevance to LIS problems, particularly at specific field or discipline levels. Indeed, researchers from diverse backgrounds have come to use informetric methods as a way of elucidating the structure of fields and of identifying where the literature of their field is to be found. Such studies show that fields are becoming interdisciplinary in scope and that the literature pertaining to their field is spread across a wide range of journals. There are real synergies to be gained from libraries participating in research projects with academic colleagues within the faculties. For example, librarians could learn from research colleagues with more extensive experience in research methods and writing, while demonstrating and sharing their knowledge of information sources, skills in retrieval, bibliographical database searching and other relevant bibliographic techniques.

Australia's contribution to the informetric (including bibliometric and scientometric) literature is also showing strong growth. Contributions come from the related fields of information management, information systems and computer science, but also from other disciplines, such as education, policy studies, and medical and allied health fields. To get full benefit from informetric research for LIS applications, the methodology needs to be taught in research course components to students taking information-related degree programs. Australian libraries are beginning to attend to their research needs by encouraging participation among their own staff. In addition, ALIA is adding its professional voice to encourage research within the profession. It is important for library managers to look more broadly for relevant research on which to build evidence for decisions. Beyond the library-related literature, there is much

relevant work undertaken from the viewpoint of disciplines and discourses, in areas of communication and searching behaviour, and about the nature of communities of readers, authors and researchers. Findings from many studies could well provide relevant but different input to solutions or problems in library management, service provision, and collection development.

### ***Acknowledgements***

This is a revised and extended version of a paper originally presented at the Queensland University of Technology “Research Applications in Information and Library Studies Seminar”, 20 September 2004.<sup>44</sup> The work now includes new text and other comments by Anne Horn who was the Respondent at the RAILS Seminar presentation.

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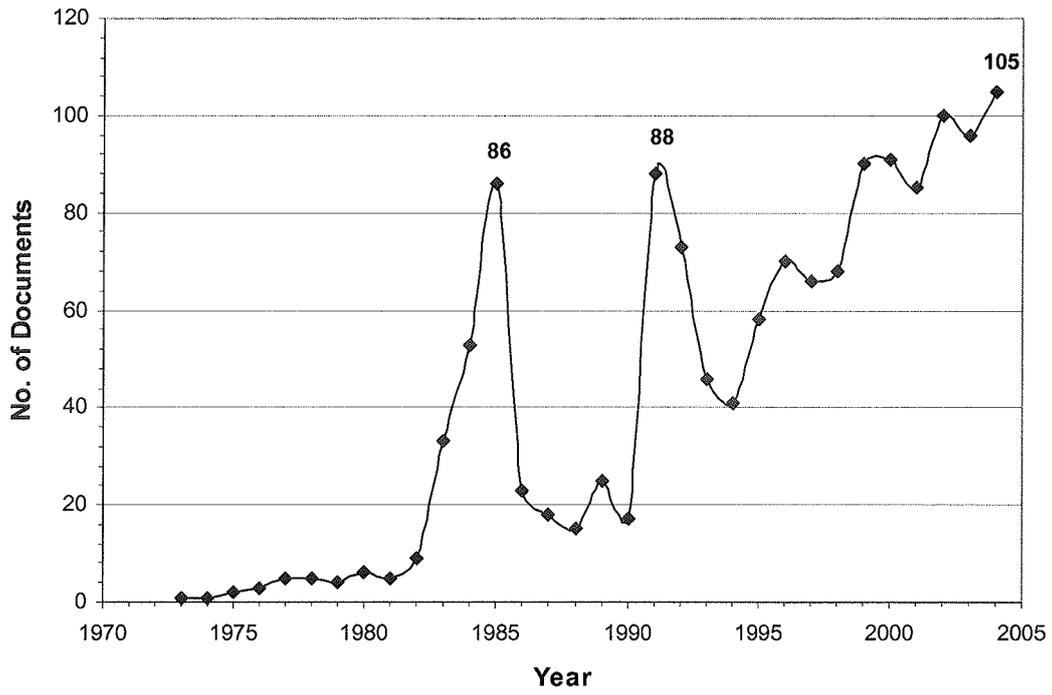


Figure 1. Yearly Productivity

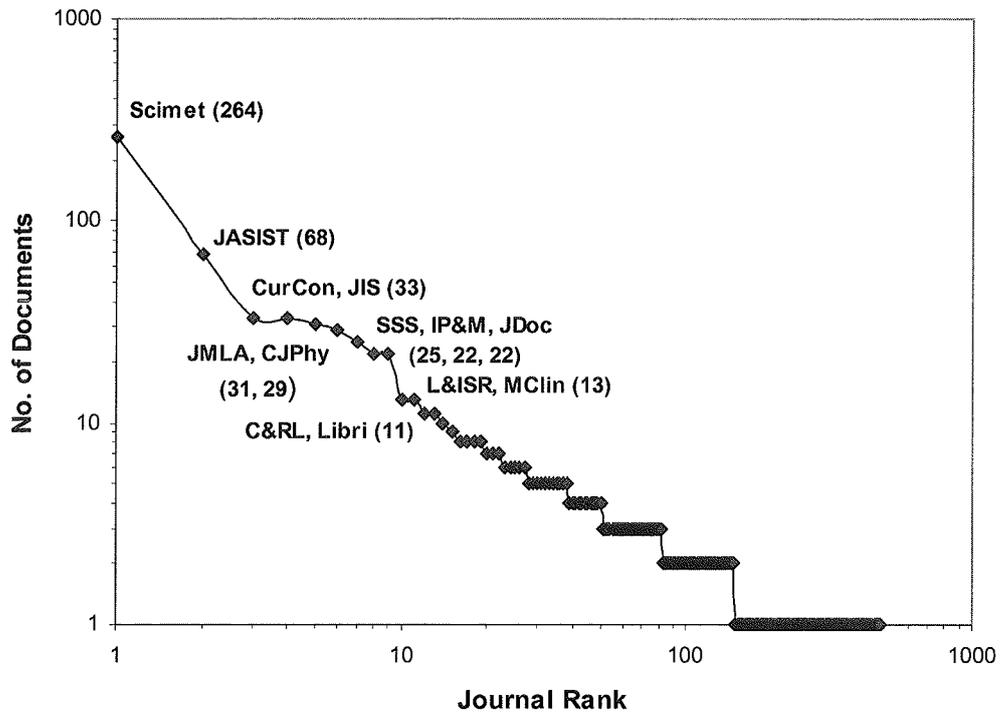


Figure 2. Journal Ranking

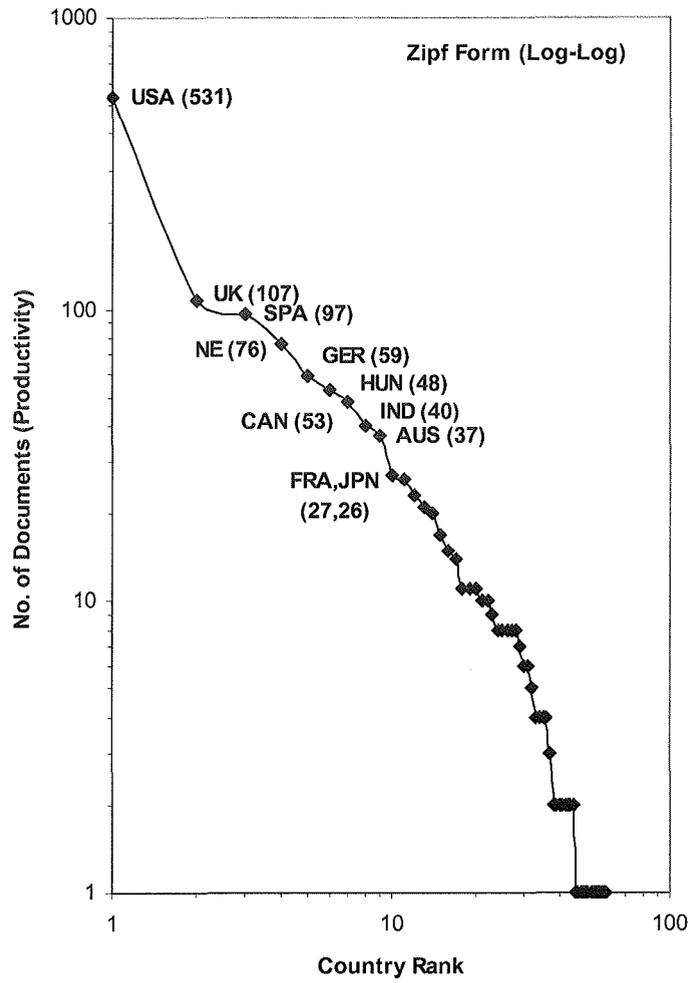


Figure 3. Country Ranking

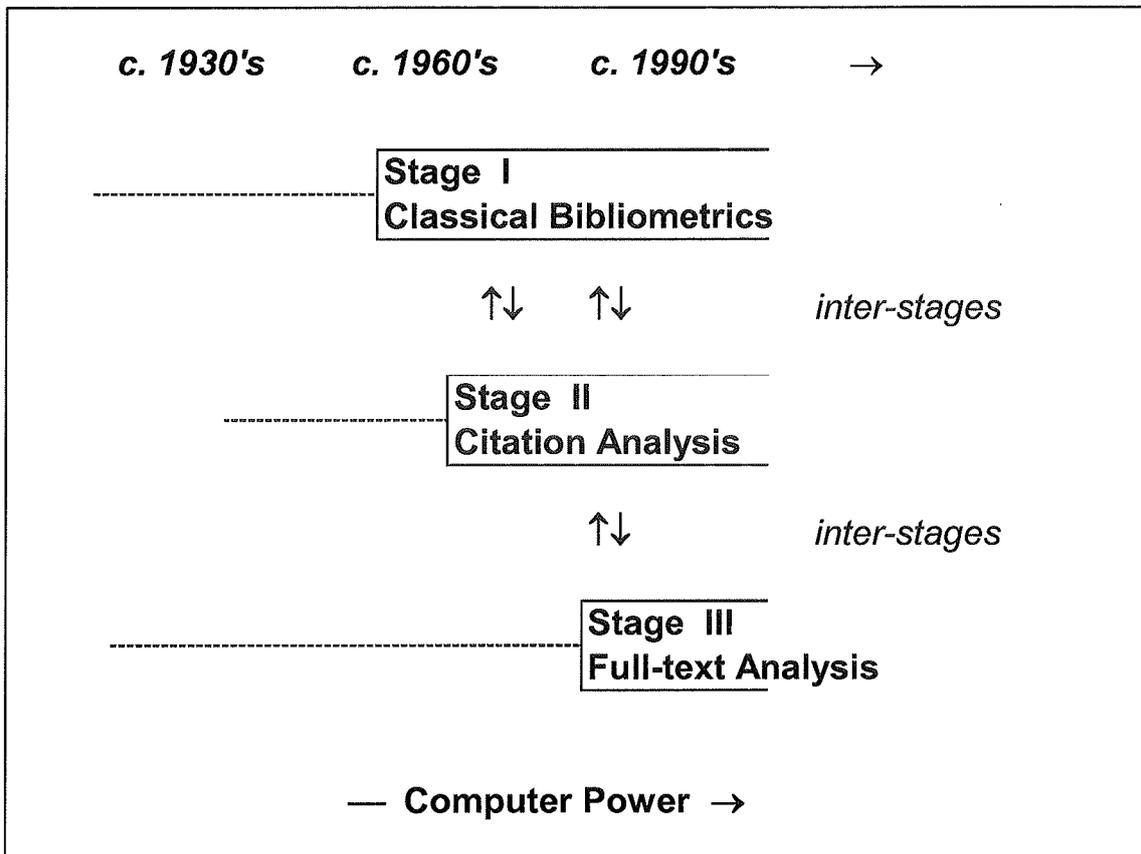


Figure 4. Summary of Developmental Model of Bibliometrics

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## Notes

- <sup>1</sup> Buckland, M.K. (2003) Five grand challenges for library research. *Library Trends*. 51(4):675-686.
- <sup>2</sup> Buckland 2003, *ibid* p. 675.
- <sup>3</sup> For a historical discussion of this term, see Wilson, C.S. (1999). Informetrics. *Annual Review of Information Science and Technology (ARIST)*. 34:107-247.
- <sup>4</sup> Selected publications from this group include: Bourke, Paul (1997) 'Discipline boundaries in the social sciences', Academy of the Social Sciences in Australia, Occasional Paper Series 1/1997. Canberra: Academy of the Social Sciences; Bourke, Paul and Butler, Linda (1993) 'Mapping scientific research in universities: Departments and fields', Performance Indicators Project, Occasional Paper no. 1. Canberra: ANU, RISS; Bourke, Paul, Butler, Linda and Biglia, Beverley (1996) 'Monitoring research in the periphery: Australia and the ISI indices', Research Evaluation & Policy Project Monograph Series no.3. Canberra: ANU, RISS; Butler, Linda (2001) *Monitoring Australia's Scientific Research: Partial indicators of Australia's research performance*. Canberra: Australian Academy of Science.
- <sup>5</sup> The Centre for Research Policy (now defunct) at the University of Wollongong worked on reports for the National Board of Employment, Education and Training preparing such reports as Murphy, P. (1996) *Determining Measures of the Quality and Impact of Journals, NBEET Commissioned Report No. 49*, Canberra, Australian Government Publishing Service: 210pp.
- <sup>6</sup> The Centre for Research Policy (now defunct) at the University of Wollongong worked on reports for the National Board of Employment, Education and Training preparing such reports as Murphy, P. (1996) *Determining Measures of the Quality and Impact of Journals, NBEET Commissioned Report No. 49*, Canberra, Australian Government Publishing Service: 210pp.
- <sup>6</sup> For example, *Measures of Science and Innovation: Australian Science and Technology Indicators Report*. Canberra: DITAC, Science and Technology Policy Branch, 1987; and *Profile of Australian Science: A Study of the Current State and Potential of Basic Scientific Research. A report to the Prime Minister by ASTEC*. Canberra: AGPS, 1989.
- <sup>7</sup> The course was titled: Knowledge Generation: Communication, Structure and Process. Because it was taught in 2001, the year that UNSW hosted the International Conference on Scientometrics & Informetrics, students were able to participate in the Conference and learn first-hand from the papers presented. The Proceedings are published by BIRG, UNSW: *8th International Conference on Scientometrics and Informetrics: Proceedings ISSI-2001* edited by M. Davis and C.S. Wilson. 2 vols. Sydney Australia, 16-20 July 2001. Sydney: Bibliometric and Informetric Research Group (BIRG), University of New South Wales (UNSW). July 2001.
- <sup>8</sup> BIRG's web site shows the strength of this program through the group's numerous publications and conference presentations (See: <http://birg.web.unsw.edu.au/>).
- <sup>9</sup> See the BIRG web site at: <http://birg.web.unsw.edu.au/publications.htm>
- <sup>10</sup> Buckland 2003, *op cit*.
- <sup>11</sup> Evans, M. (1996) Library acquisitions formulae: The Monash experience. *Australian Academic & Research Libraries*. March:47-57.
- <sup>12</sup> Butler, L. (2002) Identifying 'highly-rated' journals - an Australian case study. *Scientometrics*. 53(2):207-227.
- <sup>13</sup> See: Broadus, R. (1985) A proposed method for eliminating titles from periodical subscription lists. *College and Research Libraries*. 46:30-35; Dombrowski, T. (1988) Journal evaluation using *Journal Citation Reports* as a collection development tool. *Collection Management*. 10(3/4):175-180; and McCain, K.W. and Bobick, J.E. (1981)

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- <sup>14</sup> Nisonger, T.E. (1998) *Management of Serials in Libraries*. Englewood, CO: Libraries Unlimited. 433p.
- <sup>15</sup> See: Altmann, K.G. and Gorman, G.E. (1998) The usefulness of impact factor in serial selection: a rank and mean analysis using ecology journals. *Library Acquisitions – Practice and Theory*. 22(2):147-159.
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- <sup>18</sup> Webometrics or Cybermetrics is a new sub-field that has emerged to study the quantitative analysis of scholarly and scientific communications in the Internet. See for example: <http://www.cindoc.csic.es/cybermetrics/cybermetrics.html>
- <sup>19</sup> See, for example: Hou, J. and Zhang, Y. (2003) Effectively finding relevant web pages from linkage information. *IEEE Transactions on Knowledge and Data Engineering*. 15(4):940-951.
- <sup>20</sup> See: Marek, K. and Valauskas, E.J. (2002) Web logs as indices of electronic journal use: tools for identifying a 'classic' article. *Libri*. 52(4):220-230.
- <sup>21</sup> Davis, M. and Orsatti, J. (2003). Elite Research Careers: Relationships in productivity, field visibility and interdisciplinary engagement. Paper presented at the *9th International Conference on Scientometrics and Informetrics*, International Society for Scientometrics and Informetrics (ISSI), Beijing, China, August 25-29, 2003; and Davis, M. and Wilson, C.S. (2003). Research Contributions in Ophthalmology: Australia's productivity. *Clinical and Experimental Ophthalmology*. Vol.31, No.4, pp.286-293.
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