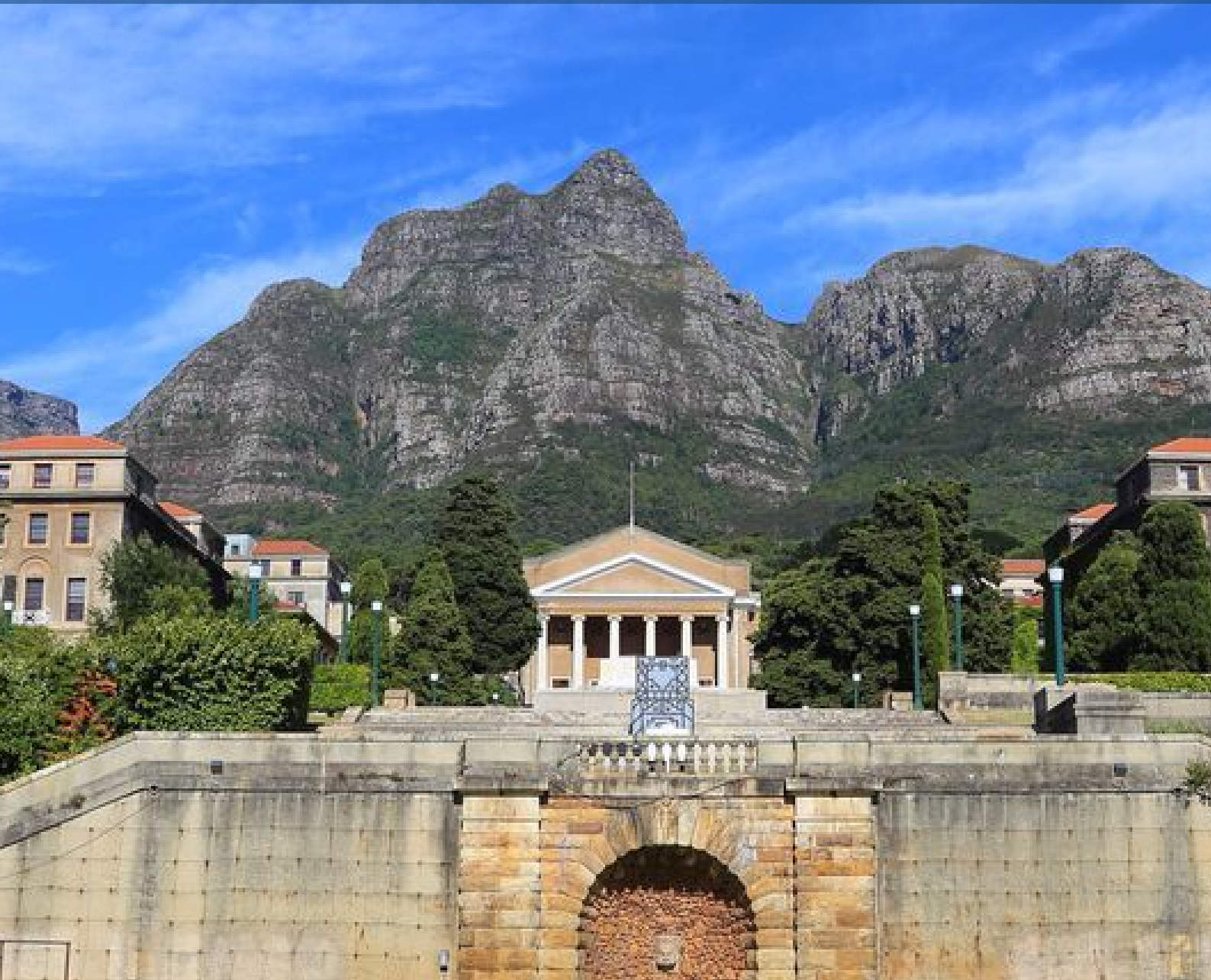


# LIS Education and Research in a Dynamic Information Landscape



Proceedings of the Library and Information Studies Centre  
75 years Commemorative Conference



Edited by Constance Bitso and Reggie Raju

Cape Town, South Africa | 27-28 November 2014

© 2015 University of Cape Town Libraries

This work is licensed under the Creative Commons licenses noted below.  
To view a copy of these licenses, visit [creativecommons.org](http://creativecommons.org). Other than as provided by these licenses, no part of this book may be reproduced, transmitted, or displayed by any electronic or mechanical means without permission from UCT Libraries or as permitted by law.



Effective 29 January 2016, this book will be subject to a CC-BY-ND license.

Suggested citation:

Bitso, C. & Raju, R. Eds. 2015. *LIS education and research in a dynamic information landscape: proceedings of the Library and Information Studies Centre 75 years commemorative conference*.

Cape Town: University of Cape Town Libraries.

DOI: <http://dx.doi.org/10.15641/0-7992-2526-6>

ISBN 978-0-7992-2526-6



# Table of contents

|   |     |
|---|-----|
| Foreword<br><i>by Constance Bitso and Reggie Raju</i>   | iii |
| Acknowledgements  | vi  |
| Abstracts   | vii |
| Chapter One<br>Library Studies at the University of Cape Town: an Historical Overview<br><i>Karin de Jager, Mary Nassimbeni and Peter Underwood</i>       | 1   |
| Chapter Two<br>Patriotism, Relevance and the Capacity to Think: Where to for the South African University in the Information Age?<br><i>Crain Soudien</i> | 11  |
| Chapter Three<br>Curriculum Content and Delivery: South African LIS Education Responses to a Changing Information Landscape<br><i>Jaya Raju</i>           | 21  |
| Chapter Four<br>Dancing with Ambiguity – the Wonder of Randomness<br><i>Steyn Heckroodt</i>   | 31  |
| Chapter Five<br>The Open Access Advantage for Researchers – Reflections on Experience and Challenges<br><i>Tom Cochrane</i>                               | 35  |
| Chapter Six<br>It's not Business as Usual! CPD as a Change Imperative for LIS Professionals<br><i>Ujala Satgoor</i>                                       | 44  |
| Chapter Seven<br>The Importance of Data, Information and Knowledge in Scholarly Communication<br><i>Carol Tenopir</i>                                     | 54  |
| Chapter Eight<br>Fostering Open Science Practice through Recognising and Rewarding Research Data Management and Curation Skills<br><i>Joy Davidson</i>    | 63  |
| Chapter Nine<br>Scholarly Communication: a System in Transition<br><i>Herbert Van de Sompel and Jenny Walker</i>  | 76  |

## Foreword

The rapidly changing information landscape is influenced by technological advancements, innovations and global trends. Data, information and knowledge are key to transformation, social development and economic advancement. Effective data, information and knowledge management are critical in this new world, requiring a rejuvenation of the Library and Information Science (LIS) profession and a metamorphosis of the older generation of librarians to collaborate with the new generation and to effect the cross fertilisation of tacit knowledge, competencies and proficiencies for dynamic knowledge-driven environments. Vigorous education strategies, learning styles and spaces as well as research are essential for contemporary LIS professionals. As a result, the Library and Information Studies Centre (LISC) at the University of Cape Town (UCT), at its 75 years Commemoration Conference in November 2014 strategically engaged in a discourse on *LIS education and research in the changing information landscape*.

This discourse was conceptualised to take cognisance of the complexity of the South African higher education agenda; its demand for transformation; the need for African LIS professionals to be adaptable to change in order to remain relevant; the value of research in knowledge generation and innovation; and the dynamic information landscape within which LIS professionals operate. The discourse was led by respected scholars who were carefully selected to elucidate significant trends in the critical areas of Higher Education; Change and Dynamics; Research Imperatives; and the Information Landscape. These were the four broad themes that framed the proceedings with which LISC intended to advance the LIS discipline on the African continent.

In his opening message to the conference delegates, the Dean of the Faculty of Humanities, UCT Professor Sakhela Buhlungu, noted that the conference was intended to expose LISC to integrated LIS education and research approaches to assist in programme design and innovative curriculum delivery relevant to the dynamic digital landscape. This suggestion from the Dean has already borne fruit, as the presentations by Associate Professor Jaya Raju and Ms Ujala Satgoor led LISC to develop a new master's degree by coursework (MPhil with specialisation in digital curation), and to design a new module: Teaching and Learning for LIS Professionals.

Furthermore, the Dean recommended that the Proceedings should be circulated as widely as possible so that the significant trends identified and discussed at the conference could be disseminated to the wider South African LIS community and the rest of Africa. Bearing in mind this message, and acknowledging both the generosity of the scholars who led the discourse, and our commitment to the philosophy underpinning the Open Access movement, it is a great pleasure to present this volume of our conference proceedings as a peer reviewed open access monograph.

LISC also wished to celebrate its 75<sup>th</sup> year in commemorating the successes and challenges it encountered over the years. It was established in 1939 as the School of Librarianship and changed its name twice more. While the conference theme and discourse was directed at

the future, it was nevertheless important to look back at its origins and development over its 75 years of existence. This historical overview is presented by its veterans: Emeritus Professor Peter Underwood and Emeritus Associate Professors Mary Nassimbeni and Karin de Jager. These scholars are well known locally and internationally for their research and teaching, professional services, and community development. They have served the department for many years, are still highly committed to its activities, and each at some point had an opportunity to be its head. LISC, UCT at large and alumni of the department value the contribution of these scholars.

Since scholarly communication is a fundamental pillar of education and research in any discipline, it is not surprising that a keynote address on scholarly communication introduced this discourse on LIS education and research in a dynamic information landscape. The proliferation of the Web and its evolution has impacted on the access and discoverability of scholarly communication. The transition from traditional paper-based texts to digital multimedia formats effected fundamental changes in scholarly communication systems. In his paper, *Towards a web-native scholarly communication system*, Professor Herbert Van de Sompel, the conference keynote speaker, disclosed how current web-based scholarly communication essentially still reflects paper-based systems. His contention was that “the current system was not reinvented from scratch; but simply copied into the web”. This renowned scholar addressed the transitional path from paper-based scholarly communication to a web-native digital environment and he shared his first-hand experiences of this transition. We are very grateful to Ms Jenny Walker who extracted the article in this volume from a recording of his presentation, and to Emeritus Professor Peter Underwood for subsequently editing the paper.

Continuing with the debate on scholarly communication, Professor Tom Cochrane in his paper *The Open Access Advantage for Researchers – Reflections on Experience and Challenges*, focused on the importance of research being open to the widest possible audience, especially to researchers in the developing world. He addressed critical questions such as the link between Open Access and reward systems for researchers (author recognition), and how researchers might improve their visibility and impact.

Increasingly, research and knowledge production in society, particularly in the scientific domain, and supported by the Open Data initiative, requires libraries to contribute to literacies in data, information and knowledge as part of their mission to further knowledge and innovation (Baškarada and Koronios, 2013). The open data initiative also requires knowledge and competencies in research data management (RDM). Ms Joy Davidson revealed diverse opportunities available for librarians to become active players in supporting RDM and curation as part of the open science movement. She reminded us all that librarians have consistently demonstrated flexibility and willingness to embrace change; an attitude which has been a crucial factor in the early successes of RDM in the United Kingdom.

The hierarchy of data, information and knowledge is the foundation of our discipline, requiring regular reflection on the changing information landscape, not only in our

discipline but also in education generally. Professor Carol Tenopir teased out a conceptualisation of the phenomena of data, information and knowledge as research imperatives, showing the relationship among them as strategic in scholarly communication.

Leading the discourse on the sub-theme of higher education, Professor Crain Soudien described the South African higher education sector and the multiple challenges and pressures emanating from government and society at large. Looking into how this sector functions in the midst of these challenges, for example the need to produce relevant graduates with patriotic values and the ability to contribute to the economy, Soudien illustrated emerging trends impacting both negatively and positively on the sector and suggested a new role for academic libraries in South Africa.

Higher education cannot be discussed in isolation from curriculum content and its delivery. Associate Professor Jaya Raju critically reflected on the new knowledge and skills sets required to function effectively in a dynamic information landscape, and how LIS education in South Africa was responding to the dynamics of the digital age.

The social nature of information promotes connections, collaborations and networks among people, communities and society at large. Knowledge is increasingly enhanced and linked in a range of ways and the ability to access, use, and interact with knowledge has become dynamic, so that LIS education and research in these contemporary times require participants not only to change but also to embrace change. Realising that change is inevitable and unavoidable in the digital age, and that aptitude for change might not be feasible without a deeper understanding of what it implies in the context of South African higher education, what it requires and how and why it must happen, Dr Steyn Heckroodt was invited to lead the discourse on change.

Building on his discussion, Ms Ujala Satgoor elucidated the LIS practitioner's perspective by emphasising that "it can no longer be business as usual", but that the LIS profession and academic libraries servicing LIS education and research in the changing information landscape have to rejuvenate themselves and drive the change and innovation processes. The profession has to learn and grow through constant and continuing professional development.

*Constance Bitso, PhD and Reggie Raju, PhD*

## **Reference:**

Baškarad, S. and Koronios, A. 2013. Data, information, knowledge, wisdom (DIKW): a semiotic theoretical and empirical exploration of the hierarchy and its quality dimension. *Australasian Journal of Information Systems*, 18(1):5-24.

## **Acknowledgements**

The Library and Information Studies Centre (LISC) is organisationally located within UCT Libraries hence the LISC75 Commemorative Conference organising committee comprised of LISC and UCT Libraries staff members. The editors acknowledge all the members of the conference organising committee namely Ms Caroline Dean, Ms Michelle Kahn, Emeritus Associate Professor Mary Nassimbeni, Ms Theresa Schoeman and Ms Cyrill Walters who worked tirelessly to make the LISC75 Commemorative Conference a success.

This work is based on the research supported by the National Research Foundation. The editors equally acknowledge the financial support for the conference from Cambridge University Press, EBSCO, Elsevier, Emerald, ExLibris, ProQuest, Sabinet, Thomson Reuters, Universal Knowledge Software, Wiley and World Wide Information Services. The financial support enabled the conference organising committee to solicit local and international speakers.

For academic integrity and quality assurance, the papers went through a double-blind review process. Without mentioning names the editors acknowledge the efforts of the reviewers for their valuable contribution.

The editors would like to acknowledge Ms Jen Eidelman for the photograph on the cover page, Ms Elizabeth Moll for designing the book cover, Mr Jeremiah Pietersen for the book layout and Ms Andrea Thornton for transcribing the conference keynote address.

## **Peer review statement**

All chapters in this monograph have 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 that 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.

# Abstracts

## **Patriotism, Relevance and the Capacity to Think: Whereto for the South African University in the Information Age?**

**Crain Soudien**, CEO, Human Science Research Council and former Deputy Vice-Chancellor, University of Cape Town

*This paper reflects on the challenges of the South African university in developing an agenda for itself in a time and space defined by multiple calls on what it should be doing. The context against which the paper unfolds is the following:*

- (i) the persistent pressure from the government for the university to align itself, its research, teaching and social responsiveness, with government's priorities. In this agenda the notion of the patriotic university is central;*
- (ii) the argument that the university should be producing graduates who will supply the economy of the country with the skills it requires. This agenda is essentially that of the relevant university as might be seen from a human capital perspective; and*
- (iii) the view that the university should prepare young people for citizenship. This agenda builds on the classical argument that the purpose of the university is to prepare young people to think critically.*

*How, in a climate in which the availability of information is increasing every day, the university is able to constitute an agenda for itself is a deeply important question. I look at how the sector is working with these pressures, and highlight emergent innovations which portend where the university could be going.*

---

## **Curriculum Content and Delivery: South African LIS Education Responses to a Changing Information Landscape**

**Jaya Raju**, Library and Information Studies Centre, University of Cape Town

*Rapidly evolving information and communication technologies have dramatically altered all aspects of library and information services and, significantly, have led to a revolution in scholarly communication. This in turn has impacted on the knowledge and skills requirements of professionals practicing in the information environment. Hence the need for Library and/or Information Science (LIS) education to reflect the new knowledge and skills sets required to effectively mediate a dynamic information landscape. This paper, taking a mixed-method research approach, uses qualitative and quantitative data gleaned from relevant literature, a survey of LIS school heads in South Africa coupled with an appraisal of the websites of these schools, and content analysis of recent relevant job advertisements, to address the following critical question: How has LIS education in South Africa responded to the dynamic information landscape? Using relevant pedagogy theory to frame the research, this inquiry focuses on LIS school curriculum content and delivery responses to a fast evolving information environment. The outcome of this inquiry provides an overview of the current status of LIS education in South Africa in an information age impacted on by rapid technology developments.*

---

## **The Open Access Advantage for Researchers – Reflections on Experience and Challenges**

**Tom Cochrane**, Queensland University of Technology

*This paper focuses on the advantages of Open Access, (OA) particularly from the point of view of individual researchers, research centres and disciplines, and institutions. The advantage described by the phrase "OA advantage", is multifaceted. The experience of Queensland University of Technology in Australia in pioneering OA as preferred practice in an institution with a growing research profile and energy, has seen evidence of the OA advantage develop in the experience of our researchers. The University has witnessed the development of*



*practical evidence about improved recognition and impact, and this has occurred in the context of sector wide activity and policy where fresh approaches and leadership will result in even greater rewards for researchers whose outputs are “in the open”.*

---

## **It’s not Business as Usual! CPD as a Change Imperative for LIS Professionals**

**Ujala Satgoor**, Immediate Past President, Library and Information Association of South Africa (LIASA)

*The impact of modern and emerging technologies on work environments and user behaviours is placing new demands on library and information services (LIS) professionals; they are being challenged to redefine their roles within this context. The need for increased versatility to function within these environments requires a redefinition of competencies and skills sets. Continuing professional development (CPD) is widely accepted as the means by which LIS professionals adapt to new imperatives and remain relevant within changing environments. This paper aims to address the new contexts for LIS practices, some of the new required skills for LIS professionals and the importance of the inclusion of CPD as an institutional strategic imperative.*

---

## **The Importance of Data, Information and Knowledge in Scholarly Communication**

**Carol Tenopir**, University of Tennessee, School of Information Sciences

*For decades, Information Scientists have explored how scientists and other researchers communicate in their work. Formal communication channels most commonly include conference papers, articles, and books. Research data has not been treated as a separate entity in these studies until fairly recently, however. With current initiatives for open data, research data as a research product unto itself is being explored, yet many barriers to this type of thinking still exist. What barriers exist to open data sharing among scientists and other researchers? Can data resources stand on their own or must data be integrated with information resources to form knowledge in scholarly communication? What happens when formal information channels are broken down into smaller parts for access and retrieval? What are the relative roles of data, graphics, articles, and other forms of formal communication in scholarship? This paper explores how knowledge of the use and conceptualisation of formal communication channels informs library and information science research and practice.*

---

## **Fostering Open Science Practice through Recognising and Rewarding Research Data Management and Curation Skills**

**Joy Davidson**, Digital Curation Centre, UK

*In a bid to improve research integrity, drive innovation, increase knowledge and to maximize public investment, researchers are increasingly under pressure to work in a more open and transparent way. This movement has been referred to as open science. Open science offers a range of potential and measurable benefits – for researchers and the institutions that employ them as well as for society more generally. However, to realise these benefits, we must work towards changing current research practices and behaviours. Researchers will need to acquire new research data management and curation skills that enable them to undertake a broader range of tasks along the entire research lifecycle – from undertaking new means of collaboration, to implementing data management and sharing strategies, to understanding how to amplify and monitor research outputs and to assess their value and impact. In parallel, information professionals who work to support researchers and the open science process will also need to expand their research data management and curation skillsets. It will be equally important that current recognition and reward systems are amended to reflect the application of such skillsets within a range of disciplines. This paper will explore the potential role that librarians can play in supporting and progressing open science and discuss some of the new skills that librarians may require if they are to fulfil this role effectively. Citing examples from the current UK*

*research landscape, this paper will map these skills to the Wellcome Trust and Digital Science's CRediT Taxonomy which was developed in 2013 to enable the broad range of contributions involved in producing research outputs to be more consistently described and rewarded.*

---

## **Scholarly Communication: a System in Transition**

**Herbert Van de Sompel**, Los Alamos National Laboratory

**Jenny Walker**, Independent Consultant

*The scholarly communication system is in transition from a paper-based system of journals and similar sources to one that is rapidly becoming web-based. The changes present technical challenges regarding interoperability between systems and services and long-term preservation, but they also yield broader challenges related to stewardship, access, the account of the scholarly record, and the very notion of the version of a record. This paper considers these ongoing changes and explores some of the possible consequences for networked, digital, research communication. The paper is a keynote presentation delivered by Prof. Herbert Van de Sompel of Los Alamos National Laboratory, New Mexico.*

# Chapter One

## Library Studies at the University of Cape Town: an Historical Overview

### ***Karin de Jager***

Library and Information Studies Centre, University of Cape Town  
Email: karin.dejager@uct.ac.za

### ***Mary Nassimbeni***

Library and Information Studies Centre, University of Cape Town  
Email: mary.nassimbeni@uct.ac.za

### ***Peter Underwood***

Former Head of the Centre for Information Literacy, University of Cape Town  
Email: pgunderwood@wol.co.za

*Review status: Peer reviewed*

---

### **Introduction**

In 2015, the Library and Information Studies Centre (LISC) marked its 75 years of continuous existence at the University of Cape Town (UCT) by arranging a two-day conference, styled the LISC75 Commemorative Conference. The invited speakers reflected on current and future trends in Library and Information Services (LIS) and emphasised the prospective rather than giving a retrospective. This chapter provides a retrospective view, charting in broad terms the evolution of the Department, highlighting key moments and considering how the Department reflected in its programmes the influence of external environmental, political and economic factors.

### **Early years: 1939-1989**

The establishment and history of the development of the School of Librarianship at UCT during its first 50 years was discussed comprehensively by Dorothy Ivey, a member of staff at the time (1989). The overview of the first fifty years that follows is based on her thoughtful article unless indicated otherwise.

The development of libraries in South Africa before the Second World War had been slow and intermittent, so that there had not been much

need for educating librarians. The few qualified librarians in South Africa had obtained their qualifications either at the University College of London's School of Librarianship, which was the only university in Britain providing library education at the time (Kesting, 1980:230), from Columbia University in the United States of America (USA), or through the correspondence courses administered by the Library Association in Britain.

In 1928 South Africa was visited by a delegation from the Carnegie Corporation of New York to advise on the situation of libraries in South Africa. This delegation realised that the country as yet had no library schools, but at the same time expressed doubt whether there was sufficient demand to sustain a library school in the country. A decision was subsequently taken to establish the South African Library Association (SALA) which would be responsible for the examination of students enrolled for correspondence courses that would be designed for the particular needs of the country, but modelled on the Library Association courses. Curricula to this effect were constructed by 1933, the first SALA examinations were held in 1934 and the first diploma awarded in 1937.

Although SALA initially regarded it with suspicion, a small department was established at UCT in 1939 to teach and qualify librarians. According to Kesting (1980:230) this was the first library school in South Africa that actually set out to provide certification; the school that had been started the year before at the University of Pretoria, was specifically meant for its own library staff and "did not lead to open certification" (Kesting 1980:230). SALA regarded itself as the only body able to provide certification at this time, and was concerned about a possible oversupply of librarians. The issue was resolved in 1940 when it was eventually agreed that the UCT qualifications would be equated with SALA's final diploma examination.

In 1939 the first head of the School of Librarianship was the University Librarian, the Rev. G.F. Parker, but shortly thereafter his successor to both positions from 1940 was René F.M. Immelman, one of the pioneers of librarianship in South Africa. He was firmly of the opinion that library education should be offered by universities, as university qualifications raised the status of the profession and focused on education rather than training. UCT offered a first basic professional qualification that prepared students to work in libraries of all types. Originally there was no demand for a degree as a minimum qualification before enrolment, although students often were graduates. A minimum of four Bachelor's degree courses were however specified, and then as now, many students seemed to work while studying, thus often taking more than the two years that were stipulated for completion while studying part time. From 1952 a degree was required as an entrance qualification.

Between 1939 and 1945, the first basic qualification was known as the *Certificate in Librarianship*. Upon completion of two years of experience, candidates were granted a *Diploma in Librarianship* and as a result of the previous agree-

ment with SALA, this qualification allowed candidates to become Fellows of SALA after another year of experience and matriculation level passes in two foreign languages. The librarianship curriculum in this period underwent minor changes, but dealt with cataloguing, classification, bibliography, reference work, book selection, and administration and organization. In this period the original curriculum entry for "practical training in library procedure" became "principles of library service" and a practical training component of four weeks' duration in approved libraries was added to the curriculum in 1945.

From 1941 until 1965 the compilation of a bibliography on a subject of the student's choice was a prerequisite for obtaining the qualification. A number of interesting bibliographies were produced, some of which were published in the *Bibliographical Series* of the School of Librarianship. The UCT catalogue still lists more than 100 unique entries for these bibliographies which are stored in the African Studies Collection. The subject matter is wide ranging and Ivey noted that "despite their imperfections, [these bibliographies] had provided much useful information since they were first instituted in 1941" (1989:287). In browsing through the catalogue entries, a number of names which were to become famous in the South African library world may be noted among the authors.<sup>1</sup>

By 1946 a one-year paraprofessional qualification was instituted. As this qualification was to be known as the *Certificate in Librarianship*, the nomenclature of the original qualification had to change in order to distinguish it from the new one-year course. It thus became the *Higher Certificate in Librarianship* with the same entrance qualifications as before; either a degree, or matriculation together with four Bachelor's degree courses. This changed in 1952 when only graduates were accepted into the Higher Certificate course. As before, the qualification could be upgraded to the Diploma.

---

<sup>1</sup> Examples include J.G. Kesting; Reuben Musiker; Barry H. Watts; Dorothy Amyot (later Ivey); Julie te

Groen; Dirk L.Ehlers, Gerald D.Quinn, and Paul M. Meyer.

The Higher Certificate was offered until 1965 when the name of the entry level professional qualification was changed once more to become the *Higher Diploma in Librarianship*, nomenclature that lasted until 1979 when it became the *Higher Diploma in Library and Information Science* and was retained at UCT until 1990 when it became the current *Postgraduate Diploma in Library and Information Studies*. By 1988 after 50 years, a total of 849 students had obtained their first professional qualification in library studies from UCT. The 50<sup>th</sup> anniversary of the School of Librarianship was celebrated in a two-day Symposium in November 1989 which had as its title 'The future of library and information science: social technological and educational challenges' and which included in its programme presentations by a number of leading South African intellectuals such as Francis Wilson, S.J. Terblanche Peter Lor and Clem Sunter (Nassimbeni and De Jager, 1990).

### **Staffing**

The first teachers in the School of Librarianship had been full-time members of the library staff and the lectures were held in a seminar room in UCT's Jagger Library gallery. The university librarian was responsible for the new unit although he was only assigned the title of Director of the School of Librarianship in 1949 when Immelman was in the post. When the School was established in 1939, the librarian had been Parker, followed by Immelman whose name was synonymous with librarianship at UCT for many years. The first full time lecturer in librarianship, Loree Elizabeth Taylor, was appointed in 1945: and with the assistance of two part time tutors, M.E.Green and Varley, ran the School until 1951 although the university librarian remained responsible for the School until the end of 1973 when the positions of university librarian and Director of the School were separated. Initially M.E. Green was appointed as acting director of the School until a decision was made to create an independent Chair of the School and in mid-1977 Prof. J.G. Kesting became its first full time Director; a position he retained until his retirement in 1991.

By 1982 the staff complement consisted of five academic posts: the Director; a senior lecturer, three lecturers, and a part-time professional assistant. After the retirement of Kesting, Ivey was appointed Acting Head of the School until the beginning of 1993 when Peter G. Underwood was appointed Professor and Director of the School of Librarianship (later the Department of Information and Library Studies and then the Centre for Information Literacy); a position he retained until his early retirement at the end of 2008. The staff complement of five academic posts, with the occasional assistance of professional colleagues, remained unchanged until the retirement of Ivey at the end of 1995 when the full-time staff complement was reduced to four.

### **Higher degrees**

While the School was located in the Faculty of Arts probably from its inception, (but first noted as such in the Calendar for 1940) the nomenclature for the Master's degree in Librarianship was Master of Arts (Librarianship). The first of these degrees was awarded in 1974. The School moved to the Faculty of Education in 1982, after which the degree was known as the MBibl. In order to equip qualified librarians with the necessary expertise to conduct independent research, the Honours degree was instituted and the first students were registered for the BBibl (Hons) in 1984. A basic four-year BBibl degree had been established in 1983 as, according to Ivey 'neither the BBibl (Hons) not the MBibl could, technically be offered in terms of the Joint University Statute' without it as a foundational degree qualification. In 1983 the School also offered the PhD qualification for the first time and the first enrolment took place in 1984. By 1988 only one PhD degree had been awarded; another eight qualified in the next twenty-five years.

The trajectory towards a mature academic department is clearly visible in the rate of growth of advanced degrees (Figure 1). In the years 1939 to 1989; 18 master's degrees were awarded, 16 of which were awarded in the period 1965 to 1989.

Figure 2 compares the Master's and PhD output of the final twenty-five year period with the two preceding periods where the output was significantly lower.

This growth can be seen against the background of the greater emphasis on research at UCT from the 1980s when more demands started to be made of academic staff, with respect to university expectations that they should all have a PhD. The National Research Foundation (NRF) started its system of rating the quality of the research of individual researchers in 1983, with the humanities and social sciences (the category covering LIS) joining the system only in 2002. Two members of staff obtained their first NRF ratings in 2003. From 1989 a total of eight students including two staff members were awarded the PhD, while the first PhD from the School in 1988 had also been awarded to a member of staff.

### **Threats to survival: 1990-2010**

In 1988 the Academic Planning Committee of the Committee of University Principals had started a national process of reviewing departments of librarianship, as they were regarded as too numerous (Raju, 2004:77) and therefore too small to be viable. The resulting Bunting Report (named after the chair of the review committee) published in 1990, concluded that library education in South Africa had to be rationalised and that a number of departments should be closed (Raju, 2004:77). At UCT therefore, the early 1990s was a period of introspection, mostly dominated by concerns about future viability and whether its primary focus on the education of librarians was in accord with the development of what had become an "information profession". After much argument and energetic debate within the School, the departmental name was changed from School of Librarianship to Department of Information and Library Studies' (DILS) to reflect its new orientation and the curriculum was enlarged to incorporate information – and later – knowledge management.

A thorough review of the Education and other faculties at UCT during the late 1990s resulted in

amalgamation of several into a new 'super Faculty' of the Humanities, which came into being in 1999. Several departments from the former Faculty of Education moved to the Upper Campus to form the Graduate School of Humanities. DILS also moved to Upper Campus in what was the first of several moves: its location changed four times in the period 1999 to 2012. The year 1999 also saw the foundation of the Centre for Higher Education Development (CHED), under the direction of Professor Martin J. Hall, with the specific remit of being an academic organisational unit to provide a cross-faculty focus on academic development. Hall also proposed that DILS should join CHED in a different guise: a newly recreated Centre for Information Literacy (CIL) with the additional role of researching and facilitating the campus-wide adoption of information literacy as an aspect of academic development. The newly forged CIL would also retain a "shadow" departmental status in the Faculty of Humanities for the purpose of continuing to validate its existing qualifications. The move was implemented at the beginning of 2000.

CHED proved a largely happy home for CIL and something of the academic cognacy experienced in the Faculty of Education was restored. It also meant that CIL had an expanded brief because its professional education activities were now partnered with the development of information literacy and techniques for its teaching. The latter was to prove difficult to manage. CIL was a pioneer of information literacy initiatives in South Africa and had to develop a *modus operandi* that would enable information literacy initiatives to percolate through UCT. Early on it was recognised that, given the staff available in CIL, the notion of individual, one-on-one teaching could only work to a very limited extent. It was decided that a portfolio approach would be tried, with each staff member being responsible for trying to develop contacts with a particular faculty. In addition, CIL decided to develop strong links with the Subject Specialists on the Library staff by sharing information literacy teaching with them.

Figure 1: Master's degrees awarded: 1989-2014

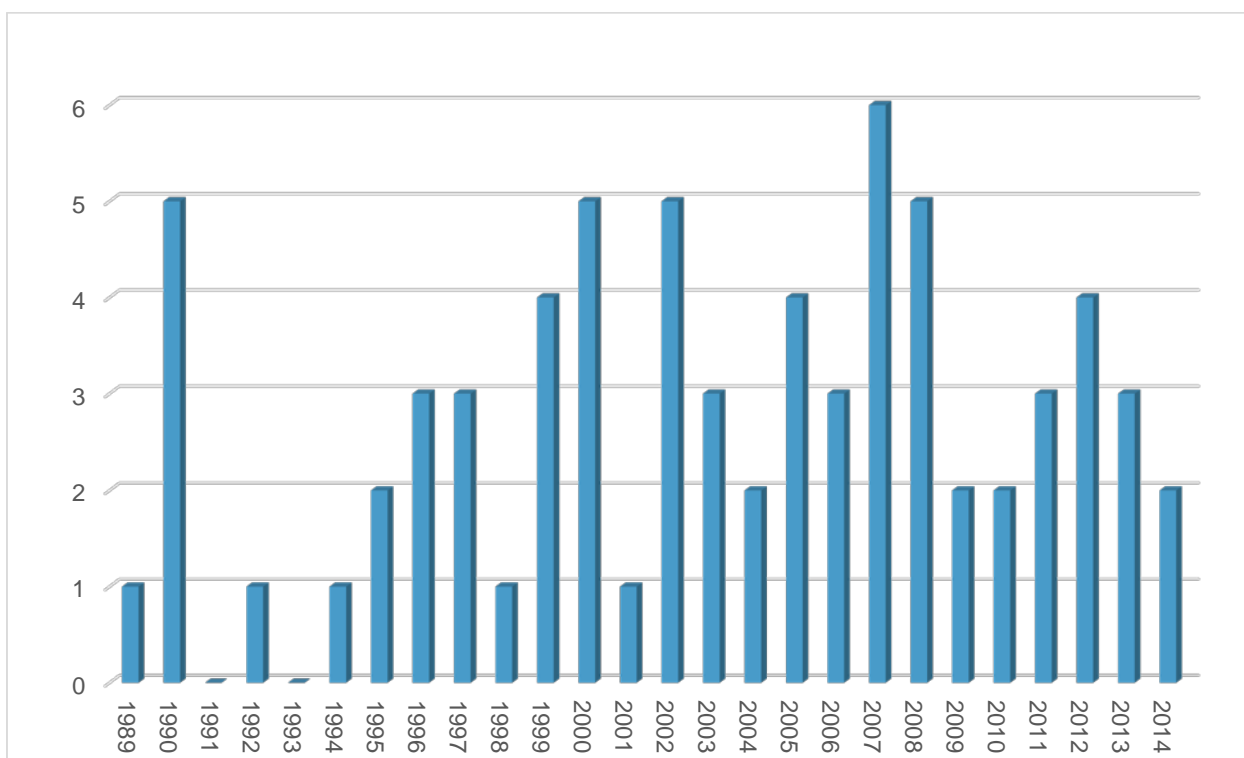
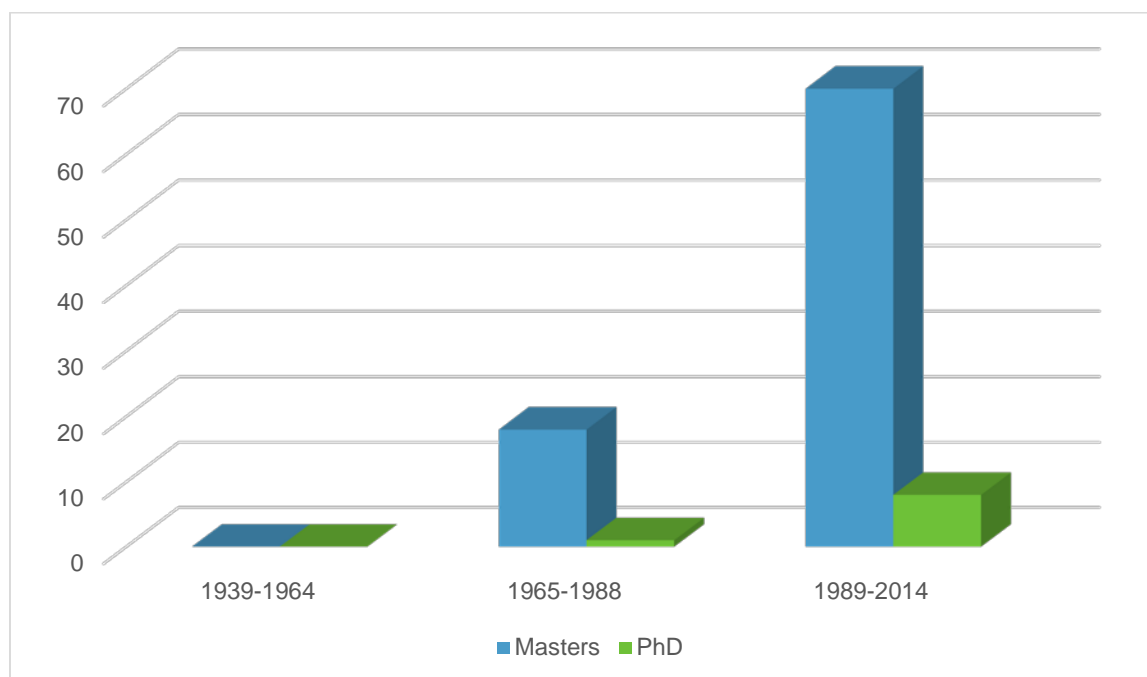


Figure 2: Master's and PhD degrees awarded: comparison of three 25-year periods



Maintaining a balance between the demands of teaching the Library and Information Science programme and developing the information literacy programme proved difficult and CIL occasionally attracted criticism for concentrating on the former at the expense of the latter, this being expressed as CIL operating too much as a Department of LIS rather than on *development* (the main

thrust of the work of CHED) of information literacy techniques. In retrospect, it is clear that this criticism had merit when we reviewed the scope of the development contribution we had made to CHED and compared it with the time spent on our teaching in the formal academic programme.

However, the information literacy focus was to take a greater prominence in the work of the

Cape Higher Education Consortium (CHEC), which comprised the five higher education institutions in the Western Cape. Early in its existence, CHEC developed INFOLIT, a research and development programme for information literacy. It was supervised by Cathy-Mae Karelse, a member of DILS staff on secondment to CHEC and, later, by Underwood, also on secondment. The INFOLIT Project was assessed as having achieved its objectives and concluded in December 2002.

Two factors were of growing concern in this period: the low number of applications to study and the resulting threat to the survival of a small department within the University. The first presented an almost intractable problem because, despite several campaigns to recruit students, the number each year remained small. The major changes in South Africa, consequent upon its move to a democratic government, included a definite slow-down in recruiting for posts in the LIS professional domain. Without the prospect of jobs after qualification, prospective students proved difficult to attract. This problem was to continue through the early post-millennial years. The problem of declining enrolment was that the new SA government neglected the funding of public libraries the biggest employer of LIS graduates. This situation was corrected in 2007 when special and generous funding was ring fenced for the development and upgrading of public libraries. The reason for the early neglect can probably be attributed to the very pressing needs of a new government compelled to find solutions for the consequences of decades of apartheid government - e.g. clean water for all citizens.

The second area of concern was governance within the University structures. The early location of SOL/DILS within the Faculty of Education had been an inspired choice: the Department was grouped with others with a similar ethos, spread of academic domains and professional orientation. There was a strong cognacy and a sharing of similar and complementary research interests: this proved fruitful to academic discourse. Perhaps the first indication of the turmoil to come

was the assertion by the university administration that the Education Faculty building on Middle Campus was not being used to the optimum because the Faculty was too small and would as explained above shortly be incorporated into a much larger Faculty of Humanities comprising of an amalgamation of the previous Faculties of Social Science, Arts and Education.

The new Faculty of Humanities – larger than at many universities after a major restructuring at UCT – had quickly proved a cumbersome beast to manage and one of the early pronouncements by its first dean, Professor Wilmot James, was that the days of small, independent, departments were past: the future was in multi-disciplinary clusters with executive managers. Left in no doubt about the likely fate of DILS, considerable thought was given in the Department to “escape” strategies. One route, amalgamation with its sister department at the University of the Western Cape, was pursued. The academic staff of both departments had often worked together and shared research, and there was little objection to the idea of an amalgamation. However, the administrators at both institutions seemed incapable of coming to an agreement – perhaps not understanding the professional sense of the move – and no merger took place.

In the period between 1977 and 2010, the fortunes of the department fluctuated from a high point when the first professor was hired in 1977 marking its maturing into an academic department independent of the library, to a very low point, when after an institutional evaluation, the decision was made by the Executive of the University to close the department at the end of 2010, a date by which most of the permanent staff members would have retired.

In 2008 a new Vice Chancellor was appointed at UCT and shortly after his appointment, he started a process to revise the University Strategic Plan (UCT Strategic Plan 2010-2014). The Plan proposed six strategic goals, each of which was accompanied by a number of action plans that



eventually also affected the future of librarianship at UCT.

While the Plan was designed to direct university activity and focus attention, it was also the basis of a measurement tool reflecting the global and national movement towards increasing managerialism and the decline in collegialism (Ramphele 2008). Adams has found links between the economic rationality as the driving force behind the establishment of various systems of governance, funding and assurance underpinning academic planning in South Africa after 1994 (2009: 9). As early as 2003, Cloete and Kulati had already argued that "... market competition and the emergence of new public management" were in part responsible for the rise of managerialism that is characterised by increasing power for administrators, declining influence of academics, and changing lines of responsibility (2003: 243). Typifying this manifestation of managerialism is "the shift in the authority of faculties from the academic unit to the managerial complex" (Jansen 2009). Jansen noted that the re-styling of the title of "Dean" to "Executive Dean" in universities was further evidence of this bias towards centralizing authority and diminishing the faculties' influence (2009).

It is arguable that this prevailing managerialism played a role in the eventual decision taken by the Senate Executive Committee to close the Department. In 2003, Hall had recommended in the Medium Term Budget Framework that the department be wholly transferred from CHED to the Humanities Faculty on the grounds that the great majority of the department's activities were LIS-related as opposed to developmentally-focused information literacy work, and that all the fee and subsidy income generated by the department accrued to Humanities. Moreover, it had become apparent that the dual mandate of CIL – op-

erating as a developmental entity, while simultaneously running academic programmes and delivering short courses for third-stream income – stretched staff capacity to the limit. The Humanities Faculty however, was not persuaded by the Business Plan that set out the case for the re-location of CIL (or DILS) to the Humanities Faculty and would not sanction such a relocation<sup>2</sup>.

The result was stalemate. By now the department was seen as too small to survive as a stand-alone department which in the interests of efficiency and presumed cost savings needed to be of a critical size. A new review of CIL was ordered instead and took place in late 2004. The outcome of this academic review was the recommendation, made in 2005, that CIL would continue in CHED but would close at the end of 2010 as staff were all nearing retirement and student numbers were low. This was an Executive decision that was not tested at the Humanities Faculty, the forum that would normally receive a recommendation of this nature.

### **The Phoenix Years: 2011 onwards**

During the period of the announcement of closure and 2011 (the date at which the last member of staff would have reached retirement age and all students should have been seen to completion) the staff continued to seek ways of reversing the decision to close. At the eleventh hour in November, 2011, after a routine visit by the Vice Chancellor on one of his regular tours of academic departments that fortuitously included CIL that year, a chink appeared. At the meeting the Vice Chancellor received a final document outlining a plan to keep the department open, pointing out the imminence of a Carnegie programme offering generously funded professional education to public librarians. At the same time the professional body, Library and Information Association of South Africa (LIASA), had made

---

<sup>2</sup> Based on the unpublished document "Library and Information Studies as a professional discipline: making the case to the Faculty of Humanities for the continuation of LIS teaching and research programmes

at UCT," written by the then Head of Department, Mary Nassimbeni in 2009.

representations to the University urging the continuation of CIL on the grounds of its excellence. In response the Vice Chancellor asked a Deputy Vice Chancellor to investigate the possibility of keeping CIL open.

In November 2011 at a meeting attended by a representative from LIASA, CIL was given the go-ahead to continue its teaching and research programmes. This, however, would involve a major change to becoming administratively located under the aegis of the UCT Libraries instead of CHED which at that stage was also undergoing reconstruction and could no longer incorporate the presence of CIL into its strategic objectives. CIL was therefore reconstituted as the Library and Information Centre (LISC) with its academic home, as before, in the Humanities Faculty and its organisational location in the UCT Libraries where the newly appointed Director was willing to house and provide administrative support to LISC. Even at this early stage however, the possibility of eventually being fully incorporated into the Humanities Faculty was not ruled out. In January 2012, Associate Professor Jaya Raju was appointed as Head at Associate Professor level on a three-year contract to take LISC forward as an academic project within UCT<sup>3</sup>. Initially the Head was supported by the recently retired members of staff on one-third contracts, with the assistance of a part-time administrator. Since 2012, the staff complement has been strengthened each year; in 2013 by the appointment of a lecturer on a three year contract, and in 2014 by the appointment of two further lecturers. At the end of 2014, the position of the Head of LISC was confirmed as permanent.

A decision was taken to follow the existing curriculum in 2012 but this year would also see the continuation of a process of curriculum renewal which had already begun. The new curriculum was informed by trends redefining the LIS

sector and delivery of information and information-related services, particularly those in the academic and public library sectors which were identified in its newly developed strategic framework as LISC's sector specialisations. This culminated in the establishment of a new Postgraduate Diploma in Library and Information Studies (PGDipLIS) at National Qualifications Framework (NQF) Level 8, allowing direct articulation to Master's studies.

In addition it became obvious that it was necessary to exploit a variety of curriculum delivery models to accommodate students coming from a diversity of contexts. In 2012 a new approach to course delivery led to the design and adoption of a 'block release' option to accommodate ten scholarship recipients in the PGDipLIS from the City of Johannesburg Public Library Services. This scholarship programme was the Carnegie funded 'Next Generation Public Librarian Scholarship Programme,' which had been instrumental in the decision to revive the department. This development reflected a pleasing symmetry in the Carnegie influence on the department, as the head of the School in 1940, Immelman, had been awarded a travelling visitors' grant by the Carnegie Corporation to enhance his qualifications at the School of Library Service at the University of Columbia, New York (Taylor 1970:2).

LISC's new synergistic relations with UCT Libraries quickly revealed the need for deeper level skills and competencies in new areas such digital curation, research librarianship and leadership and management in library and information services. These high level skills required master's level study with options for specialisations in these areas. With support from the Humanities Faculty and the University Administration, LISC was able in 2012 to design a new-look coursework master's programme, the Master of Library and Information Studies, which addresses the skills and competencies required by the modern

---

<sup>3</sup> This section is based on the LISC Annual Report for 2012 written by Raju.

LIS sector. Furthermore, in 2014 the Humanities Faculty approved the introduction of a new MPhil in digital curation. Another innovation in the Master's degree programmes has been the introduction of a blended learning model, whereby courses are delivered both remotely (online) and in occasional contact sessions.

In spite of the increased activities associated with the design and delivery of new courses, LISC continues to maintain a focus on research productivity and excellence. Currently 16 masters and four PhD students are working to complete their dissertations. Members of staff are all active and productive in research and regularly present their findings at national and international conferences on themes including skills for LIS, knowledge management, digital curation, research data management, LIS policy, library evaluation and impact.

## Conclusion

The commemorative conference gave academics, researchers and practitioners an opportunity to reflect on the current trends in LIS in order to map a way forward for a new generation of professionals, and to recognise that in the evolving information landscape, driven by technological advancements, information and knowledge are central underpinnings for socio-economic development. This event provided an opportunity for LISC to engage with leading scholars and colleagues to explore the critical areas of higher education, change and dynamics, research imperatives and the information landscape – the four broad themes that framed the conference programme and will inform LISC in its continued search for excellence in teaching, research and social engagement<sup>4</sup>. This chapter has provided a retrospective view to enable LISC to learn from the past and further enrich its search for excellence.

---

## References

Adams, F. 2006. Managerialism and higher education governance: Implications for South African universities? *South African Journal of Higher Education*, 20(1):1-2

Bhulungu, S. 2014. Welcome Address to LISC at the LISC75 Conference, by the Dean of the Faculty of Humanities, 27 November.

Cloete, N. and Kulati, T. 2003. Managerialism within a framework of cooperative governance? In: *The higher education managerial revolution*, edited by A. Amaral, V. L. Meek and I. Larsen Dordrecht: Kluwer Press, p. 229-252.

Ivey, D. L. 1989. School of Librarianship of the University of Cape Town, 1939 to 1988: overview. *South African Journal of Libraries and Information Science*, 57(3):284-296.

Jansen, J. 2009. Intellectuals: the state and universities. *University World News*, 43. 13 December 2009. Available: <http://www.universityworldnews.com/> (20 March 2015).

Kesting, JG. 1980. South Africa, Libraries in the Republic of. In: Kent, A., Lancour, H. and Kent, K. (eds.), *Encyclopedia of Library and Information Science*. New York: Dekker, Vol. 28:129-259.

Nassimbeni, M. 2009. Library and Information Studies as a professional discipline: making the case to the Faculty of Humanities for the continuation of LIS teaching and research programmes at UCT. Unpublished.

Nassimbeni, M. and De Jager, K. 1990. The future of library and information science: social, technological and educational challenges. Proceedings of the 50<sup>th</sup> Anniversary Symposium of the School of Librarianship, University of Cape Town, 20-21 November.

---

<sup>4</sup> This final section draws from the Welcome Address by the Dean of the Faculty of Humanities, Professor

Sakhela Bhulungu, to LISC at the LISC75 Conference, 27 November 2014.

- Rahu, J. 2004. LIS education and training in South Africa: a historical overview. *South African Journal of Libraries & Information Science*, 71(1):74-84.
- Raju, J. 2012. LISC Annual Report for 2012. Unpublished.
- Ramphele. M. 2008. *Laying ghosts to rest: dilemmas of the transformation in South Africa*. Cape Town: Tafelberg.
- Taylor, LE. 1970. R.F.M Immelman. In: *Libraries and people: essays offered to R.F.M Immelman*, edited by JG. Kesting, SI Malan, AH. Smith. Cape Town: Struik, p. 1-8.
- University of Cape Town. 2014. The strategic plan for the University of Cape Town, 2010-2014. Available: [http://www.uct.ac.za/downloads/uct.ac.za/about/goals/uct\\_strategic%20goals.pdf](http://www.uct.ac.za/downloads/uct.ac.za/about/goals/uct_strategic%20goals.pdf). (20 March 2015)

## Chapter Two

# Patriotism, Relevance and the Capacity to Think: Whereto for the South African University in the Information Age?

**Crain Soudien**

CEO, Human Science Research Council and former Deputy Vice-Chancellor, University of Cape Town  
Email: csoudien@hsrc.ac.za

*Review status: Peer reviewed*

---

### Introduction

In a wide-ranging lecture about the role of the university in the information age at the University of the Western Cape in 2009, Manuel Castells (2009:1) made the point that universities were primarily about *processing information*: “In a context of a technological revolution and in the context of a revolution in communication, the university ... (is) a central actor of scientific and technological change.” What he was drawing attention to was the *central* role of the university in being able to work with the extraordinary quantum and volume of information – ideas, concepts, discourses, policies, theories and analyses – that the technological revolution has made available to us, and to our ability to be able to engage critically with it, to see its strengths, weaknesses and, critically, that which it obscures.

Important about the intervention Castells was making, was the emphasis he lay on how much one should remain aware of the social dynamics surrounding the process of processing information. Universities, he argued, had to acknowledge how much inequality stalked the economies of the world. He urged that, along with becoming better processors of information, they should, simultaneously, “become the critical source of equalisation of chances and democratisation of society by making possible equal opportunities for people....[thereby] contributing to social equality” (Castells, 2009:1). In the way he framed the issues, Castells was talking to a fundamental challenge facing us in the South African university. How were, and are, we going to work

with the apparently oppositional projects of what he calls “equalisation” and the technology revolution and its extraordinary new possibilities? Elsewhere he brings together these questions of the social and the technological – the great challenges of inequality in the broader society and the possibilities inherent in the information age – to suggest that they constitute for us new questions about development and what we understand by it (Castells, 2014).

In this paper I attempt to sharpen the contradiction in Castells problematique. I use his foundational injunction in his major texts that we cannot, anywhere, step aside from the need to engage with the information revolution (Castells, 1996). In sharpening his contradiction, I argue that the informational explosion which Castells speaks of consists of more than the bounteous opportunities that come with new technologies. They also include, as part of the deepening democratisation through which the world is going, better understanding of information which we had previously not taken seriously, particularly in the colonial context, older knowledges, which we had historically ignored, marginalised and even delegitimised.

Important, then, about the contemporary era, is not just that we live in a knowledge economy, but that the knowledge economy is surrounded by and permeated with all the discursive contestations that would have been present and active before the world arrived at the state in which it currently finds itself. Critical about the technological revolution, therefore, is that the proliferation

of information happens as political struggles, economic wars and cultural contestations all continue. Important to understand, therefore, is that the volume of information at our disposal has increased but that it comes not as a neutral or impartial force. The South African university is having to confront this reality in heightened ways. While many institutions around the world have to deal with the realities, on the one hand, of colonialism and the subjugation of their *non-European* cultures, and, on the other, of their full absorption into the new global information revolution, what distinguishes the South African universities is that they were essentially founded on the principle of cultural superiority and inferiority. How the post-apartheid university, against this, understands development and understands its own agenda is deeply important. The question, in its fullness, speaks directly to the challenges that confront South Africa, and particularly to the way its colonial and racialised history of inequality at the local level pulls it in one direction while its dependence on the new global conditions over which it has little control pull it in another direction. What social, cultural and economic imaginations does a modern African social system cultivate for itself?

The university, I want to argue, is an important space for facilitating the emergence of new approaches to these questions. In presenting it as a critical site for facilitating this emergence, I want to develop for it a broader task than is generally constructed for it. At the heart of such a broader approach is knowledge and particularly the *informationally* dense form this knowledge takes. How does the university engage now with *all* that it knows?

### **The university for development: the two dominant approaches**

In this paper the pathways that are being defined for the South African university in relation to these challenges, are critically explored. For ease of exposition I describe this challenge as the challenge of the *University for Development*. Because development is such a contested idea, it is

important to bring to the surface those meanings about it that circulate in the South African environment. In the first part of the paper, I distinguish between two prominent approaches, that of the national patriotic university and that of the human capital-intensive university. How, I ask, do these two dominant approaches help us in *processing* all the information we are aware of in front of us? What do they help us see and what do they obscure for us? In the second part of the paper, through a critical engagement with the alternatives, I attempt to develop a new synthesis for where the university could be going. In the course of getting to this, I keep in mind Castells' warning about how universities should be managing themselves in critical times such as this. He makes the point that universities, as one of the primary sites for the processing of knowledge, should not just depend on the availability of technology itself. The technologies by themselves, he warns, introduce into institutions cultures that they themselves do not have full knowledge of, and, more critically, are not in control of (Castells, 2009:1). What this raises is the reality that we may not always be able to take full control of all the factors in the environments in which we function, but we do need to understand them better. In the South African context, where we have historically struggled with understanding the full complexity of the factors informing our social circumstances, it is in our interests to be better informed about the options before us. In doing so, I keep in mind Castells' caution that "the quality, effectiveness and relevance of the university system will be directly related to the ability of people, society and institutions" (Castells, 2009:1). He is talking about us, we who now operate in these institutions.

### ***The national patriotic university***

How does the state think we should be operating in these new conditions? The approach of the state is, as might be expected, by no means singular, coherent and consistent. Different ministries bring different emphases to their approaches. Formally, the state's agenda is defined by White Paper 3 which defines the task of the

university as being that of “meet(ing) the challenges of a new non-racial, non-sexist and democratic society committed to equity, justice and a better life for all” (Department of Education, 1997:5), while, simultaneously, striving to grow and enhance the country’s already strong research culture. Interpreters have taken away from White Paper 3 a number of emphases. How this base commitment to *non-racialism*, *non-sexism* and *democracy* is interpreted by the state is important to understand.

An important interpretation of this commitment is evident in recent comments made by key government figures about the university. In what follows, I try to show what this view is all about.

In June 2014 the Minister of Science and Technology at an Academy of Science of South Africa (ASSAf) conference on the humanities asked, “What is the language that the humanities have to offer to policymakers to contribute to the government’s vision of a prosperous, non-racial nation?” (Soudien, 2014a). She had suggested that the universities were not in their policies (and she had in mind a recent decision by the University of Cape Town to broaden its understanding of disadvantage beyond the use of ‘race’), reflecting the agenda of the state. What she meant was unclear, but she intimated that the University of Cape Town was not promoting the interests of black people. The president of the country, Mr Jacob Zuma, weighed in on the discussion and suggested that the mission of the university should be that of patriotism. He did not say that the universities were unpatriotic, but found himself in the midst of his closest allies who were of the view, as Jimmy Manyi, spokesperson for government at the time, said, that “universities could not ignore local issues in favour of ‘internationalism’”. Mr Zuma said that South Africa was a developmental state and ‘therefore its approach and attitude cannot be informed by European dictates’ (Redelinghuys, 2014: para 2).

What Mr Zuma meant by ‘patriotic’ is not without its subtleties. He argued that:

We must do everything possible to ensure that our universities never become what Antonio Gramsci described as ‘incubators of little monsters aridly trained for a job, with no general ideas, no general culture, no intellectual stimulation, but only with an infallible eye and a firm hand’. Graduates must emerge from universities as complete humans who have full appreciation of the history of our country, its present and its future. Students must emerge from universities as patriotic citizens willing to participate both in the conceptualisation and implementation of our progressive programme to transform society. We therefore need to reflect with regards to what extent our universities now reflect the changes that our country has been undergoing since 1994. (Zuma, 2014: line 75)

Implicit both in the tone and content of their questions of our universities was a sense of irritation with the universities. Academic freedom yes, but, as the President suggested, this academic freedom had to be used behind an already established progressive agenda – that of the state.

Central to this critique was and remains the contention that the foremost characteristic of the former white universities was their whiteness. They remained white in their orientation and, critically, white in whom they appointed. The *Report of the Ministerial Committee into Transformation and Social Cohesion in Higher Education*, prompted by a racial incident at the University of the Free State in 2008, found that there were problems of transformation at every institution. It made the comment that not a single institution in the country was free of challenge (Department of Education, 2008).

This critique provides one with a clear view of the kind of *development* in our society that this dominant approach would like to see. Professor Malegapuru Makgoba of the Transformation Oversight Committee, a committee instituted by Minister for Higher Education and Training Blade Nzimande, suggested that the sector was in deep transformation trouble. He had developed what he called an *equity index*, which purported to

measure the degree to which institutions had transformed in terms of their racial composition and in relation to their capacity to produce research. He found that “It could take 43 years to achieve racial balance among staff in universities” (Jenvey, 2013). His own institution he declared to be in the middle of the range of institutions which had made progress. It was both demographically more representative and more research productive than most. It presented itself, according to Makgoba, as the foremost institution in the country in terms of addressing its development challenges. In contrast were the *problem* institutions of the country. Amongst these were UCT and Stellenbosch which, as he said, would take hundreds of years to transform. While they were doing well in terms of their research, they were not including the country’s black people. This development took a further twist in the context of the debate around UCT’s admissions policy which had moved away from using ‘race’ as the sole basis for its affirmative action measures.

Makgoba, drawing on his equity index went on to make the point that:

Almost 20 years post freedom, the Equity Indexes for students and staff in the higher education sector show that transformation is not only ‘painfully’ slow but also embarrassingly so. It is an open question whether this self-regulation (in the guise of autonomy) should be allowed to continue or should be reviewed. Given the vast investment in higher education since 1994 (over R238 billion up to and including 2013), the equity return needs to be interrogated. The equity index study shows that it is difficult to transform ‘privilege’ voluntarily and suggests that extraordinary measures are needed.

The question remains as to the reasons behind this slow progress: is it passive resistance or a denial of failure by the sector? Is it the abuse of autonomy or an abhorrence of accountability by the sector? Has government failed to provide clear unambiguous steering or monitoring mechanisms or has it been cowed by the voice of the ‘privileged’ at the expense of the

disadvantaged majority, shying away from doing that which is common sense in a democracy? Or is it another intrinsic problem inherent or integral to higher education such as conservatism? (Govender, Zondo and Makgoba, 2013: 1-11).

I will return in the concluding section of the paper to a larger assessment of the significance of this view for working in a knowledge rich environment. But let us look first at the human capital view of the knowledge economy.

### ***The human capital imperative***

The way in which the human capital argument lands and takes flight in the South African context is essentially to argue that apartheid distorted the distribution of skills amongst the people of the country. The task of the new state and its knowledge producing institutions is then to ensure that these skills are available to everybody. In this the universities become drivers of opportunity. Writing from the vantage point of the universities of technology, De Beer (2010:91) describes them as not merely “old institutions with new names but (as institutions which) are facing the challenge of earning their rightful place in the South African higher education sector.... as sites of innovation and economic development....”

Two important illustrations of this argument are to be found in the *Human Resource Development South Africa Draft Strategy for Discussion 2010-2030* (HRDSA, n.d) and in the *National Development Plan (NDP)* (National Planning Commission, 2011). Neither document, it needs to be said, presents itself as a straight blueprint for human capital development. In both documents there is awareness of the issues of inequality. Nonetheless, the essence of the position taken is that human resource development is essential for “supporting national economic growth and development” (HRDSA, n.d: 7). Kraak (2003: 661) spelled out the problem as follows:

The skills problem is found not only at the high-skills end of the spectrum, but also in the intermediate and low skills. Each of the skills bands



is experiencing acute problems in human resources development.

Kraak's argument situated itself firmly in the dynamic of the global economy and its shift in orientation away from a focus on low-cost labour and cheap materials towards

high-quality, high value-added export orientated manufacturing and services. ... A necessary corollary to this new production regime has been the attainment of high participation rates in general education and in particular, the development of multi-functional skill capabilities.... (The latter) can be acquired only through high levels of general education on which appropriate forms of vocational and career-oriented training can optimally be built. (Kraak, 2003: 662).

A major issue in this analysis is the low participation rate in higher education. As Kraak (HRDSA, nd: 17) argued elsewhere, low enrolments in further education and training, poor outputs of middle-skills levels, poor throughput rates, declines in the number of full-time researchers, all point to the important role of the higher education sector and particularly the universities. The HRDSA (nd:17) went on to say that "These developments in education and training had a dampening effect on the economy at a time when there was increased need for priority skills due to economic growth and renewal."

In relation to this, the NDP places a great reliance on the universities: "The country's higher education system will make a critical contribution to economic and social progress, but performance of existing institutions ranges from world-class to mediocre" (National Planning Commission, 2011:18). And so it seeks to mobilise the country around critical education targets.

It is what these targets are that it is important to understand. The targets in the NDP relating to higher education are to:

- increase the higher education participation rate from 17 percent to 30 percent. Enrolments... will need to increase to 1 620 000 from 950 000 in 2010.

- increase the number of students eligible to study maths and science at university to 450,000 per year. The department has set a target to increase the number of learners eligible for bachelors programme to 300 000 learners by 2024, 350 000 learners who pass mathematics, and 320 000 learners who pass physical science.
- by 2030, to have 75 percent of academic staff with PhDs. The present figure is 34 percent.
- produce 100 doctoral graduates per million per year. That implies an increase from 1420 a year in 2010 to 5 000 a year (National Planning Commission, 2011:34-35).

In the HRDSA (n.d:37) strategy plan, which preceded the NDP, these translate into specific commitments and activities: "To increase the supply of skilled personnel in areas of science, engineering and technology."

How have universities worked with this injunction? The University of the Witwatersrand announced (University of the Witwatersrand, 2011, para 6) in its 2011 research report that its newly established Directorate for Research Development would focus on five priorities, namely:

- skills enhancement – developing non-technical skills;
- knowledge transfer – through one-on-one mentoring and coaching engagements between experienced and emerging researchers;
- recognition – recognising achievements in the realm of research;
- exploiting networks – linking researchers with appropriate funders; and
- removing barriers – assisting to remove or reduce (internal) hindrances to research (University of the Witwatersrand, 2011:9).

The *University of Technology* movement in the country has added impetus to these developments and has seen the establishment of new kinds of universities. While it is important to be

aware of how much these universities keep the social context in their sights, how they do this is significant. The primary mechanism for achieving social impact is through what De Beer (2010:94) describes as knowledge transfer: "They should be serving society, (assisting in) poverty reduction; establishing national infrastructure...; stimulating innovation and economic growth...." In this the universities are, as Hattingh (cited in De Beer, 2010:92) says, "among the most important actors in a national system of innovation.". There is even, in their rhetorical explanations of themselves, the commitment that they will include indigenous knowledge. But it is their emphasis on technology, as institutions which present themselves as the major interpreters of the information revolution which we should be understanding better. As Du Pre (2010: 10) says:

The aim of technology is to improve the lives of human beings. In relation to a university of technology it means that all teaching/learning programmes are related activities of a university of technology.... At universities of technology, then, science, engineering and management would have top priority.

### **Where to Now?**

How does one make sense of these two dominant approaches to agenda-setting in the country? How do they help us to become better *processors* of all the information we have in front of us? How, to return to the approach to *processing* I introduced at the beginning of this essay, do they help the universities make sense of what an appropriate agenda for themselves might be? If one is to work with the opinions of the agenda-setters themselves, the sector is beset by challenges. The view of the state is that the universities have failed to align themselves with its project. They have failed to bring into their midst the majority of the country's people, its black people. In terms of the second, the country is inadequately addressing its skills crisis and this then has a "dampening effect on the economy at a time when there was increased need for priority

skills due to economic growth and renewal" (HRDSA, nd: 17).

How do we respond to this? How do we make sense of these positions and how do they condition and influence our capacity to be better processors of knowledge?

I would like to suggest that neither the *state's view* nor the *human capital* approach presents a sufficiently penetrating framework for understanding the density and complexity of our informational demands. Neither provides the academy with a clear enough socio-cultural orientation to guide its *processing* work. Neither sees the challenge confronting the universities in its full complexity. What the approach of the state represents is a narrowly Africanist position. The state presents itself as a developmental agency acting for 'its people'. It sees 'its people', however, in racial terms. It constitutes the problem of the universities through a symptomatic emphasis on the effects of apartheid. What apartheid did was to systematically impede opportunity for access by people it classified as African into the university. And so, goes the response of the post-apartheid government, the agenda of the university must be to address this basic injustice. Access becomes then the determinative priority.

The university, therefore, has to make its primary task that of correcting the demographic imbalances in what universities look like. South African universities, of course, have the historic obligation of widening and accelerating access into their midst. This obligation is unchallengeable. They are morally, politically, and on the simple basis of the good sense of diversity required to be open. Openness is a value which they have to propagate. But a university can never construct its agenda on a limited understanding of access. It cannot use racial demographic representivity as the primary point of reference for the agenda it would wish to follow. Representivity can be made a desirable condition, but it cannot be projected as the basis for how the university should function. The point needs to be made that many South African universities have already achieved

what this agenda of the state is demanding, but show little sign of an increase in their capacity to *process* the information which is in front of them. They are complying with many of the policies developed by the state. What they are not doing is to innovate in relation to the problems which the society is facing. This requires complex information-gathering and information-processing capacity. This capacity is, of course, in the laboratories and in the seminar rooms where scholars are debating and making sense of the issues. But it is also in the libraries which are called upon now to be able to anticipate the kinds of issues and the quality of the information needed to make sense of these issues.

The libraries and their staff members thus have to understand much more clearly what the most relevant and pertinent information is that should be available to the scholars and the scientists in the university. It also bears emphasizing, as the example of many African universities demonstrates, that it takes more than replacing white figures with black figures to create the conditions inside the university for it to engage with the essential challenges in society. An important African intellectual Babuuzibwa Luutu commented in a recent address to a conference on transdisciplinarity that many universities in Africa had attempted what he called the Africanisation route and failed. The Africanisation he was talking of was the wholesale overhauling of the professoriate (Soudien 2014b). It had to be alert to the complexity of the information and their knowledge frameworks. It was not simply taking knowledge as it came from the West, but also knowledges which may previously have been suppressed and were now, as the world was becoming more open to alternative explanations of how the world worked, very much more available.

The human capital approach, similarly, reveals itself as a limited framework. Again, as in the approach of the state, it has the virtue of drawing attention to real challenges. It is a reality that apartheid produced a skewed labour market in

which high-level skills were reserved for people classified white. But the human capital approach sees the problem in exactly the same symptomatic way as the state's Africanist approach does. People were denied skills and so, therefore, it is the obligation of the state to redress this injustice. Appealing as this argument is at one level, and correctly requiring a systematic response on the part of the state, how the meaning of skills is constructed in this argument is problematic. It effectively narrows it down to a restricted idea of competence. The task of the universities is to make competent those who lacked this capacity before. The university's task is then effectively instrumentalised. What is not addressed is the selection and the substance of the competences. Not clearly brought into perspective are questions of whether the competences are by themselves sufficient, how they address questions of people's capacity to cope with the new conditions of the economy, and, critically, whether they provide young people emerging from the universities with the attributes to engage with the complexity of their society and the knowledges that may be required to operate in the society in critical and socially productive ways.

The point to emphasize is that neither the narrow Africanism of the state nor the limited instrumentalism of the human capitalists sees the complexity with which an information processing institution has to work.. I want to suggest that the circumstances we confront in South Africa demand even more. The racialised nature of our South African inequality has come to produce complex epistemological and ontological silences which we in the university are required to process. We now know this. We now know that the particular modernism that developed through colonial and apartheid South Africa structurally placed African systems of knowledge – customs, cosmologies, belief systems – in a position of inferiority. Out of this grew a modern scientific complex which at no stage engaged with African knowledge. Its assumption that African knowledge was inferior by definition meant that

none of the whole complex of what Africa had in its scientific repertoire about everyday life, about the relationship of human beings to the ecology in which they found themselves, about physical and psychological phenomena, counted for anything. The point now is that the ascendancy which dominant western knowledge enjoys in the university is enjoyed by virtue of the sheer assertion of power. Historically outstanding is the need for a reckoning, on completely different discursive terms, of what the value of this delegitimated knowledge is. The university has to acknowledge the historical condition of alienation that has accompanied its ascendance in the last 100 years. It is not just African people's physical access into the university which matters, but the full array of knowledges which have accompanied and supported their capacity to survive which the university needs to understand. At the core of the issue of the discussion is the full repertoire of approaches which African people have used to pose and solve the problems of their daily lives.

In confronting where we are now, the university needs to engage with the fullness of what we as a human species now knows. It is not just the affordances of new technologies and their extraordinarily powerful insights to which the university needs to apply its mind, but also how these new technologies relate to older apparently less useful and relevant understandings of the world. The critical unarticulated question is how we South Africans, who find ourselves in a socio-cultural environment in which the most advanced technologies exist side-by-side with older knowledges that have been deliberately marginalised, but which retain their significance in many people's lives, develop a new socio-cultural literacy which is radically multi-cultural. It is here, I suggest, that the university needs to assist. As a site which processes knowledge, how does it develop in its students the capacity to process the knowledge of the future and of the past? In doing this the university locates itself much more fully and more self-consciously in the full expanse

of history and possibility. What a modern and self-aware knowledge system that is acutely sensitive to its African locatedness looks like, is an especially important task of the university to address, and to become, as Castells (2009:1) argues, "the source of cultural renewal and cultural innovation which is linked to the new forms of living which we are entering".

In terms of these "new forms of living", it is important to note how new initiatives that have come into being in the country, such as the new Centre for Excellence in Scientometrics and Science, Technology and Innovation Policy (SciSTIP), approach the question of working with these changed information conditions. They emphasize the necessity of building the knowledge economy in South Africa in *inclusive* ways. In doing so they make clear an awareness of inequality (Making the Connection between Science and Society, 2014: 2). Signalling an awareness of approaching knowledge-production from a conscious ethical stance is important. Approaches such as these are important. They constitute critical developments for thinking about how the university presents itself as a site for the processing of complex information. But even they do not go far enough. What is needed is a clear response on the part of the universities that they understand the cognitive injustices in which they have been complicit as major participants. There has to be a new dialogue.

The terms of this dialogue need to begin with an acknowledgement of the multiplicity of the forms of information and forms of knowledge we have at our disposal. Critical in this is a recognition of the plurality of paradigms of knowing. This is what one might call an epistemic challenge. What do we do with this? We need to begin with the acknowledgement that historically we overlooked other approaches to making sense of the world around us. This is the beginning of a process of engaging with the historical questions of recognition amongst us. When we have done that, we need to begin a serious dialogue around the value of all the knowledges in our intellectual

orbit. This is at one level a matter of sharing what we know, the democratisation of knowledge. The principle behind this sharing needs to be clear. We need to assert the basic value that our stores of knowledge, our knowledge systems, our understandings of life and of our relationships with one another, can no longer be projected and defended on the basis of ethno- religio-, class- or cultural-centric claims. We are in a situation *now*, and this is important to understand, where we can no longer present ourselves to each other without explanation. We now need civilising procedures for how to deal with ourselves in each other's presence. Given how badly we have managed this challenge of being alongside of and in relation to each other in the past, our utter failure to appreciate our complex capacities, and our inability to see beyond our skins, the task before us is great. But, and this is the incredible learning opportunity before us, nothing can be taken for granted and so we are going to have to come to a much deeper appreciation of each other and of what we know. Hopefully what will come out of this is both self-affirmation and humility: the affirmation that we bring something different and the humility that we always have much to learn.

This is the challenge with which this set of readings grapples. This text emanates out of

South Africa, that complex child of modernity with its often unacknowledged and therefore unexamined racialised scientific epistemologies is an extraordinary moment in the sociology of knowledge. The modern South African university library has to place itself at the heart of this process. It has to see itself as a resource, as a site of facilitation for learning and so as constantly being able to anticipate the needs of knowledge-seekers. But, as knowledge is democratised and is available more freely, it has to learn how to work much more closely with everybody within its reach, including the makers of knowledge. It has to come to this new phase in which we find ourselves with an awareness of how political knowledges are, and that knowledges have histories. The demand on librarians is now great. They need to, as would have been the case in the past, know their subjects well. They now need to go beyond that. They need to see their subjects in their full complexity and be able to mediate the possibilities and the challenges that come with these knowledges. In this sense, the library is a powerful site for development, a space in which the value of information, data and knowledge, from all quarters, can be explored, critiqued and built upon.

---

## References

Castells, M. 1996. *The rise of the network society*. Oxford: Polity Press.

Castells, M. 2009. The role of universities in development, the economy and society. Transcripts of lecture given by Manuel Castells at UWC, August 2009. Available: [Http://www.chet.org.za/papers/role-universities-development-economy-and-society](http://www.chet.org.za/papers/role-universities-development-economy-and-society) (26 October 2014).

Castells, M. 2014. Reconceptualising development in the global information age. Public lecture delivered at STIAS, 5 June 2014. Available: <http://www.chet.org.za/papers/ma->

[nuel-castells-reconceptualising-development-global-information-age](#). (26 October 2014).

De Beer, D. 2010. Technology transfer at universities of technology – operating as new generation universities. *Kagisano Series*, 7(2010):89-112.

Department of Education. 1997. White Paper 3.A programme for the transformation of higher education. Pretoria: Department of Education.

Department of Higher Education and Training. 2008. *Report of the Ministerial Committee into Discrimination and Social Cohesion in Higher*

- Education*. Pretoria: Department of Higher Education and Training.
- Du Pre, R. 2010. Universities of technology in the context of the South African higher education landscape. *Kagisano Series*, 7(2010):89-112.
- Govender, K.S, Zondo, N.P. and Makgoba, M.W. 2013. A new look at demographic transformation for universities in South Africa. *South African Journal of Science*, 109 (11/12):1-11).
- Human resource development strategy for South Africa (HRDSA). [nd] Available: [http://www.hrdcsa.org.za/sites/default/files/documents/microsoft%20Word%20-%20StrategyHRDSA%20Strategy.doc\\_0.pdf](http://www.hrdcsa.org.za/sites/default/files/documents/microsoft%20Word%20-%20StrategyHRDSA%20Strategy.doc_0.pdf) (23 October 2014).
- Jenvey, N. 2013. Race 'Equity Index' for universities stirs controversy. *University World News*, 294. 1 November, 2013. Available: [www.universityworldnews.com/article.php?story=20131031122032172](http://www.universityworldnews.com/article.php?story=20131031122032172) (19 October 2014).
- Kraak, A. 2003. HRD and the skills crisis. In *HSRC Human Resource Development Review 2003: Education, Employment and Skills in South Africa*. Cape Town: HSRC Press, page 661-683.
- Making the Connection between Science and Society. 2014. *Mail and Guardian*, Advertising Supplement, Nov 7-13, page 2.
- National Planning Commission. 2011. *National Development Plan*. Pretoria: National Planning Commission. Available: <http://www.npconline.co.za/medi->
- [alib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res-pdf.](http://www.npconline.co.za/medi-alib/downloads/home/NPC%20National%20Development%20Plan%20Vision%202030%20-lo-res-pdf.) (19 October 2014).
- Redelinghuys, J. 2014. Weep for our universities. In *Daily Maverick*, 07 September 2014. Available: <http://www.dailymaverick.co.za/opinionisat/2014-09-07-weep-for-our-universities/>. (3 August 2015).
- Setumo, S. 2014. Zuma calls for patriotic universities. *Business Day BDLive*. 05 September 2014. Available: <http://www.bdlive.co.za/national/education/2014/09/05/zuma-calls-for-patriotic-universities.> (23 October 2014).
- Soudien, C. 2014a. Notes taken at Academy of Science South Africa Conference on the Humanities, Opening Talk by Minister of Science and Technology, Naledi Pandor. Pretoria, 25 June 2014.
- Soudien, C. 2014b. Notes of keynote address given by Professor Babuzibwa Luutu, at the South African Research Chair Initiative on Education Development, Unisa, Pretoria, 2 December 2014.
- University of the Witwatersrand. 2011. Research report 2011. Available: [http://www.wits.ac.za/files/06fif\\_515337001369293212.pdf](http://www.wits.ac.za/files/06fif_515337001369293212.pdf). (03 August 2015).
- Zuma, J. 2014. Address by President Jacob Zuma on the occasion of the celebration of the first year anniversary of the Progressive Professionals Forum, Gallagher Estate, Midrand. Available: <http://www.thepresidency.gov.za/peb-ble.asp?relid=17959&t=107>. (3 August 2015).

# Chapter Three

## Curriculum Content and Delivery: South African LIS Education Responses to a Changing Information Landscape

**Jaya Raju**

Library and Information Studies Centre, University of Cape Town  
Email: jaya.raju@uct.ac.za

*Review status: Peer reviewed*

---

### Introduction

In a highly networked 21<sup>st</sup> century digital information landscape, Library and/or Information Science (LIS) education carries the responsibility of producing graduates who are able to effectively mediate this dynamic environment. Rapidly evolving information and communication technologies (ICTs) have dramatically transformed library and information services, particularly in the higher education environment where it has led to a revolution in scholarly communication (Riley-Huff & Rholes, 2011; Goetsch, 2008). This in turn has impacted on the knowledge and skills requirements of professionals practising in the information environment. Hence LIS curriculum content and delivery need to respond appropriately to the knowledge and skills demands of this changing information landscape. This paper, taking a mixed-methods research approach, uses qualitative and quantitative data gleaned from relevant literature, an email questionnaire survey of LIS school heads in South Africa coupled with an appraisal of the websites of these schools, and content analysis of recent relevant job advertisements, to address the following critical question: How has LIS education in South Africa responded to the dynamic information landscape? Using what is referred to as heutagogical teaching and learning theory (Hase & Kenyon, 2000), this paper focuses on South African LIS schools' curriculum content and delivery responses to a fast evolving information environment. The outcome of this in-

quiry, it is hoped, will highlight critical issues relating to LIS education in South Africa in an information age impacted on by rapid technology developments.

### Theoretical framing

It is common knowledge that the use of ICTs has changed higher education pedagogy. Examples include: the adoption of online learning or e-learning using Web 2.0/3.0 interactive technology, blended delivery of instruction (combination of online and face-to-face learning), synchronous and asynchronous communication, virtual use of audio-visual media as well as text, educational resources being freely available via the Internet (OERs) and the seamless access to information resources for educational purposes via open journal publishing and institutional repositories - with much of this being mediated via mobile devices such as smartphones and tablets. In such an environment of constant change, virtual engagement, and a high degree of mobility and flexibility, what is taught (content) and how it is taught (delivery) become critical. Hase and Kenyon (2000) found that traditional teacher-centered methods and practices of teaching (pedagogy – for example in primary and secondary schools) and adult student-centered teaching (andragogy – for example, in higher education) were not entirely satisfactory in meeting the learning needs in contemporary 21<sup>st</sup> century society in which “information is readily and easily accessible”. Hence they built on existing humanistic theory to formulate the heutagogy teaching

and learning theory which will be more suitable to the digital information environment as it focuses on self-determined or self-directed learning (Hase and Kenyon, 2000). For Hase and Kenyon (2007) the “unpredictability and turbulence of the [digital] environment” required a heutagogical approach to education to develop “capable” individuals who have high self-efficacy, know how to learn, are creative, have the ability to use competencies in familiar as well as in new situations, and work well collaboratively (Myburgh & Tammaro, 2013: 223).

According to Myburgh and Tammaro (2013: 225) “heutagogical approaches place the ultimate responsibility for learning on the learner, who must develop self-directive competencies” and hence the usefulness of this approach to “methods of educating information professionals”. Such self-directed learning is “dependent to a large extent on information – connecting with others and sharing ideas, discovering and sharing information, and collecting and making meaning of information” (Myburgh & Tammaro, 2013: 225). The use of ICTs, explained Myburgh and Tammaro (2013: 227), supports the heutagogical approach because it facilitates learner generated content (e.g. blogs, wikis, websites, Facebook annotations, and Twitter notes), active engagement in the learning process, group interactions and reflective practice. The heutagogical approach is also closely associated with critical pedagogy and constructivist approaches to learning, both of which encourage learners to view the world critically and to build their own meaning of the world drawing from their experiences and engagements with reality. The latter learning approaches, claimed Walster (1995: 247), lent themselves to LIS education in the 1990s as they were well suited to learning environments involving “online instruction, interactive environments, electronic access, and electronic training...” which emerged during this time. The characteristics of these approaches to teaching and learning in which contemporary context and sense making by learners themselves are central, are used in

this paper to ascertain South African LIS education responses (in terms of curriculum content and delivery) to a changing information landscape.

### **Review of selected literature**

“That technology has wrought tremendous changes ....some will even claim...havoc...in the [LIS] professional and educational domain alike, will not be denied by many”, claimed De Bruyn (2007: 111). Erdman (2008: 94) made reference to a “field [that is, LIS] where the line between librarian and computer tech is blurred more and more”. Hence the re-defining of LIS jobs and the emergence of new job titles such as ‘Digital Strategies Librarian’, ‘Digital Technologies Librarian’ and ‘Teaching and Learning Librarian’ (*Redefining LIS jobs*, 2007). Accordingly, LIS education course content the world over began to show evidence of increasing infusion of ICTs as well as a broadening of curricula in response to “broader information environments that transcended traditional libraries” (Ankem, 2010: 214-215). To support this broadening of the scope of their teaching offerings some LIS schools entered into “strategic alliances” with other academic disciplines so as to draw on their knowledge and expertise or hired teaching staff from other disciplines (Ankem, 2010: 215) such as Computer Science, Information Technology, Information Systems, Software Engineering. Raju (2013: 250) reported that LIS schools have come to “include the ‘I’ word or to even omit the ‘L’ word to embrace diversification caused by evolving...ICTs”. And more recently, some LIS schools have chosen a more distinct paradigm shift to become iSchools which focus on embracing the issues, opportunities and challenges of the information age (Bonnici, Subramaniam & Burnett, 2009: 264) generally and not libraries per se. On the whole, the picture is one of a highly turbulent environment, both educationally and professionally.

The broadening or diversification of the LIS curriculum in response to the impact of evolving ICTs on the information landscape, brings with it the challenges of defining the core LIS curriculum



to meet the demands of the modern information workplace. IFLA (International Federation of Library Associations and Institutions), in its 2012 revisions to the *Guidelines for Professional Library/Information Educational Programs* (IFLA, 2012: 2), remarked not only on the need to accommodate the “Internet and other digital technologies” into the core of LIS education but also obliquely referred to the blurring of boundaries between LIS and related disciplines (alluded to earlier), indicating the diffuse and diverse nature of the evolving information landscape – and hence the challenge of pinning down an educational core.

Miller (2007: 203) questioned, in the context of the need for LIS professionals in the current digital age, to “understand and help to augment” the teaching and learning process [particularly in higher education], whether new LIS graduates have the required knowledge and skills to “meet the demands of this new era of information access and learning”. Hence in his study, Miller (2007: 203) called for “a need to recalibrate the LIS core curriculum”. He usefully pointed out that despite LIS “competing with other [information related] disciplines, it still held the professional corner” when it comes to teaching people to be efficient and effective in their search for information (particularly in the complex digital terrain). Hence Miller (2007: 206) argued for not just the inclusion of technology knowledge and skills in the LIS core curriculum, but, very importantly, pedagogical knowledge and skills as well. Technology has shifted the focus from the intermediary activities of librarians (e.g. reference work) to empowering the end-user to effectively and efficiently navigate the complex digital information terrain (Riley-Huff & Rholes, 2011: 131). Hence the need on the part of academic librarians for understanding of pedagogy and instructional design theory and practice (Miller, 2007: 207) which has not, traditionally, been part of the education and training of LIS professionals.

Miller (2007: 213-215) recommended that LIS

education should look to the discipline of Educational Technology to strengthen its core curriculum with the inclusion of teaching and learning for librarians. In proposing a “course template” including both technology and pedagogy for librarians, he interestingly added teaching and learning theory relating to curriculum delivery, for example, distance education and learning management systems, and explained that his proposed course would be delivered to students in a “hybrid (that is, blended – combination of face-to-face and online learning) environment” using “course management software” that may “be easily adapted to be offered totally as an online course”. Innovative curriculum content delivery (blended or online formats) has much relevance for LIS education in the current digital age as it presents opportunities for it to reach a wider audience of students and here again, LIS education would need to reach out to other disciplines, such as Educational Technology, to manage this form of content delivery with efficiency. Mezick and Koenig (2008: 604) made the useful observation that with virtual delivery of curriculum content, “learning is reinforced because the medium of delivery is also the subject matter” in that LIS students “utilize the very systems that they will be using in the workplace”; the virtual learning environment allowed students “to learn from the environment as well as from the content of the course”. It is also transformative in that it allows both students and educators to become more online-focused in an e-learning higher education environment.

Raju (2014: 169), in a study of the knowledge and skills required for LIS professionals to effectively mediate a digital era academic library, concluded that a “blend of discipline-specific knowledge, generic skills (general skills that apply to all disciplines e.g. problem solving) and personal competencies (attitudes, values and personal traits)” was required. Hence it is the responsibility of LIS educational programmes to strengthen these various skills sets. Discipline-specific knowledge would always remain at the

core of LIS education. However, Bronstein (2007: 74) pointed out that personal competencies, which she referred to as “personal or social skills”, are difficult to identify and measure. Nonetheless, she posited that it was important for LIS programmes to develop areas of study that focus on developing students’ social skills as such skills (e.g. interpersonal skills, teamwork, ability to respond to the needs of others) are required to strengthen a user-centered approach to information work. This assertion is particularly important in view of the fact that technology, specifically the Internet, has led to the democratization of access to information (De Bruyn, 2007: 109), whereby the focus has shifted from the information professional as the intermediary to the end-user of information. Hence the importance of a user-centered approach to information work which requires well developed social skills on the part of LIS professionals.

This review of selected literature highlights trends relating to the impact of rapidly evolving technology on the LIS workplace, particularly in the higher education environment, and the implications of resulting workplace skills and competency requirements for the depth and breadth of LIS curriculum content as well as its delivery to students preparing for professional participation in a dynamic information environment.

### **Empirical component**

The characteristic features of Hase and Kenyon’s (2000; 2007) heutagogical teaching and learning theory which more appropriately addressed the learning needs for a digital information environment, together with learning requirements for such an environment identified from the literature reviewed, were used to identify trends from a 2014 email questionnaire survey of LIS school heads (HoDs) in South Africa (around issues of new themes taught, curriculum delivery modes and staff expertise using open-ended questions) as well as from content analysis of the websites of these nine LIS Schools which were currently operational. Data extracted from these empirical sources, as evidence of current

curriculum content and delivery in LIS education in South Africa, were also juxtaposed against knowledge and skills requirements extracted through content analysis of the job requirements in 2014 job advertisements emanating from the academic library sector which seems to be the most affected by rapidly evolving ICTs. The juxtaposition was to ascertain whether LIS education in South Africa was speaking to the knowledge and skills needs of the digital information environment.

Content analysis of job advertisements is a well-established method of ascertaining requirements of the employment market (Orme, 2008: 620, 623; Ocholla & Shongwe, 2013: 35). The learning needs for a changing digitally oriented information environment identified in the literature were populated on a chart (see Table 1) and frequency counts of these were recorded in the columns representing LIS schools (HoDs’ responses and website analyses) and job advertisement requirements. It was considered useful to combine LIS school HoDs’ responses and website analyses as together these two sources of data represented the positions of the individual LIS schools in the areas being probed.

This mixed methods approach was useful in “drawing on both qualitative and quantitative research” for a “more complete understanding” of the research problem (Creswell, 2014: 218) articulated in the question: How has LIS education in South Africa responded to the dynamic information landscape? The LIS schools surveyed were those from the Universities of Fort Hare, Cape Town, KwaZulu-Natal, South Africa, Limpopo, Zululand, Pretoria, Western Cape and the Durban University of Technology (nine currently active LIS schools in South Africa. There was no response from Walter Sisulu University or an active LIS school website for it. Thirty (30) academic library professional level job advertisements were analysed; these were systematically collected during 2014 from the weekly *Mail & Guardian* newspaper (a popular source of advertise-

ments in the higher education sector in South Africa) as well as from the online source *LiasaOnline* (listserv of the LIS professional body in South Africa) and related online lists to allow for the current trend in the digital environment where organisations choose to advertise jobs online only (Reeves & Hahn, 2010: 118), largely to cut costs. Table 1 presents the analysis of data in a “mixed methods data analysis” form which involved “the mixing of two forms of data [qualitative and quantitative] concurrently and sequentially in a single project” (Creswell & Plano Clark, 2011: 212).

### **Discussion of findings**

It is clear from Table 1 that, in terms of discipline-specific knowledge or what is referred to as professional knowledge, there is 100% correlation between presence of this in the curriculum content of all nine LIS schools and the requirements of the workplace, in the case of the academic library sector. The same is evident (see Table 1) for relevant technology infusion into LIS curricula in South Africa – the literature reports (Ankem, 2010: 214-215) that LIS schools the world over (and South Africa is not any different) have increasingly infused ICTs into their curricula in response to the impact of evolving technology on the LIS professional domain. However, within the South African LIS educational domain not all nine schools have introduced new curriculum themes and relevant technology skills at the same pace in response to the changing information landscape. For example, one LIS school HoD admitted, in some instances, to “lagging behind international changes to the information landscape”, while other schools seem to have pushed ahead since 2010 with new offerings in areas such as Research Librarianship, Digital Curation, and Content Management Systems and Repositories, covering topics such as the Open Movement (open access, open content e.g. OERs, open data, etc.), HTML and XML, RDA and Dublin Core, Online AACR2 and Online Dewey, and Virtual Reference.

In terms of curriculum delivery, all nine LIS schools (according to the heads surveyed) have,

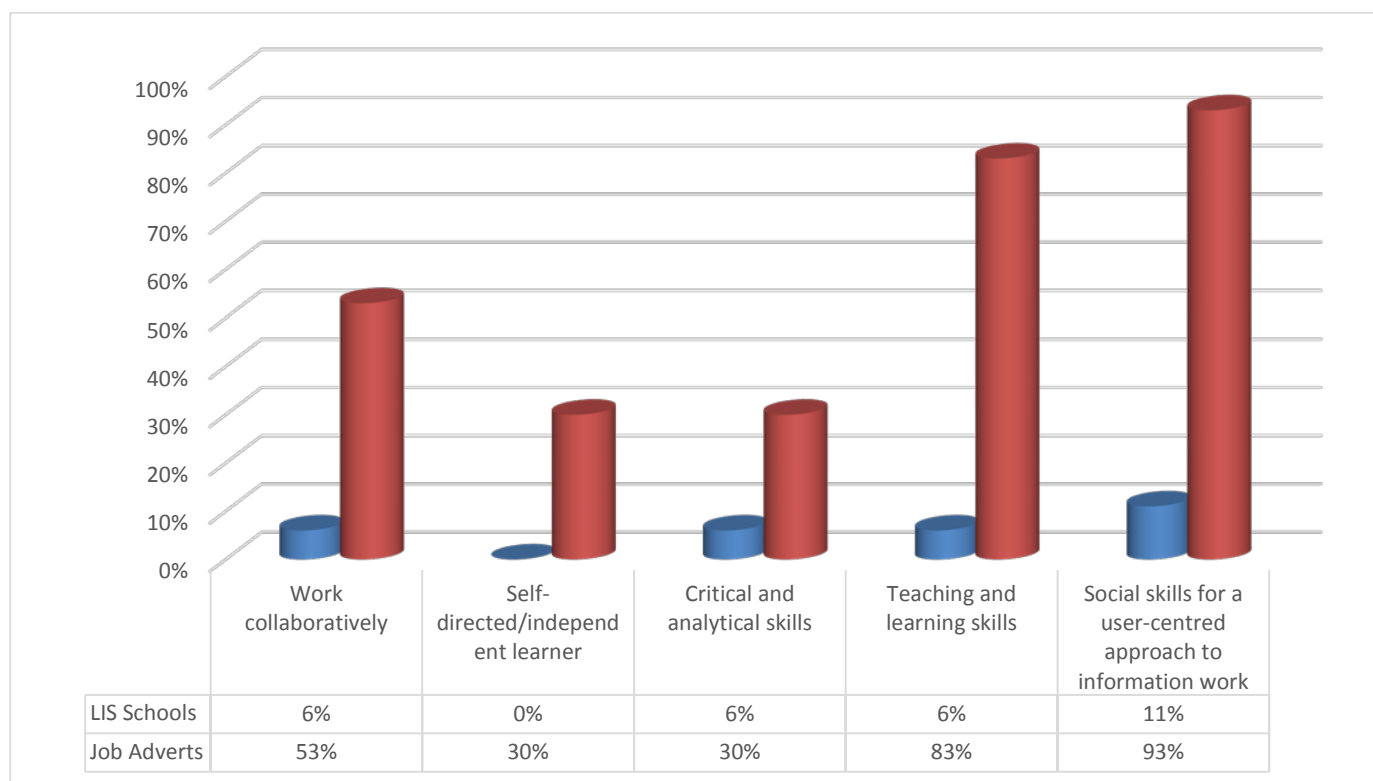
in one way or another, exploited available technology to embark on new curriculum delivery methods to reach a wider audience of learners. These include, Blackboard, Moodle, Videoconferencing, Vula (institution specific and Sakai supported) coupled with ‘block release’ student registrations, blogs, online discussion forums, social media (Facebook and Twitter) and blended delivery (combination of face-to-face and online learning). While some schools’ websites were very detailed and up-to-date, others were not as current and comprehensive - this could probably explain why Table 1 reflects only a 61% presence for online delivery modes despite the 100% response on this issue from LIS HoDs. Academic libraries, strangely, in their job advertisements do not seem to be interested in online instruction skills despite a significant 83% interest (see Table 1 and Figure 1) in hiring professionals with some teaching/instruction skills and the literature (Mezick & Koenig, 2008: 604) emphasizing the value of online learning in teaching users how to access information. While one or two LIS school heads claimed that it is still early days and they are “still experimenting” and hence success of curriculum delivery via new delivery methods is difficult to ascertain, most of the nine schools were satisfied with their new delivery methods with some commenting that both students and academics enjoyed the flexibility it offered and the “ease at which [sic] data can be updated and the quick feedback [that is possible]”. In fact Hase and Kenyon (2000; 2007) observed that it is precisely for these reasons that online learning is so conducive to self-generated learning which is core to heutagogical education.

Regarding main challenges relating to delivery of new curriculum content in the current digital age, LIS school HoDs listed a variety of issues, including Internet access difficulties, meeting the learning needs of a diverse cohort of students, competition from “cognate institutions”, variations in students’ digital literacies, diversity of delivery technologies, attracting students to the programme, and inertia on the part of especially

Table 1: Indications of heutagogical approaches to education in South African LIS Schools

| Learning needs for the changing digitally oriented information environment to produce <b>“capable” individuals (Hase &amp; Kenyon 2000; 2007) for this environment</b> | LIS Schools (HoDs’ responses & website analyses) |              | Job advertisement requirements |              |
|--|--|--------------|--------------------------------|--------------|
|  | <i>Frequency</i>                                 | <i>% age</i> | <i>Frequency</i>               | <i>% age</i> |
| High rate of self-efficacy   | -  | 0%           | 2                              | 7%           |
| Know how to learn  | -  | 0%           | -                              | 0%           |
| To be creative   | -  | 0%           | 7                              | 23%          |
| To be able to use competencies in familiar and new situations  | -  | 0%           | 4                              | 13%          |
| To be able to work well collaboratively  | 1  | 6%           | 16                             | 53%          |
| To be a self-directed/independent learner  | -  | 0%           | 9                              | 30%          |
| Make meaning of information in its context/construct knowledge using own experiences   | 1  | 6%           | 1                              | 3%           |
| Engage in reflective practice  | -  | 0%           | -                              | 0%           |
| To be critical and analytical  | 1  | 6%           | 9                              | 30%          |
| Have discipline-specific/professional knowledge and skills   | 18   | 100%         | 30                             | 100%         |
| To be technology (ICTs) proficient   | 18   | 100%         | 30                             | 100%         |
| To be skilled for the broader information environment (and not just traditional libraries)   | 17   | 94%          | -                              | 0%           |
| Have teaching and learning (pedagogical) skills to instruct others on accessing information  | 1  | 6%           | 25                             | 83%          |
| To be able to teach and learn via online instruction using learning management systems/software  | 11   | 61%          | -                              | 0%           |
| Social skills for a user-centred approach to information work (client/learner focus, communication skills, interpersonal skills, etc.)                                 | 2  | 11%          | 28                             | 93%          |
| <b>TOTAL</b>   | <b>9 + 9 (18)</b>                                | <b>100%</b>  | <b>30</b>                      | <b>100%</b>  |

Figure 1: Selected learning needs: LIS Schools and Job advertisement requirements – comparison



older academics to embrace new knowledge and new technologies relevant to the LIS discipline. These are understandable and anticipated issues, many of which require medium to long-term institutional responses.

In view of the diversification of LIS curricula, globally, to en-skill graduates for a broader information market, as articulated in the literature (Ankem, 2010: 214-215) as well as by LIS schools in South Africa (see the 94% presence of this trend in Table 1), it is surprising that the majority of these schools (according to the HoDs surveyed), if they did make any new appointments in the last five years, did so from among LIS generalists. There were just one or two cases of an appointment of a LIS or IS (Information Science) academic with specialist expertise in Information Technology or Knowledge Management or Archive and Records Management. There were only three schools who made appointments in the last five years from disciplines outside of L/IS, and these have been from cognate disciplines such as Computer Science, Enterprise Content Management/Digital Curation, Law, Education, and Agricultural Information Systems. Perhaps this will

grow in the future to join the international trend reflected in the literature (Ankem, 2010: 215) where it is not uncommon to find LIS schools broadening their focus through “strategic alliances” with other cognate disciplines or hiring of staff from these disciplines. This not only addresses viability and diversification issues but also promotes interdisciplinarity which is much valued in higher education teaching and research. That Table 1 reflects a nil score in this learning area for employer requirements as opposed to 94% on the part of LIS schools is not necessarily anomalous, as it is the responsibility of LIS schools to ensure the employability of their graduates by broadening their skills base; that is, this forward thinking role sits with the education sector rather than with the employment sector.

It is evident in Table 1 that heutagogical education places more emphasis on generic skills compared to discipline-specific knowledge and skills, a point re-iterated by Hase and Kenyon (2000) when they explained that in a 21<sup>st</sup> century world where “information is readily and easily accessible” and where “change is so rapid”, disci-

pline-based knowledge does not adequately prepare one “for living in modern communities and workplaces”; that “modern organisational structures require flexible learning practices”. Hence one finds the dominance of generic skills in heutagogical education (see Table 1). It is interesting to observe in Table 1 that, in almost all of these generic learning areas, South African LIS schools have a very meagre showing. One may argue that much of this skills training is embedded in the curriculum and hence not overtly visible via LIS schools’ websites and curriculum outlines. The proponents of heutagogical education may argue then that this lack of visibility may also be interpreted as a lack of emphasis on these critical learning areas as opposed to the prominence given to discipline-based knowledge and skills.

Figure 1, in the form of a bar graph, highlights six of these generic learning areas from Table 1 to draw attention to the fact that despite demands from the employment sector (in this case academic libraries) for these generic skills needs, evidence from LIS schools seem to indicate an under-performance in these areas. A worrying revelation in this illustration (Figure 1) is the 83% demand in job advertisements for teaching and learning (pedagogical) skills and a mere 6% showing from the LIS schools. This is an area, particularly, that needs immediate attention on the part of LIS schools as the literature (for example, Miller, 2007: 207) is vocal about the need for information professionals to understand pedagogy and instructional design and theory to be able to empower the end-user to learn to navigate the complex digital information terrain to contribute to him/her becoming a self-directed and independent learner. A further area of concern is that of social skills for a user-centered approach to information work (see Figure 1) where, again, LIS schools fall far short of employer requirements. The literature (for example, De Bruyn, 2007: 107) explains that technology, particularly the Internet, has shifted the focus from the information

professional as the intermediary to the end-user of information. For this reason social skills such as user/client-centered orientation, become critical.

## Conclusion

This paper addressed the question: How has LIS education in South Africa responded to the dynamic information landscape? It focused on LIS education in terms of curriculum content and delivery and in doing so framed the enquiry using a heutagogical approach to education which is deemed appropriate to educational preparation for a changing and highly digitised information landscape of the 21<sup>st</sup> century because of its focus on current context and the centrality of the learner in directing his/her own learning. Such an analysis, using a mixed methods research approach for data collection from relevant literature, LIS schools and relevant job advertisements revealed that while LIS schools in South Africa are on the whole doing well in the current digital information context in terms of discipline-specific/professional knowledge and skills (including technology imperatives) *vis-à-vis* employer requirements, they have not come off well in the generic learning areas which, according to Hase and Kenyon (2000; 2007: 112), are critical to producing “capable” people for “capable” organisations. Amongst these deficiencies, two learning needs that require urgent attention by LIS schools in South Africa are those associated with 1) teaching and learning skills for information professionals, which traditionally have not been part of the education and training of information professionals; and, 2) social skills for a user-centered approach to information work, especially in the context of the “democratisation of access” to information made possible by technology and the resulting “emancipation” of the end-user of information (De Bruyn, 2007: 109) that is so vividly expounded in the literature.

## References

- Ankem, K. 2010. The extent of adoption of Internet resource-based value-added processes by faculty in LIS education. *The Canadian Journal of Information and Library Science*, 34(2):213-229.
- Bonnici, L. J., Subramaniam, M. M. and Burnett, K. 2009. Everything old is new again: the evolution of library and information science education from LIS to iField. *Journal of Education for Library and Information Science*, 50(4):263-274.
- Bronstein, J. 2007. Current trends in library and information studies curricula around the world. *Journal of Information, Communication & Ethics in Society*, 5(2/3):59-78. DOI: 10.1108/1477990710837579.
- Creswell, J.W. 2014. *Research design*. 4<sup>th</sup> ed. Los Angeles: Sage.
- Creswell, J.W. and Plano Clark, V.L. 2014. *Designing and conducting mixed methods research*. 2<sup>nd</sup> ed. Los Angeles: Sage.
- De Bruyn, T. 2007. Questioning the focus of LIS education. *Journal of Education for Library and Information Science*, 48(2):108-115.
- Erdman, J. 2008. Education for a new breed of librarian. *The Reference Librarian*. 47(2):93-94. DOI: 10.1300/J120v47n98\_8.
- Goetsch, L.A. 2008. Reinventing our work: new and emerging roles for academic librarians. *Journal of Library Administration*, 48(2): 157-172. DOI: 10.1080/01930820802231351.
- Hase, S. and Kenyon, C. 2000. *From andragogy to heutagogy*. Melbourne: Ultibase, RMIT University. Available: <http://pandora.nla.gov.au/nph-wb/20010220130000/http://ultibase.rmit.edu.au/Articles/dec00/hase2.htm> (11 November 2014).
- Hase, S. and Kenyon, C. 2007. Heutagogy: a child of complexity theory. *Complicity: an International Journal of Complexity and Education*, 4(1):111-118.
- International Federation of Library Associations and Institutions (IFLA). 2012. *Guidelines for professional library/information educational programs*. Available: <http://www.ifla.org/publications/guidelines-for-professional-library-information-educational-programs-2012> (17 November 2014).
- Mezick, E.M. and Koenig, M.E.D. 2008. Education for information science. *Annual Review of Information Science and Technology*, 42(1):593-624.
- Miller, M.J. 2007. Information communication technology infusion in 21<sup>st</sup> century librarianship: a proposal for a blended core course. *Journal of Education for Library and Information Science*, 48(3):202-217.
- Myburgh, S and Tammaro, A.M. 2013. *Exploring education for digital librarians: meanings, modes and models*. Oxford: Chandos.
- Ocholla, D. and Shongwe, M. 2013. An analysis of the library and information science (LIS) job market in South Africa. *South African Journal of Libraries and Information Science*, 79(1):35-43. DOI: 10.7553/79-1-113.
- Orme, V. 2008. *You will be ...: a study of job advertisements to determine employers' requirements for LIS professionals in the UK in 2007*. *Library Review*, 57(8):619-633.
- Raju, J. 2013. The LIS school in the ICT age: a casualty, or a catalyst for a paradigm shift? – the case of South Africa. *Libri*, 3(3):250-258. DOI: 10.1515/libri-2013-0020
- Raju, J. 2014. Knowledge and skills for the digital era academic library. *The Journal of Academic Librarianship*, 40:163-17. DOI: 10.1016/j.acalib.2014.02.007.
- Redefining LIS jobs*. 2007. Available: [www.techsource.ala.org](http://www.techsource.ala.org) (27 November 2014).
- Reeves, R.K. and Hahn, T.B. 2010. Job advertisements for recent graduates: advising, curriculum, and job-seeking implications. *Journal of Education for Library and Information Science*, 51(2):103-119.
- Riley-Huff, D.A. and Rholes, J.M. 2011. Librarians and technology skill acquisition: issues and perspectives. *Information Technology in Libraries*, 30(3):129-140.

Walster, D. 1995. Using instructional design theories in library and information science education. *Journal of Education for Library and Information Science*, 36(3):239-248.



## Chapter Four

# Dancing with Ambiguity – the Wonder of Randomness

**Steyn Heckroodt**

Westford School of Management

Email: steyn@westford.org.uk

*Review status: Peer reviewed*

---

I was tasked to talk about “what change is?” at the LIS75 Commemorative Conference – more specifically, to consider what change is through the lens of its significance to education. Why is it, I’ve been asked, that we need to change to make higher education more relevant? How do we ensure that the higher education system matches the needs of new students, and students who are returning for new or advanced programmes? Who needs to change, and how?

Certainly, by no means a small salvo of questions. So, let us take an analytical view of the topic first, before we attempt a systemic one.

In the weaving of my topic, the authors I consulted considered the following concepts and aspects: Change, lens of significance, education, why the need to change. They highlighted the following assumptions: – there is a need for relevance, to match needs for new students and returning students. And the assumption is also that there is a difference between new and returning students, and undergraduate and advanced programmes. These aspects and assumptions prompt the question, “who needs to change and how?”

Certainly, I was offered a dictionary of aspects, concepts and questions curtailed into one quilt of a topic.

Now – let us attempt a systemic view of this topic by summarising its essence. The essence, as I’ve extracted it, boils down to the following: *“Ensuring Higher Education sustainability through innovative change and flexibility”*.

Embedded in this systemic version of the topic under discussion, are some of the answers

to the original question: Why do we need to change? Well, I would argue, for the simple sake of sustainability, which has always been the primary driver of change – at least in the business world. And today, as a matter of fact for many decades, Business Schools and so-called Higher Education Institutions, are not just schools, they are also businesses with a market, with needs, with financial viability, feasibility and sustainability requiring certain Key Performance Indicators (KPIs) that drive these as imperative business practices. However, businesses as entities are finding themselves at the intersection of change and reaction to change where the speed, randomness and unpredictability of change are superseding our ability to prepare for this nature of change. Hence, innovative change becomes the new KPI which organisations have to embrace for the sake of sustainability and in this sense Higher Education Institutions are no different. As a matter of fact, they experience it much more urgently as they are the entities to which businesses look for answers in terms of preparing for this sweeping randomness in change the world is experiencing.

The title of my narrative: ‘Dancing with ambiguity – the wonder of randomness’ has specific significance and has by no means been chosen randomly. In fact, had I not myself been willing to change at one stage as senior lecturer at the Dutch Sudanese Management Centre (Business School of the Netherlands’ initiative providing European accredited management training in the heart of Khartoum – capital of Northern Sudan) I too would have found myself

at the peril of becoming irrelevant – the irrelevance that threatens many a lecturer, teacher, trainer and most training and education institutions (higher and otherwise) today.

You see, where I found myself in the heart of a country engulfed in a civil war, a military regime and imposed international sanctions, it's a bit difficult not to think differently about Porter's Five Forces (Manktelow & Carlson, 2014) and conventional PESTLE methodologies (Heckroodt, 2013) with which we scan the environment (Choo, 2003), if the same environment is so disrupted that the very conditions that gave rise to these frameworks, methodologies and paradigms of management simply do not exist. It is in these circumstances when the very constructs that gave rise to the paradigms through which we view the world, evolve from enablers to limitations, to stumbling blocks.

So – in asking me what needs to change and how we need to change as providers of Higher Education, I would venture to say that the answer lies in a fundamental questioning of the building blocks of Higher Education and the assumptions on which they rest, underpinning the paradigms that we have used for decades to shape our environment conceptually.

Today, as Senior Lecturer at Stellenbosch Business School and guest lecturer to four international business schools and private education institutions globally, I have to agree with Dr. Johan Roos, Dean and Managing Director of Jönköping International Business School (JIBS), where he also holds a professorship in strategy (including a period from 2009 to March 2011 when he served as President of Copenhagen Business School) that the educational institutions where our future business leaders are being trained, must be dramatically recalibrated and transformed.

Roos carries on to say that business education today is anachronistic in both how it is conducted and on what it focuses its content. Our brick institutions have in no way caught up with what today's technologies make possible in terms of

virtual learning and individualised, customised instruction. More importantly, business education needs to evolve once again, revising its goals to educate leaders of the future who have a new set of skills: sustainable global thinking, entrepreneurial and innovative talents, and decision-making based on, what he calls, *practical wisdom*.

For me, an example of such practical wisdom would be my challenge in Sudan where I could not use conventional frameworks taught in MBAs internationally as the fit between the frameworks or paradigms of the environment, with which I had to make sense of a disrupted environment, simply did not exist. This would be an example of practice forcing us to question the constructs of a theory that we used in order to make sense of the world in which we needed to manage our organisations.

So, in change there is content and approach as well as methodology. I'm going to focus on content and approach, more specifically the content and approach of strategy as a subject matter at Higher Education Institutions. Strategy is still regarded, in my view and experience, as the primary building block of competitiveness (Casadesus-Masanell & Ricart, 2010) and thus ranks as the most essential skill to be taught at Business Schools to our business leaders of today. This belief leads me to question the assumptions I have indicated above. The question is whether we still should regard strategy as the primary building block of competitiveness, as it has been over the past three decades, or whether we should shift our thinking in the direction that in the future the quest for sustainable competitiveness may well be embedded in business model flexibility (Casadesus-Masanell & Ricart, 2011).

What do I mean by this? Let me try and explain through an example.

Outside the lecture room, I spend my time building business expansion models for companies that wish to internationalise their

businesses. More specifically, I help companies expand onto the African continent.

In following Woolworths' exit from Nigeria in October 2013, the reasons for their exit have been cited as challenges with the supply chain infrastructure, high duties and levies, as well as a troubled relationship with the landlord.

It is interesting to note that none of these reasons were specific to Woolworths, but form part of the larger contextual environment which contains those factors of influence over which we as a business have little or no control (Heckroodt, 2013). A conventional thought paradigm on strategy would default to the notion of changing strategy, hence selecting an exit strategy, citing non-feasibility and viability from a shareholder perspective.

However, the challenge I pose to organisations is to progress from a choice of an alternative strategy, to rather considering a different business model while maintaining the strategic course selected. Failing to shift the building block of sustainable competitiveness to business model flexibility, away from contingent strategy as a solution to a changing environment, is to remain stuck in a thought paradigm of expired constructs. If a carpenter needs to use a screw to fix something, the strategy stays in place, irrespective of whether the screw requires a star point or flat point screwdriver. The tool would be different, but the strategy remains.

This is but one example of trying to answer the 'how' and the 'what' to change. The 'how' is to think differently by questioning the assumptions (McGrath, 2013) that gave rise to the paradigms we use in our efforts as educators to make sense of the world of management that we teach our students – new and returning ones. Not only do we need to change our way and

methodology of teaching through the introduction of new technologies, but we need a serious and fundamental rethink of the constructs we have used for decades on which to build our curricula.

Whereas most of the questions and concerns regarding education – of any sort and level including basic upbringing, come from those tasked with the responsibility thereof, those on the receiving end seem less concerned. If you are an educator, one would wonder about this disconnect between those who educate, and those who receive the education – at any stage of their life. My own definition of change, as the way in which I refer to it in this paper, is the challenge experienced when what used to work, appears to not be working any longer. Hence, educators are asking the question:

*“Why do we need to change to make higher education more relevant? How do we ensure that the higher education system matches the needs of new students, and students who are returning for new or advanced programmes? Who needs to change, and how?”*

Change in itself is not a bad thing and without it we, as a species, would not progress and develop or evolve (Nathan Bennett & Lemoine, 2014). So what then is the big issue about change? Should it not rather be something we as educators need to embrace and encourage, as opposed to worry so much about?

This paper attempts to ask this and a myriad of questions in the space of change in education and the uncertainty it embeds. The main focus is on the newness change can bring to higher education and in doing so, provide those on the receiving end of education with cutting edge relevance, competence and skills as they venture into the future.

---

## References

Casadesus-Masanell, R. and Ricart, J. E. 2010. From Strategy to Business. *LRP Long Range Planning*. 43(2/3):195-215.

Casadesus-Masanell, R. and Ricart, J. E. 2011. How to Design a Winning Business Model. *Harvard Business Review*. 89(1/2):100-107.

Choo, C. W. 2003. The Art of Scanning the Environment. (J. Voros, Ed.) *Reframing*

*Environmental Scanning* Australian Foresight Institute, Monograph series 4(2003):7-16.

Heckroodt, S. 2013. *Strategic Thinking - GAME OVER*. Cape Town. Available: Epubsa.co.za.

Manktelow, J. and Carlson, A. 2014. Porter's five forces. Available from Mindtools.com: [http://www.mindtools.com/pages/article/newTMC\\_08.htm](http://www.mindtools.com/pages/article/newTMC_08.htm) (March 17, 2015)

McGrath, R. G. 2013. *The End of Competitive Advantage*. Boston: Harvard Business School Publishing.

Nathan Bennett, N. and Lemoine, J. G. 2014. What VUCA Really Means to You. *Harvard Business Review*. 92(1/2):27.

# Chapter Five

## The Open Access Advantage for Researchers – Reflections on Experience and Challenges

**Tom Cochrane**

Queensland University of Technology  
Email: t.cochrane@qut.edu.au

*Review status: Peer reviewed*

---

### Introduction

In considering the Open Access (OA) advantage for researchers, the perspective that I am adopting is that of a university, one that developed a positive view about the advantages of Open Access from an institutional point of view over ten years ago. That university is the Queensland University of Technology (QUT), in Australia. It pioneered OA as a preferred practice in one of Australia's fastest-growing universities in terms of research profile.

In reviewing the way that OA has developed, it is interesting also to consider the context, particularly the way that OA as a practice has gradually found expression in public policy. Sometimes public policy imperatives can have a challenging and retarding impact on OA advantages, as in the case of nationally developed research assessment and reward regimes which support conventional journal title hierarchies based on imperfect metrics such as journal impact factors.

By 2014, QUT had developed considerable practical evidence about improved recognition and impact as a consequence for researchers of adopting OA. This paper considers those consequences as well as some areas of institutional and sector wide activity where new leadership and innovation is likely to result in even greater rewards for those whose outputs are "in the open"

### The QUT story

#### *The initial idea*

One of the challenges, sadly even today, is the

problem of definition. The OA lexicon is full of confusables, perhaps the prime example of which is that OA can only be achieved through action by OA publishers, attracting an article processing (input) fee. A rich source on such confusables is to be found in the Global Open Access List, (GOAL, 2015), where there are numerous postings on the distinction between green (author initiated) and gold (publisher initiated) forms, as well as the different economic models of gold OA. (This is further discussed later in this paper under the heading "Green or Gold?"). So to go back to basics, and to retrace what Queensland University of Technology actually did, the definition describing OA that most clearly fits the initial action is that it is concerned with research outputs as found in published journal articles in the traditional subscription literature. Writing in the Times Higher Educational Supplement, in November 2009, Zoe Corbyn stated:

Open Access is simply, the idea that research articles should be freely, immediately and permanently available online to anyone, rather than locked away in subscription journals as many currently are (Corbyn, 2009).

The push at my own institution began in 2003, and it is interesting to note that, by then, the worldwide discussion of the possibility of faster dissemination of research was more than ten years old. As we considered the main drivers for introducing an OA approach we reviewed three influences. These were firstly, that the tech-

nology that made it possible to imagine immediate and universal access had now been in place for some years; secondly, that the economic distortions of the scholarly publishing business (in the case of Australia made worse by exchange rate problems for the Australian currency), had been widely discussed and documented; and thirdly, that researcher motivation aligns well with the quest for recognition and/or impact which is enhanced by being more widely visible.

The institution's first steps in developing the approach were cautious. It is fair to say that the technology and economic imperatives together were front of mind, and that some of the evidence of research advantage developed later. With hindsight, the policy designers and implementers may have more strongly argued the research advantage, but it is also the case that the evidence had still to develop. As part of managing risk, it was a fundamental tenet of the approach that OA would be provided and developed only for the "giveaway literature", that is the scholarly output for which authors and referees get no monetary return.

### ***The institutional journey***

In late 2003 the University embarked on its OA journey. To do this it first developed policy which required approval through the University's governance mechanisms, particularly the University Academic Board. Simultaneously the implementation, including choices of technology and areas of responsibility and funding, had to be considered. The University had one advantage in this, which was that the policy proposals were crafted and advocated by the divisional organisation which contained the library, which had responsibility for the implementation.

At the core of university policy (from its inception onwards), has been the following statement:

*Material which represents the total publicly available research and scholarly output of the University is to be located in the University's digital or "E print" repository, subject to the exclusions noted. In this way it contributes to a growing international corpus of*

*refereed and other research literature available on Open Access, a process occurring in universities worldwide." (Queensland University of Technology, 2013).*

From the beginning, the focus was on the high quality research output, in other words refereed research articles and conference papers. The policy as it evolved mandated the inclusion of these in the institutional repository together with theses at the post peer review stage. Additionally the institutional repository may receive submitted manuscripts with corrigenda added, unrefereed research literature, books and book chapters, creative research works, datasets and their descriptions.

Importantly the policy also laid out from the beginning, provision for excluding or exempting materials from its effect, specifically those the subject of commercial and confidence agreements or which in other ways contain confidential material not suitable for published exposure. It is important to understand that the main intent of the policy is to place into the institutional repository material which is already placed into public view in the more restricted world of traditional subscription journals.

For some years the statement of the policy was to couple availability with the time of publication rather than acceptance, though in practical implementation of the policy, deposit on news of acceptance has been widely practiced and encouraged, including within Faculty practice. The QUT policy also specifies that requests for embargoes of more than 12 months should be referred to the Deputy Vice Chancellor (Technology Information and Learning Support). This is one area where there has been a significant development of complexity as OA has become a tenet of public policy in various jurisdictions, and the publishing world has responded with a variety of proposed embargo periods applying to the provision of OA.

A significant part of the institutional journey has been to develop a university wide Intellectual Property (IP) policy which reflects an institutional

commitment to openness, as well as the other important provisions that a properly framed IP policy should address, including clarity about the relationship between institution and its staff and students on the ownership of IP, and the necessary protections to allow, in appropriate circumstances, for commercialisation. The development of these policies is often a fraught and complex process, and QUT's inclusive approach has been a strong and effective one, allowing the crafting of policy addressing the full spectrum of requirements.

### ***Refinement of the approach – the motivation of researchers***

Over a period of more than ten years, the implementing team has been able to develop tools to attract researchers to the sense and logic of self-archiving behaviour. This had its roots in an early and inspired technique, which was to provide the institution, and the world, with statistics on the top 50 authors, and top 50 papers, in terms of download traffic over given intervals. It did not take long for these real-time statistics to provide the basis for some interesting and enriching feedback to researchers, not to mention some friendly competitive rivalry.

These tools have been refined so as to provide information on downloader location, and to allow not only authors but research centres and administrators to be aware of these *prima facie* indicators of interest and impact. Furthermore, as widely available tools measuring research impact in the journal literature, such as Scopus and Web of Science, have been complemented by the emergence of measures such as those provided through altmetrics, the repository has been able to provide correlations of these as shown in Figure 1.

As the metadata generated by the institutional repository can be harvested in the open, discoverability properties in the big search engines become important. There is nothing more gratifying to a researcher than to return a first

page result from a very large number of hits, (perhaps over one million), from a simple search on Google or similar search engine.

### **Correlations between bibliometric indicators and availability in the open**

As the institutional repository grew and practice matured alongside the availability of an increasing array of research metrics, one of the most interesting and gratifying results for the institution has been the demonstrable increase in citation impact that seems to accompany the availability of the research articles in the open. There are many examples where a researcher observes increased citation impact associated with the comprehensive uploading of full text copies of published articles. Conversely researchers with less consistent use of the repository (and here it should be mentioned that whether there is a mandate in place or not, universities are not known as places of coercion), show a less consistent increase in their citation impact. Figure 3 shows this effect in the case of a researcher in the area of environmental health.

### **Observed benefits**

So, in recent times, researchers within the University have reported not only greater visibility through the institutional repository, but also satisfaction with the impact on bibliometrics in the literature. They also report new contacts and readers who generally come from environments outside those which conventionally have access to the subscription journal literature reporting their research. From these contacts new opportunities to consult, and thus, to have an impact within an industry or government arena, have arisen.

Furthermore, at least one faculty has reported that new research students, (i.e. higher degree research students), have been attracted to the faculty by being able to find reports on faculty research "in the open", and have accordingly gone on to enrol at the University, to mutual benefit.

Figure 1: Downloads and bibliometrics (Cochrane, 2014)

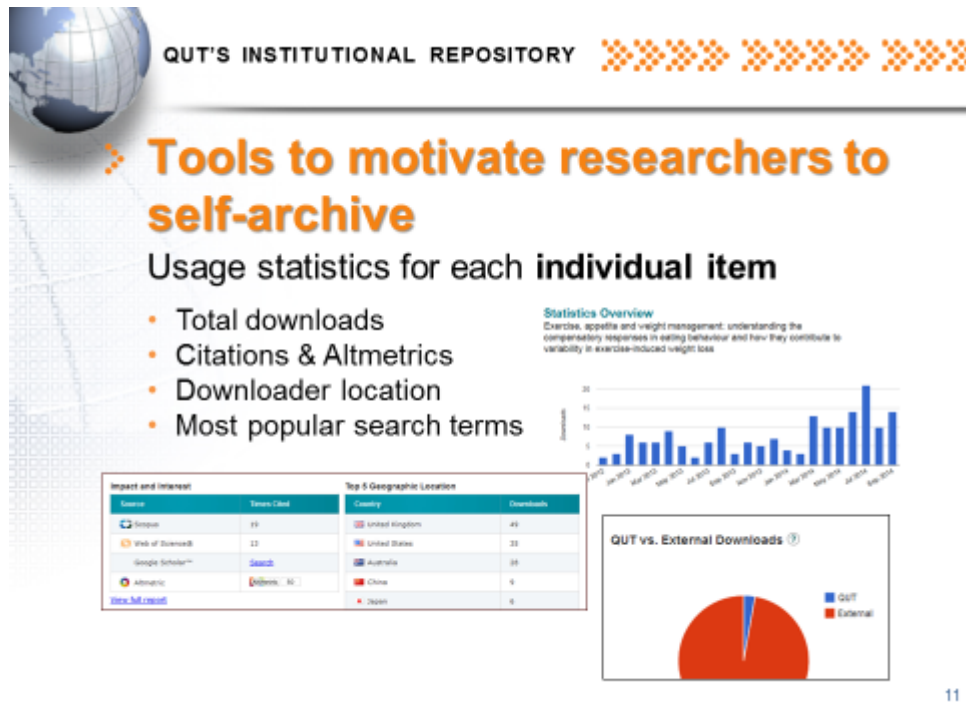
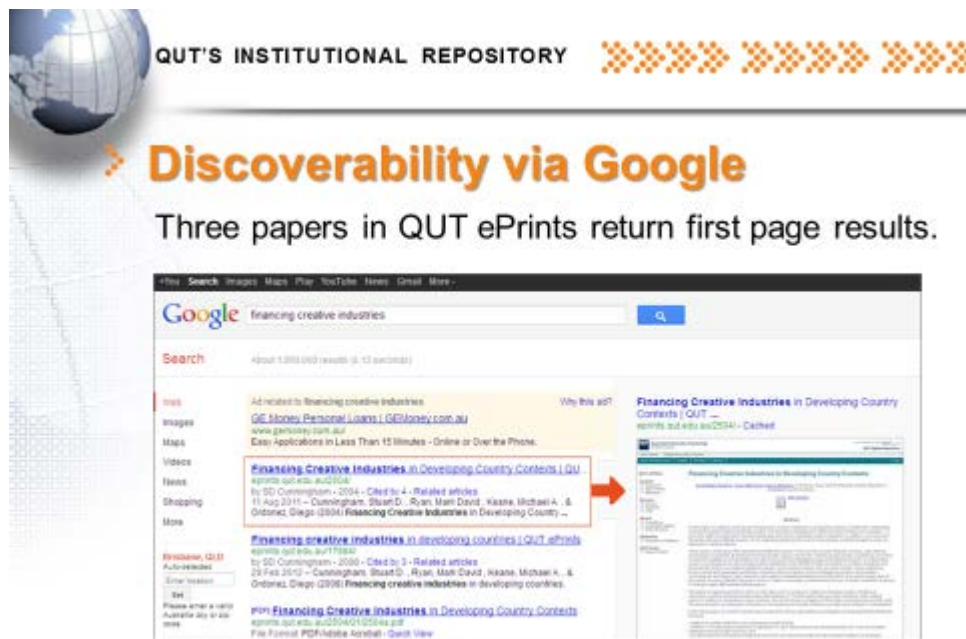


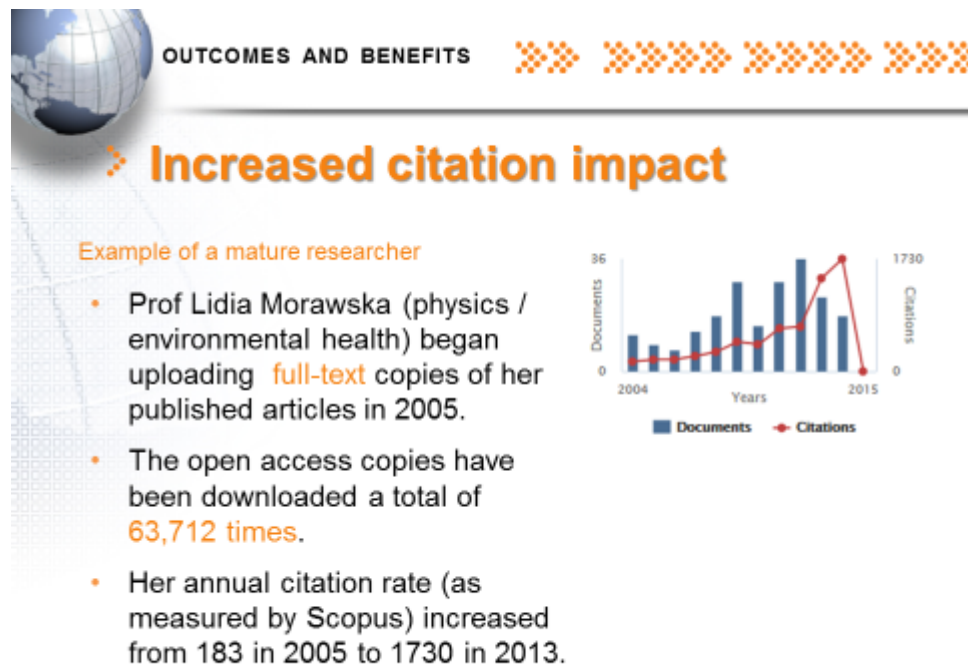
Figure 2: Discoverability via Search Engines (Cochrane 2014)



A search for information on financing creative industries returns over 1.8 million hits.



Figure 3: Correlations between download incidence and citation rates (Cochrane, 2014)



15

### Beyond the institution – some Open Access issues worldwide

This description turns now from the experience of one university which has been an early mover in this field, to some more general observations about the advantages of OA, breaking through some of the limitations of format to which it has so far applied, and some topical issues developing in 2014/15.

#### The Open Access advantage

The phrase, “the Open Access advantage”, has been in use in the literature of OA for some years. Essentially advantages can be traced from at least six perspectives.

- from the point of view of *fundors*, whether government or private research foundations, the greater visibility of the outcomes of research that has been funded by them is an immediate and obvious advantage. The Wellcome Trust articulated this over a decade ago, citing in particular the need to bring the benefits of medical research to professionals working in areas of the world without access to published research outputs in the subscription (toll-gated) journal literature;

- from the point of view of *institutions* the possibility of increasing the profile and impact of the research carried out at that institution brings with it clear advantage;
- from the point of view of *researchers* themselves, as described above, the value of increases in the visibility of their work, and impact on the metrics that matter to them in their careers, are clear;
- from the point of view of *communities*, particularly those that might benefit from work carried out in research institutions that have hitherto had more obstacles in gaining access to it, the benefit is clear;
- from the point of view of *government*, and as a principle of public policy, it can be seen that public funding of research deploying as it does taxation revenue, deserves the immediate and public accessibility of research findings once they have been quality certified through the peer review processes associated with publication;
- and finally, from the point of view of *disciplines*, it can be argued that new techniques in dissemination can have an enliv-

ening effect, – and this argument is further pursued in relation to monographs in the humanities and social sciences, below.

### **Green or gold?**

Anyone familiar with OA debates will be aware of the often described “two roads” to OA. Because there is significant confusion, and to some degree mischief, generated by misunderstanding these, it is worth reviewing them here.

The green road to OA involves initiation at the level of the author, either as an independent party, or as activated by them within an institutional setting. It involves the act of “self-archiving”, and in its optimum form involves lodging a copy of the manuscript in an institutional or discipline-based repository at the time of acceptance for publication. As it has grown, and as publishers have become more inclined to act to preserve an advantage of exclusive exposure, the notion that its availability in the open can be subject to a period of embargo has become more common, and the proposed periods extended. A compromise position in “green” practice has evolved, in which a requested embargo period may be observed while at the same time providing a requester who has come across the article (in a reference in the open) to use a so-called “request a copy” button so that they may be sent the full text of the article in advance of the end of its embargo period.

A key point about the green road is that it is a practice that has commenced and coexisted with the subscription journal literature. In effect, it has no influence on the actual process and techniques of publishing, nor so far, any reported impact on subscriptions.

The gold road to OA involves initiation by the publisher. It is the publisher that acts to make the work available in the open. There are a range of economic and business models for this. Quite commonly a publisher may be an organisation large enough to provide its material in the open as part of its overall mission, and there is no individual cost associated with each output. An example of this is the World Bank. The most often

cited model however, and one which is frequently confused as being the only way of providing the gold road is one where the business model depends on input revenue in the form of article processing charges, (“APCs”). Some very well-known large-scale gold journals have developed on this basis, such as the Public Library of Science, (PLOS).

Any conversation or debate about OA must be clear about not only the two green and gold paths, but also the varieties of the gold path in particular.

### **The case of the monograph**

As some institutions and individuals developed stronger OA practices over a period, it was found crucial to distinguish between the giveaway and the non-giveaway research literature. Accordingly, in the case of QUT, it was decided that any longer form of scholarly publishing which is traditionally sold with the possibility of royalty to the author (and here it is emphasised that this is possibility rather than actuality in many cases), would be excluded from the scope of the policy.

But over an extended period certain kinds of scholarship (which have a stronger relationship with longer form publishing as a way of giving expression to the research work in their fields, particularly the humanities), have experienced decline. A particularly pernicious aspect of this has been the decline of publishing of good research because of the decreasing likelihood that publishers could earn an income from such publishing. Indeed in some jurisdictions there has been pressure from some publishers to seek government support to continue older models of publishing.

It is important, in fact critical, to understand that using the word “publishing” is insufficient to understand and analyse what possibilities are available for the provision of OA. A more granular approach is required. The fact is that long form publishing in the humanities often represents economically exactly the same deal as publishing

an article in science – i.e. it is absolutely a give-away process on the part of the author. However a key difference is that publishers often add significant value through the work of assigned editors.

In this context new business models have developed with exciting prospects. The reason for the excitement is that not only do they offer the achievement of OA for certain categories of monograph, but also the business model in its early phases indicates that some humanities scholarship may be published which was previously locked out because of the economic logjam in scholarly monograph publishing. Knowledge Unlatched is perhaps the best-known example in the English-speaking world of this development and OA advocates are watching its development as a gold model based on new forms of cooperation between the academy and publishing houses with great interest (Knowledge Unlatched, 2015).

### **Contemporary issues**

As well as new possibilities for the dissemination of scholarship in the open based on these unprecedented forms of collaboration (i.e. the Knowledge Unlatched example), there are significant and accelerating developments affecting the way OA is growing and is provided. These include developments in public policy mandating both research assessment and OA; complex policy changes by publishers (a recent example from Elsevier in April 2015 is a case in point), and fresh perspectives from young researchers. Finally international perspectives have become more widely understood, particularly from developing economies with research and innovation aspirations which are challenged by the economic structure of scholarly publishing, based as it is, in Western publishing houses.

As government develops more definite policy on OA it may be necessary to support and advise those with the responsibility of thinking how government policy will be implemented. Experience has already shown that this is likely to involve assisting with the understanding of OA as

having a green form as well as a gold form, identifying and seeking support for the notion of the institutional repository as an important element of institutional profiling, providing advice on how research assessment regimes might be implemented in future, including ways in which OA can support understanding of impact, (as well as potentially improving quality as measured by traditional bibliometrics), and engaging in active and continuing dialogue with government about the increasingly multichannel ways in which research can find an audience beyond its traditional scholarly base.

New developments demand different and imaginative thinking in terms of new business relationships in scholarly communication. It is incumbent on those responsible, for example directors of libraries in universities, to think about the business model introduced by initiatives such as Knowledge Unlatched in terms of a willingness to think outside traditional approaches to acquisitions budgets. Certainly many university libraries have experimented with e-presses and e-publishing, but there may be a tendency by administrators to regard these as a small-scale cottage industry style innovation rather than a significant and permanent shift in the way libraries invest to support scholarly communication. It is also important to understand that publishing is not a monolith, as mentioned before, and to identify *scholarly* publishers who are willing to innovate with new models.

As research funders have moved to mandate OA as a principle in optimising the reach of taxpayer funded research, so too we have seen vigorous publisher responses including a desire to move in to help manage processes, to change embargo practices to steer the OA policy options towards gold, to delay deposit times for articles, and to change policy in a complex setting with sometimes astonishing rapidity.

In the face of these publisher responses, it is imperative for institutions to think clearly about the role and function of institutional repositories. They should pursue the imperative of seeing that

articles are deposited when they are accepted for publication, configure and implement the request-a-copy procedure, and respond in a thoughtful way to new policy developments, such as those mandating similar (OA) approaches to data. They should contribute to and support further thinking about the exploitation of research in new ways, particularly re-use.

Such thinking necessarily involves deciding on positions about copyright licensing. As world-wide conversations about open content licensing, particularly Creative Commons develop, it is essential that universities consider the policy options, decide on preferred advice for their own research communities, establish the necessary expertise to advise, and above all devise an appropriately comprehensive institutional IP policy covering all of the aspirations of the University including the optimum access to the full text of its research outputs.

Finally, recent trends have included a greater engagement by young researchers, including undergraduates, in the issues involved, as well as understanding how citizens may simply demand greater access to research than they have traditionally had.

One of the most dramatic divides is that between universities and research institutions in nations with developed economies, and those in emerging, dynamically growing economies. Erin McKiernan, a US trained neuroscientist living and working in Mexico has developed a powerful articulation of the issues involved. Challenged in recent months by a publisher who queried her statement about a lack of access to research outputs published in the traditional toll-gated literature she responded to the question – *Who does*

*not have access?* – forcefully, as follows. In her open letter to the President of the Council of Scientific Society Presidents she stated that those lacking access include:

- citizens whose tax dollars pay for research;
- patients who want to research their own medical condition;
- educators who would like to incorporate the latest scientific discoveries into their curricula; and
- scientists at institutions who cannot afford journal subscriptions (McKiernan 2014).

## Conclusion

For many of its advocates OA has had too long a history of piecemeal and fragmented implementation. But in the last three to five years the principles have found support at an increasing number of institutions, and significantly, at government policy levels. Powerful commercial interests are of course threatened, as is the case with any traditional business model which meets new disruptions arising from the Internet. It requires skill and tenacity together with clear-headed thinking for research communities collectively to seek and implement what we all deserve, a world in which research outputs are available and accessible universally, as soon as they have been accepted as warranting promulgation and publication (i.e. quality certified), and further for those outputs to be the basis for dynamic re-use and further research as the world demands greater productivity from its research sector in meeting the great challenges of coming years in the solving of problems, both globally and locally.

---

## References

Cochrane, Tom. 2014. The Open Access advantage for researchers – reflections on experience, learnings and challenges". Presentation at Library and Information Studies Centre, University of Cape Town, 75 years

Commemorative Conference, (27 November).

Corbyn, Zoe. 2009. Learning to Share. *Times Higher Education Supplement*, 12 November. Available: <http://www.timeshighereducation.co.uk/409049.article> (5 August 2015).

GOAL - Global Open Access List (Successor of AMSCI). 2015. Available: <http://mail-man.ecs.soton.ac.uk/mail-man/listinfo/goal> (5 August 2015).

Knowledge Unlatched. 2015. *Company Description and Information*. Available: <http://www.knowledgeunlatched.org/> (5 August 2015).

McKiernan, Erin. 2014. *Open Letter to Gordon Nelson, President of CSSP*, 18 September. Availa-

ble: <https://emckiernan.wordpress.com/2014/09/18/open-letter-to-gordon-nelson-president-of-cssp/> (5 August 2015).

Queensland University of Technology, 2013. *Manual of Policies and Procedures, Chapter F, Information Management, Section F/1.3* QUT ePrints repository for research output. Available: [http://www.mopp.qut.edu.au/F/F\\_01\\_03.jsp](http://www.mopp.qut.edu.au/F/F_01_03.jsp) (5 August 2015).

## Chapter Six

# It's not Business as Usual! CPD as a Change Imperative for LIS Professionals

***Ujala Satgoor***

Immediate Past President, Library and Information Association of South Africa (LIASA)  
Email: u.satgoor@ru.ac.za

*Review status: Peer reviewed*

---

### Introduction

The ubiquity of information and communication technologies (ICTs) in current library and information services (LIS) has necessitated the need to redefine the purpose of the library and the role of the librarian within the environment of the “digital native”. The ability to adapt and respond to the demands of the digital native may be perceived as both a challenge and opportunity for academic libraries to shift from the “business as usual” mind-set that largely prevails within the LIS sector.

Within the business context, business as usual companies are those that focus on normal business operations such as production, processes and managing customer relations on a daily basis. However they are fast realising that, in the face of global challenges, emerging technologies, shrinking economies and the need to be competitive, the tried and tested ways of doing business cannot continue. Increasingly the questions being asked are why must businesses change? How do they change? What do they change to? What are the processes to be followed and resources required to become different; and most importantly, how does the human capital of a business embrace and adopt change?

Despite different contexts, this shift in thinking is also being felt widely by and applicable to the academic LIS sector. Libraries to a large extent may be described as business as usual entities based on their stability, funding, processes and services. However the changing education landscape; shrinking budgets and increasing costs of

resources; and the impact of technology on services and operations have triggered the realisation that business as usual is no longer possible for library and information services globally.

There is also the realisation that library staff, including management, need a mind-set and paradigm shift to accommodate the changing electronic work environment. This could be in terms of new information services and the assumption of new roles and competencies so that the academic library environment reflects its alignment with institutional goals as well as changing user needs. While changes in the physical environment may be considered, it is the long-term investment in library staff that will elicit the greatest results. Therefore, CPD which is generally accepted as the means “to improve upon skills, understand new techniques and maintain previously learned knowledge” (Ukachi and Onuoha, 2013: 269), cannot continue as an ad hoc activity. It needs to be adopted as an organisational strategic imperative for library staff to remain relevant and attuned to the fast changing academic landscape. Ukachi and Onuoha (2013) further suggest that CPD could also be seen as an enabler to creativity and innovativeness towards doing things differently. This paper discusses CPD as a strategic imperative for academic librarians in South African higher education. It highlights challenges and opportunities in higher education that require a dynamic LIS sector to keep up with emerging library trends and new roles that require commitment, leadership

and initiative to keep abreast through CPD because business as usual is no longer possible.

### **Drivers of change in academic libraries**

South African academic libraries have for many years been comfortable with the perception of being support services within the academic project. However this support role is being challenged by new demands of the evolving higher education landscape, such as economics, demanding organisational dynamics and culture, and emerging technologies. These demands offer excellent opportunities for academic libraries to understand their context, review their standards and infrastructure, and redefine their role, position and value within the academic project of their institutions in order to emerge as focused and dynamic academic partners.

### **Higher education landscape**

The 1999 review of the historically segregated South African higher education landscape resulted in the National Plan for Higher Education which led to the restructuring of this sector from 36 historically white or historically black universities, technikons and colleges of education, into 23 merged higher education institutions (HEIs). These merged HEIs comprised of 11 traditional universities, six comprehensive universities and six universities of technology, all with the specific aim of redressing historical educational imbalances. An additional three HEIs were established during 2013/2014 (Department of Higher Education and Training, 2015).

In the 2014 LIS Transformation Charter, some of the challenges confronting higher education were listed as “transformation and redress imperatives” and noted as “rapid increases in student numbers, students who are ill-prepared for the demands of higher education, increasing uptake of and demand for ICTs in teaching and learning, the drive towards quality assurance, pressure for increased community engagement, changing pedagogic practices, and concern about the employability of their graduates” (Department of Arts and Culture and National Council for Library

and Information Services, 2014:69). In response to these challenges, the 2013 White Paper for Post-School Education and Training (Department of Higher Education and Training, 2013) envisions the type of post-school education and training system to be achieved by 2030 and articulates strategies for this system to contribute to the building of a developmental state with a vibrant democracy and a flourishing economy. It further speaks to huge reforms in the higher and vocational education sectors as well as a planned enrolment of 1.6 m students by 2030. The rudiments in the vision are expanded access, improved quality and increased diversity of provision; the need for “outstanding researchers that are capable of producing ground-breaking work” (Nzimande, 2014); the regulatory role of professional bodies; an increase in post-graduate numbers; greater support for the emerging academic and researcher; and an increase in research in the humanities. Given this vision for higher education and the changing higher education landscape, to what extent are academic libraries ready to meet these research, teaching and learning expectations and able to demonstrate their value, effectiveness and increased efficiencies?

### **Economics**

Shrinking budgets, cutbacks and financial constraints are a constant refrain heard across the academic library sector. The challenge of “doing more, with less” and of retaining what one has, is a stark reality. Since 2014 South African academic libraries have been confronted with the triple hazard of annual price increases, fluctuating exchange rates and the introduction of 14% value added tax (VAT) on electronic resources. In many cases this represents as much as a 26% increase in the annual information resources budget, which is unsustainable in the long-term. These economic uncertainties have compelled librarians to engage more concertedly and regularly with their collections and user groups, scrutinise usage patterns and statistics to inform collection development and management, as well as explore resource sharing and recognise the benefits

of consortial membership. Membership of the South African National Library and Information Consortium (SANLIC), which negotiates and facilitates affordable access to scholarly electronic information in support of the teaching, learning and research activities of its members through collective negotiations with publishers and aggregators (sanlic.org.za), permits institutions to have access to “big deals” and aggregated databases which they could otherwise ill-afford. Another option for the sector is the national big deal being explored under the aegis of the Academy of Science of South Africa (ASSAF) for the Department of Science and Technology. This will facilitate access to information resources by a wider community and will be paid for by government.

Universities cannot afford to lose academic libraries, which exist to provide information expertise and facilitate their research and information needs in alignment with universities’ priorities and those of their community. The constraints in budgets, where the bulk is focused on information resources with the balance being juggled between staffing, services and facilities, has prompted academic libraries to think beyond traditional services and to embrace innovation in order to remain relevant as a non-business entity. It has also led many libraries to reimagine and reconfigure their library spaces, to accommodate and reflect 21<sup>st</sup> century learning styles and social behaviour.

If the perception of the academic library as a worthwhile investment is to be fostered and strengthened, it becomes the responsibility of the library to ensure the return on this investment by facilitating its own transformation in order to contribute dynamically and distinctively to institutional, student and research success. However this can also be compromised if the library – in its structure, culture and leadership – does not visibly adapt itself to the changing needs of users and their habits, preferences and environments; position itself in the academic midst; deliver cost effective, creative services and tools of value; and make the work of users easier, more productive

and pleasurable (Rochkind, 2013).

### **The Library organisation**

Organisational development is key to accomplishing organisational change and success, enhanced performance and effectiveness of its human capital and inculcating a knowledge and learning environment. Martins and Terblanche (2003:73) identify “strategy, structure, support mechanisms, behaviour that encourages innovation, and open communication” as the core elements of organisational development and a culture that stimulates creativity and innovation.

The need to demonstrate value and relevance has seen the emergence of academic libraries as strategic organisations in alignment with the goals of their parent institutions. Regular strategic reviews, SWOT analyses, LibQUAL+® surveys and evaluations based on business related systems such as the Balanced Scorecard are all contributing to redefining organisational leadership, culture, positioning and operations. These analyses enable the library to adapt to the future.

Strategic organisations are being defined by the congruence between goals, outcomes and processes and the purpose, values and culture of the organisation. They are further based on the assumption that capable leadership is available to steer organisations through change and turmoil (Pasmore, 2014). Studies have further revealed that organisational leadership has moved away from the individual positional leadership model to that of formal and informal leadership that permeates every level of the organisation in support of organisational goals.

Dynamic organisations also thrive on interdependent, connected leadership and a culture that is rich in diversity. It is a culture that fosters collaboration, learning, collective responsibility for outcomes, and opportunities for development (Pasmore, 2014). It also recognises that knowledge, talents, skills and competencies of its human capital drive change and innovation, as well as informing future workplace planning and intergenerational dialogue.

Given the above trends, to what extent are



South African academic libraries engaging in strategic thinking and strategic planning for organisational development, over and above the expected alignment with the academic project? The need to foster new organisational cultures has never been more urgent than the present. The future of academic libraries lies in the process of transforming the current stable and static business as usual environments into robust and dynamic learning environments, where staff are able to take charge of their knowledge exchange and skills transfer towards developing new expertise for evolving roles and competencies.

Although Johnson (2007) posits that leadership is not taught in library schools, some LIS schools in South Africa such as the University of Cape Town and University of Western Cape do indeed teach LIS leadership. Moreover, librarians are well positioned within their organisations to take the lead in ensuring that their communities optimise their use of available resources, thereby contributing to the social and economic advancement of the nation. Core to this is the internal development of leadership that takes collective responsibility for defining the purpose and success of the library; that is able to respond and adapt to the changing user needs and demands; possess the ability to envision and plan for the future; and be able to raise the levels of practice within a broader context.

## **Technology**

Technology is widely acknowledged as the major enabler of change and innovation in the academic library sphere. It has infused and reinvigorated every aspect of library operations and services, and precipitated discussions about physical and digital spaces for access to information networks, new interactive learning opportunities, and collaboration and knowledge creation in response to users' current needs, demands and expectations. These discussions should also anticipate and incorporate flexibility for future pedagogical shifts and technological changes.

Technology-enabled academic library environments provide an integrated solution for teaching, learning, research and collaboration. This integrated solution includes a sophisticated IT infrastructure; networked, wired and wireless connectivity; discovery tools across platforms; customized interfaces for mobile devices that provide 24/7 access to information resources; and tools that support scholarly communication and enhance research visibility. In the face of the digital deluge of information, academic libraries have consolidated their positions as trusted places for authentic information in support of academic scholarship.

Breeding (2013) advises "to remain relevant, libraries must shape the way they deliver their services to accommodate each new wave of technology that captures the imagination of society." He further refers to greater collaboration and cooperation amongst institutions towards lowering costs, enhanced discovery and access through shared automated infrastructure, resources sharing, technical services and collection management.

Library practice in the digital age poses challenges and opportunities for South African libraries. While it may have prompted librarians to reimagine their roles, strengthen existing programmes, and learn new skills within this context, a sustained programme for skilling and training is required to respond appropriately to the fast pace of technological developments. The focus according to Chiware (2007) should be on ensuring an understanding of the current state and prospects of digital libraries and their importance to developing economies. There is a need for familiarisation with digital projects in other institutions, for skills in digital library design, architecture, development and management. LIS practice needs to master tools and protocols for interoperability and project management; technologies for digital content development and collection management; as well as scholarly communication including copyright issues within the digital

domain and information retrieval skills within digital libraries.

### **Emerging trends for academic libraries**

Environmental scanning is crucial for keeping abreast with trends and developments, which inform strategic planning and continuing professional development within academic libraries. It is important to recognise that while these trends point to building on current, evolving and new trends, new competencies and redefined services, libraries need to embrace that which is appropriate to its context, staff development and future planning. A review of the 2012 and 2014 trends identified by the Planning and Review Committee of the Association of College and Research Libraries, the Australian Library and Information Association and the Horizon Report (Johnson et al, 2014) indicate issues relevant to a range of environments and levels of organisational capabilities. The issues resonant with current practice in South African academic libraries relate in varying degrees to:

- e-Resources purchasing and management
- Digital resources – access and preservation
- Mobile environments, content and delivery
- Open Access – mandates, accessibility to research content, publishing and publishing models
- The value and contribution of the library to student success and retention
- Embedding Information and other literacies in the academic curricula
- Altmetrics to measure the impact of scholarly works and research published on the web
- Scholarly communications
- User behaviours and expectations
- Rethinking the roles and skills of librarians

The reports identify the following emerging areas for discussion:

- managing big data

- digital humanities
- embedded librarianship

The Horizon Report (Johnson et al, 2014) recommends that when engaging with these trends, librarians need to be aware of the implications for policy, leadership and practice. When adopting new trends, academic libraries need to ensure that they are in harmony with the strategies and imperatives of the parent institution, the available resources and their role within the overall academic project.

### **New emerging roles for librarians**

The above mentioned drivers of change, advancing tools and changing technologies, evolving research methods, pedagogies and changing research communication practices, the abundance of information in varied formats, all prompt the redefinition of the liaison role of the librarian. Greater engagement, relationship building and collaborative partnerships across the institution are now expected of librarians. This serves as an opportunity for academic libraries to review their core purpose, strategies and job profiles to reprofile and align structures to incorporate new roles and to reimagine their services. Whilst many view new roles such as teaching and learning with scepticism, the academic library is fast evolving into an environment that requires new expertise and specialist librarians in support of the changing teaching, learning and research paradigms.

The changing education landscape is prompting academic libraries to connect more purposefully with their communities. Furthermore their relevance of purpose is enhanced by an understanding of the immediate academic and broader developmental contexts within which they function. User services are being determined by user needs assessments. Increasingly governance in academic libraries is devolving and becoming more participative and responsive. Therefore advocacy, project management, leadership and management are emerging as focus areas of staff development.

Some of these new emerging roles for academic librarians range from the “superliaison” librarian who acts as liaison to other librarians in the fields of “copyright, geographic information systems (GIS), media production and integration, distributed education or e-learning, data management, emerging technologies, user experience, instructional design, and bioinformatics” (Jaguszewski and Williams, 2013:07) to field specific specialists to embedded librarians. In South Africa, in addition to understanding and consolidating the principles of liaison librarianship, emerging areas of specialisation that are being explored by certain academic libraries include:

- scholarly communication and open scholarship
- digitisation and digital collections management
- electronic resources management
- training and development
- data management.

Given current roles and practice, and the above emerging areas of specialisation, the way for academic libraries to meet these new demands is by engaging in CPD.

### **Continuing professional development**

Globally, professional bodies acknowledge and accept CPD as the means by which practitioners remain relevant and competent, and are able to practice at the accepted professional standards. Majid (2004:58) defines CPD as “a systematic method of learning that leads to growth and improvement in professional abilities, enabling individuals to function successfully in a changing work environment...the purpose of continuing professional development activities is to fill-in the knowledge gaps between formal education and the needs of the professional practice.” It is generally accepted that CPD enables professionals to:

- keep abreast of new developments and trends
- address scarcity of skills

- acquire new, relevant and/or appropriate skills
- plan their professional growth or advance in their careers
- identify and develop specialisation
- redefine roles and responsibilities
- become competitive in the labour market

CPD further enables organisations to introduce change and innovation through engagement with staff on new thinking, skills, competencies and services. Ukachi and Onuoha (2013: 270) confirmed that there is increasingly “global interest in the area of creative and innovative library and information services delivery” which is driving academic libraries to maintain their relevance and demonstrate their value in the overall academic project. CPD is largely located within the workplace, and accepted activities include both formal and informal learning interventions. Maesaroh and Genoni (2010) listed these activities as:

- structured orientation/induction programs
- on-the job training programs
- in-house short courses with internal trainers
- in-house short courses with external trainers
- job exchanges within the organisation
- visits to other library and information services
- staff exchanges with other organisations
- external formal study courses (e.g. diplomas, degrees)
- external short courses
- attendance at:
  - seminars and workshops
  - pre- or post-conference workshops
  - conferences
  - continuing professional education events
- guest speakers
- involvement in professional associations and activities

One can assume that given the current state, role and prospects of digital libraries, academic librarians must understand the immediate and broader contexts within which they function. Technologies in the workplace have increased the prospects of communication, collaboration and professional exchange amongst librarians. Chiware (2007) further reiterated that academic librarians must:

- keep abreast of major projects involving digital collections that are enhancing access, visibility and preservation of African research;
- develop advanced IT skills for digital library management, including knowledge of hardware, software and networking requirements; open source software; vendors and suppliers; and all web-based services including publishing;
- organise, manage and present digital information to users. This digital environment has elicited the need to develop “capacity and an understanding of the changing nature of collection development in the digital age” (Chiware, 2007: 04). This has opened a whole new arena of professional competencies including digital collection management, electronic resources management, information retrieval, cataloguing and indexing of e-resources, new copyright challenges, developing standards, tools, practices and policies; and facilitating ease of access to and use of digital collections.

Thus far, CPD within South African library practice has been adopted on an ad hoc basis in fulfilment of organisational human resources requirements. The changing workplace and emerging roles require CPD to be understood, embraced, aligned to organisational imperatives and located within the overall staff development strategy.

### **Whose responsibility?**

Staff development has emerged as a strategic imperative for managing a dynamic changing

workplace and for organisational sustainability. A key driver for staff development, of which CPD is core, is the recognition that the greatest asset of an institution is its human capital; that its success is contingent upon an enabling work environment and the realisation that “every person has a different reason for working and their motivation to be the best stems from being valued for a job well done by those they hold in high esteem” (Satgoor, 2011:02). To date, CPD has resided predominantly within the aegis of human resources departments and treated in an ad hoc manner by library managers and librarians. However it is increasingly evident that CPD has to be treated as a shared responsibility of the individual, the institution, professional associations and LIS schools:

- Individual librarians need to be more proactive in identifying personal and professional development needs and conveying this during development conversations with their line managers. These conversations should culminate in professional development plans that clearly articulate the development needs, the proposed interventions and timelines for implementation.
- The library director together with the institutional human resources department determine the overall annual library development needs, the appropriate levels of interventions and the required resources.
- The human resources (HR) division is guided by the institutional HR development policies, which are informed by the national Skills Development Act (97 of 1998) and the Skills Development Levy Act (9 of 1999). Most institutions are committed to promoting a culture of learning within the workplace and to ensure that their human resources development is in compliance with government regulations, employment equity and steeped in a desire to retain, develop and utilise the skills

at the institution. To this end, the appropriate interventions are identified, opportunities and the necessary resources (funding and leave) are made available.

- The role of the professional association is critical for the implementation of CPD within the sector as the association is often responsible for setting professional standards and providing CPD opportunities. The Library and Information Association of South Africa (LIASA) is now the South African Qualification Authority-registered professional body for library and information services in South Africa. The implication is that CPD is directly linked to the designation of professional librarian, which will require registered members to meet the requirements of an integrated and articulated CPD programme to retain the designation. This serves as an opportunity for academic libraries and LIASA to set the standards of academic library practice and determine the structured CPD programme, which is aimed at enhancing the scope and depth of learning.
- LIS Schools have an important role to play in ensuring that graduates exit with the core knowledge of library and information science, as well as of the current practices. There should be room for the regular review of curricula and in some cases re-education, so that they complement the technological needs of practice and evolving areas of specialisation, either at primary qualification level or as CPD certificated programmes.

The demand for CPD as a more formal and concerted intervention will precipitate greater engagement among the role players identified above, but it will also serve as a strategic institutional investment in developing human capital.

### **Taking the lead!**

Given the above drivers of change, emerging roles and the importance of CPD, it can no longer

be business as usual for academic library directors and managers. The current climate in higher education is opportune for them to take the lead in charting a new course for their academic library in the following ways:

- Reflection on one's personal leadership style and being open to embracing a more participative and connected leadership style.
- Engaging with strategic planning as a transparent and an inclusive process. Strategies should clearly reflect the library's alignment to the institutional imperatives and demonstrate the value the library adds to the institution's success.
- Adopting staff development or CPD as a strategy with clear objectives and identified resources. The personal development plan must be actively used as a developmental tool and reviewed annually. This development conversation enables staff to recognise the institution's commitment to their personal and professional development, as well as acknowledging their role in contributing to the success of the institution.
- Revisiting the organisational structure so that it is in alignment with the vision and strategies of the institution. Given the emerging roles and redefined responsibilities, vacancies need to be reviewed and filled, resulting in changed structures that reflect new areas of specialisation and expertise.
- Inculcating a dynamic organisational culture that is reflective of strong values, a spirit of enquiry, collaboration, lifelong learning, experimentation and a mind-set of "one organisation, many leaders". Involving staff in rewriting the purpose, values and culture of the library will contribute substantially to fostering ownership and joint responsibility.
- Recognising technology as an enabler and ensuring that library technology,

standards and infrastructure need to be continually updated to keep pace with patron and researcher needs (Johnson et al, 2014).

- Regularly engaging with the academic community and staff to facilitate changes in perception and meaning of the library and librarians. This requires active advocacy, marketing and demonstrating the value which the academic library adds to teaching, learning and research. The perception of the librarian can also be influenced by librarians engaging in research and publishing.
- Investing in staff and technologies so that ease of access is ensured by the ability to

function optimally in a technologically advanced environment.

- Being open to collaboration within and beyond the institution.

## Conclusion

Academic libraries as predominantly business as usual institutions are positioned to redefine, re-imagine, repurpose and reinvigorate themselves provided there is cognition that while technology is the enabler, people are the driving force behind change and innovation; and that institutional success is directly linked to a culture of continuous learning and acknowledgement. An investment in human capital will definitely reap dividends that will ensure sustainability.

---

## References

- Breeding, M. 2013. The Systems Librarians: Library Technology Forecast for 2014 and Beyond. *Computers in Libraries*, December 2013. Available: <http://www.infotoday.com/cil-mag/dec13/Breeding--Library-Technology-Forecast%20-for-2014-and-Beyond.shtml> (08 November 2014).
- Chiware, E.R.T. 2007. Training librarians for the digital age in African university libraries. *IT and Research in African University Libraries: present and future trends*. Pre-IFLA Satellite Meeting, Durban. Available: <http://tinyurl.com/hofgjk> (29 November 2015)
- Council for Higher Education. 2000. *Towards a New Higher Education Landscape: Meeting the Equity, Quality and Social Development Imperatives of South Africa in the 21<sup>st</sup> Century*. Available: <http://tinyurl.com/ov8w89l> (28 November 2015).
- Department of Arts and Culture (DAC) and National Council for Library and Information Services (NCLIS). 2014. *The Library and Information Services Transformation Charter*. Available: [http://www.nlsa.ac.za/Downloads\\_01/2014\\_Final\\_LIS\\_Transformation\\_Charter.pdf](http://www.nlsa.ac.za/Downloads_01/2014_Final_LIS_Transformation_Charter.pdf). (05 November 2015).
- Department of Higher Education and Training. 2013. *White Paper for Post-School Education and Training: Building an Expanded, Effective and Integrated Post-School System*. Available: <http://tinyurl.com/gu9gb5e> (29 November 2015).
- Department of Higher Education and Training. 2015. *Annual Report 2014/2015*. Available: <http://www.dhet.gov.za/Commissions%20Reports/DHET%20Annual%20Report%202014-2015.pdf> (29 November 2015).
- Jaguszewski, J.M. and Williams, K. 2013. *New Roles for New Times: Transforming Liaison Roles in Research Libraries*. Report prepared for the Association of Research Libraries. Available: <http://www.arl.org/component/content/article/6/2893> (18 November 2014).
- Johnson, C. A. 2007. Library and information science education in developing countries. *International Information and Library Review*, 39(2):64-71.
- Johnson, L., Adams Becker, S., Estrada, V., and Freeman, A. 2014. NMC Horizon Report: 2014

- Library Edition. Available: <http://e-collection.library.ethz.ch/eserv/eth:9052/eth-9052-01.pdf> (29 November 2015).
- Maesaroh, I. and Genoni, P. 2010. An investigation of the continuing professional development practices of Indonesian academic libraries. *Library Management*, 31(8/9):621-634.
- Majid, S. 2004. Continuing professional development (CPD) activities organized by library and information study programs in Southeast Asia. *Journal of Education for Library and Information Science*, 45 (1):58-70.
- Martins, E.C. and Terblanche, F. 2003. Building organisational culture that stimulates creativity and innovation. *European Journal of Innovation Management*, 6(1):64-74.
- Nzimande, B. 2014. Education key to fight poverty. *The Citizen*. Available: <http://www.citizen.co.za/112071/education-key-fight-pov-erty-nzimande/> (29 November 2015).
- Pasmore, W. 2014. Developing a leadership strategy: a critical ingredient for organizational success. Available: <http://www.ccl.org/leadership/pdf/research/LeadershipStrategy.pdf> (29 November 2015).
- Rochkind, R. 2013. *One scenario for the death of the academic library*. Available: <https://bibwild.wordpress.com/2013/05/26/one-scenario-for-the-death-of-the-academic-library/>. (28 April 2015).
- Satgoor, U. 2011. Staff development for institutional success: A reality. Available: [http://repository.up.ac.za/bitstream/handle/2263/17342/Satgoor\\_Staffdevelopment%20\(2011\).pdf?sequence=5](http://repository.up.ac.za/bitstream/handle/2263/17342/Satgoor_Staffdevelopment%20(2011).pdf?sequence=5) . (28 November 2015).
- Skills Development Act (97 of 1998). Available: <http://www.saqa.org.za/docs/legislation/2010/act97.pdf> (29 November 2015).
- Ukachi, N.B. and Onuoha, U. D. 2013. Continuing professional development and innovative information service delivery in Nigerian libraries: Inhibitors and the way out. *Annals of Library and Information Studies*, 60:269–275.

## Chapter Seven

# The Importance of Data, Information and Knowledge in Scholarly Communication

**Carol Tenopir**

University of Tennessee, School of Information Sciences

Email: ctenopir@utk.edu

*Review status: Peer reviewed*

---

### Background

Research in scholarly communication, including the role and importance of data and publications, can reveal important insights into how knowledge is formed and transmitted. These insights can be interesting in and of themselves, as answers to fundamental research questions such as how formal communication helps science progress, and they also can help librarians and publishers and researchers create better information systems. This paper is about the intersection of these concepts in the study of scholarly communication with examples from my own research and the work of others that inspired me in formal scholarly publication.

I cannot begin a paper with a title like this without the obligatory reference to T.S. Eliot's "The Rock" and the data, information, knowledge, and wisdom pyramid derived from it (Eliot, 1934.) Eliot famously posed the questions: "Where is the wisdom we have lost in knowledge?"; "where is the knowledge we have lost in the information?" The pyramid, derived from Eliot, shows data as the bottom foundation or biggest slice of a pyramid. By adding value such as contextualisation and categorisation to data, information is created and becomes the next, smaller but more refined step in the pyramid. Value added by comparison or connections to information create knowledge, while adding value to knowledge such as possible actions or decisions can create wisdom, which is application of knowledge (Taylor, 1986.)

Research on how experts communicate is, of

course, not new. The formal study of scholarly publication goes back to work in the early 1960s by Derek DeSolla Price (1963) and seminal studies by Garvey and Griffith (1967, 1972) and many others over the last six decades. Garvey and Griffith's discussion of "communication means" includes dozens of formal and informal communication venues that researchers use throughout the research process to disseminate their ideas. These means and venues range from personal informal conversations to formal peer-reviewed publications and everything in between. The detailed view of communications means depicted in Figure 1 can be summarised as shown in Figure 2.

Figure 2 is a concise view of Garvey and Griffith's more detailed analysis, where communication can be oral or written OR informal or formal. All communication means contribute to scholarship in sequential and iterative ways and are part of understanding and creating new knowledge.

As complex or as summarised as these standard diagrams are, however, they are incomplete when we think about the complete picture of how scientists or other scholars create knowledge. They leave out important intermediate steps or sources such as observations recorded in laboratory or field notebooks, videos, audio files and data sets. Figure 3 depicts how some of these sources contribute to the research work of a scientist.

Scientists do not just rely on oral communication or written reports to build knowledge and to create publications or new information products.



Figure 1: Communication Means from the work of Garvey and Griffith (reproduced from Tenopir and King, 2004.)

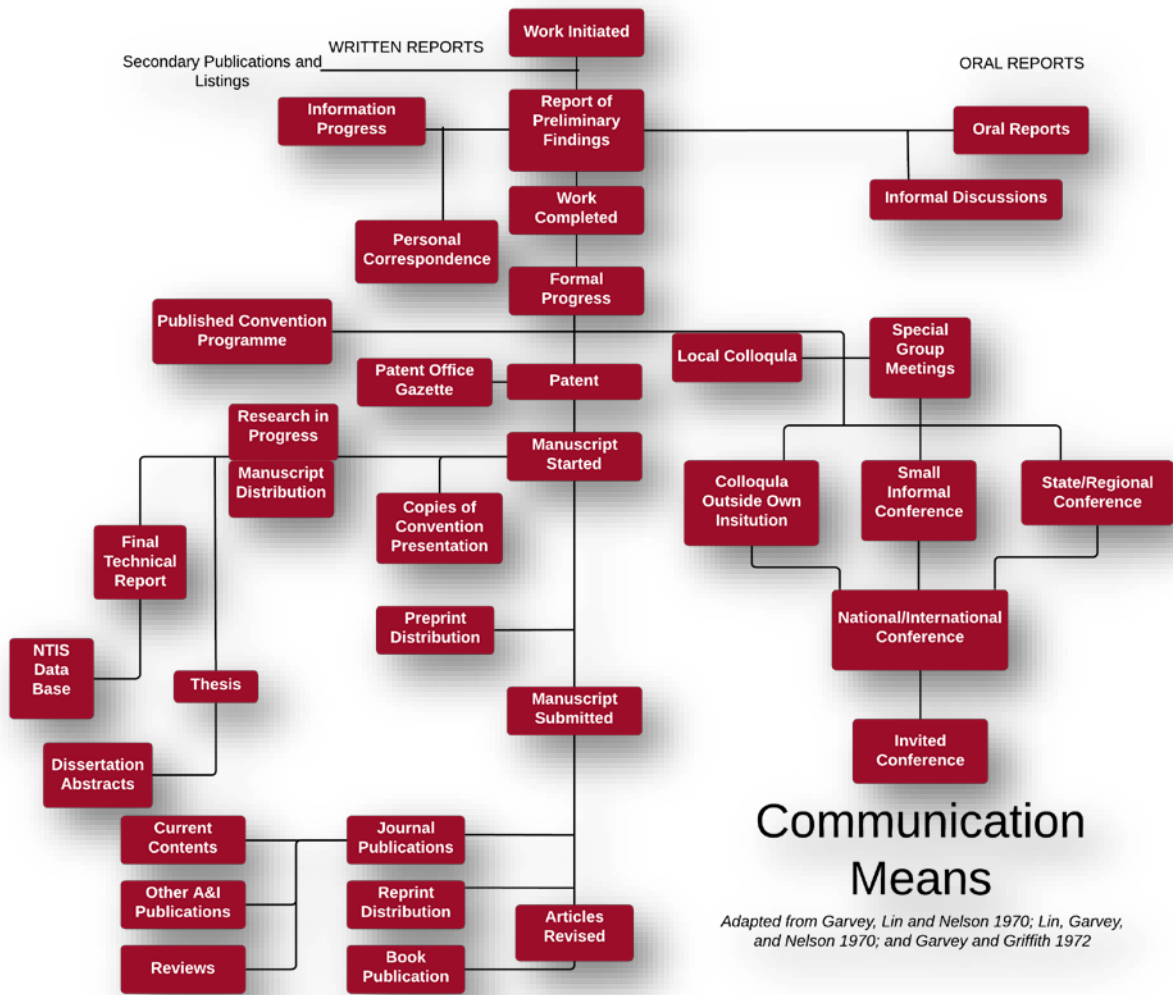
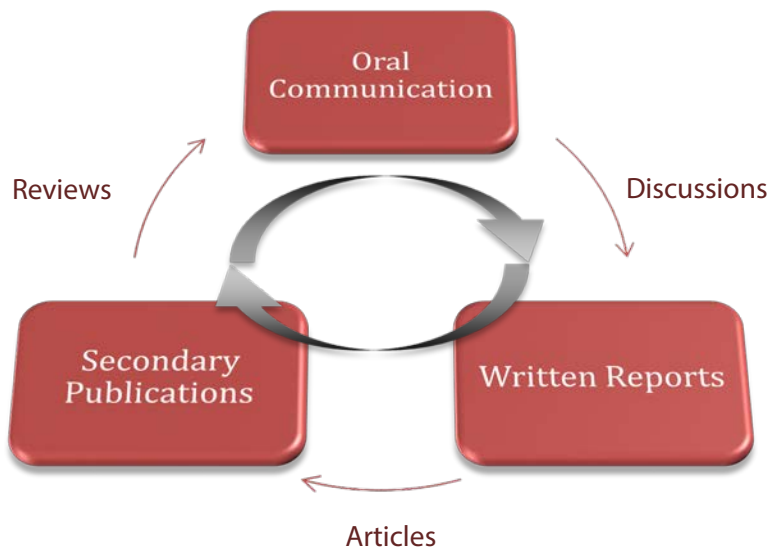


Figure 2: Summary of Communication Means



To understand the entire process, we need to focus more on workflows or the process of how work and knowledge creation go together. Data, specimens, sounds, images, and the like, together with analysis and narrative, all feed into the process of creating new knowledge and communicating science. In an electronic environment, multiple ways of communicating information can feed into enhanced e-publications, as depicted in Figure 4.

Traditionally, not all of these steps or resources have been reflected in the final or more formal products of scholarship such as books and articles. In an e-environment, however, all important artifacts of science and workflow can also be included as parts of publications to form a more complete representation of scholarly communication.

Putting everything in boxes as in the previous diagrams implies a separation and neatness that is not necessarily there. In science, for example, images can both be a transformation of data, that is, a way to understand underlying data collection by visualizing it, OR images can be the data themselves such as photos of animals, or x-rays.

Images by themselves, however, normally do not convey as much meaning as is conveyed when combined with explanatory text. Text, plus images, plus data convey the most meaning and allow the fullest picture (or lead to more knowledge being construed).

And, perhaps, scientific wisdom can be obtained by combining multiple sources of data, with text and visuals, and adding models and computations, which convey an additional level of meaning. This image from the DataONE (Observation Network for Earth) shows an example of how combining data on bird observations, land cover, and weather data that examines climate change, may affect bird migration. (Figure 5) ([dataone.org](http://dataone.org).)

By adding analysis and narrative to the other components, electronic publications have the power to convey multiple levels of meaning to provide various levels or stages of information.

Multi-leveled e-publications allow the consumer to select the level that is needed at the time.

One way to think of this is to think in terms of granularity, or parts, and how to deconstruct, combine and recombine them. Granularity can be defined as 'divisible, or made up of conveniently small and independent parts' (Business Intelligence Dictionary) Granular publications can be combined, divided, and recombined as desired. In the terms of the journal world this means we can go beyond the traditional idea of granularity in terms of just journals, issues, or even articles.

Again, this is not a new concept, the idea of granularity in publishing has long been talked about and is possible. This is not to say that traditional aspects should be eliminated—granularity can mean more parts (or grains), in addition to fewer.

In the traditional, formal, written communication process, especially from the viewpoint of libraries, granularity for writing and reading is often at the journal level. Libraries traditionally selected and purchased journals by journal title, rather than paying for parts of a journal. For distribution and shelving, print journals in turn were broken into issues. In the current e-access and search engine world, granularity from the reader's viewpoint (and certainly the author's) is most often at the article level. Libraries still make purchases at the journal title level or, often, at an even higher level of granularity in bundles of titles grouped by subject or publisher.

On the other hand, granularity of searching and using today may be broken down even further to help users get the level of granularity they need to construct meaning for their purposes. This granularity may be by allowing separation of sections, paragraphs, graphs, tables, photographs, and other components. In addition, if all component parts of a bigger whole are labeled and linked together, an article or a table or a paragraph can be a starting point to go bigger—to the data sets behind a table, for example. This type of flexible thinking shows the value of an ar-

Figure 3: Sources Used by Scientists in Research

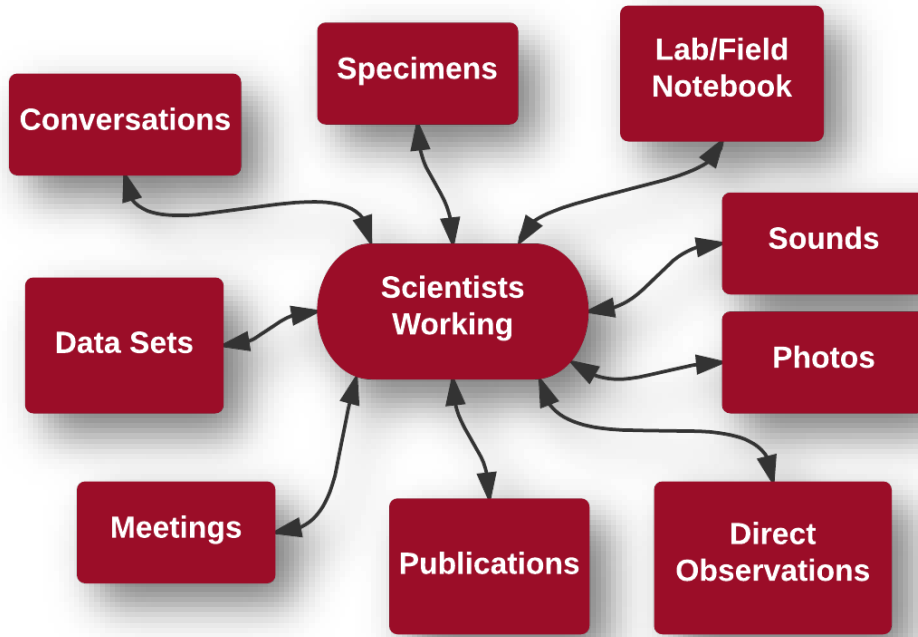


Figure 4: Expanded Formal Publication in an E-environment

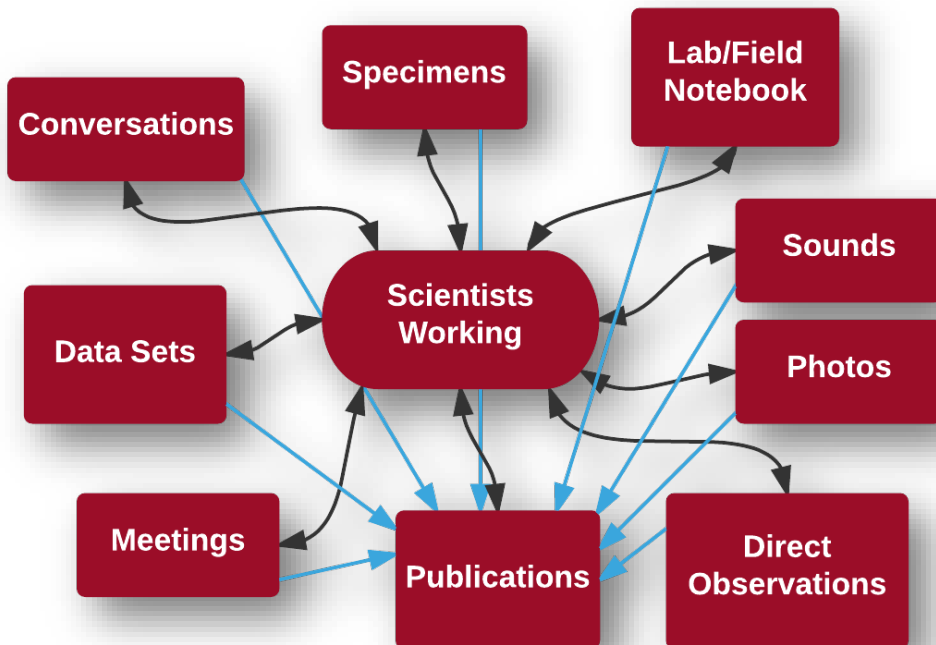
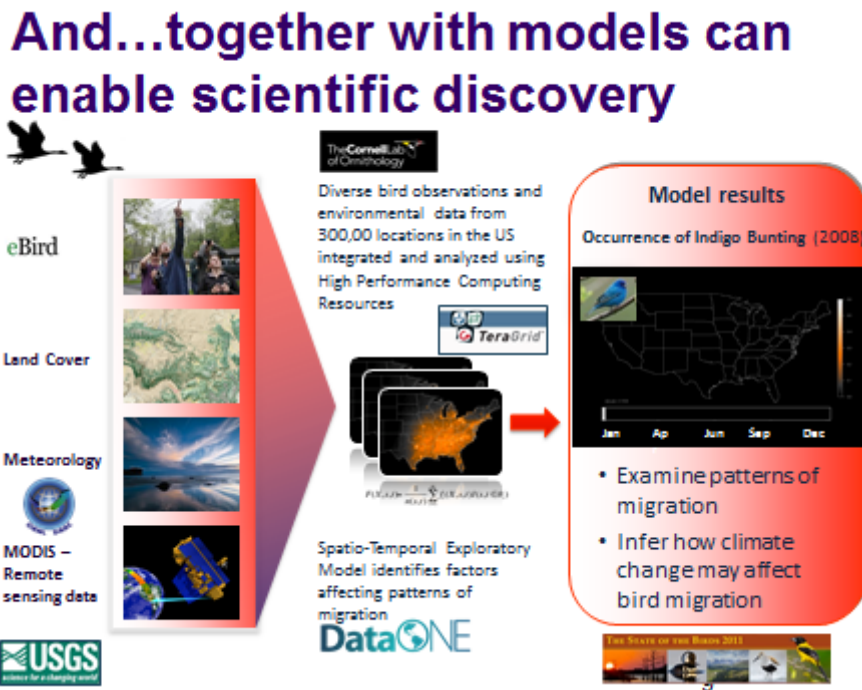


Figure 5: DataONE's Depiction of Combining Multiple Sources of Information



title in the center with granularity allowing use in multiple ways—bigger, smaller, or in sections.

Technology and structures are being put in place to allow this description and interlinking. For example, subject data repositories such as Dryad link articles to data, and many publishers, such as PlosONE, in turn link articles to the corresponding data sets in DRYAD. ([www.plosone.org](http://www.plosone.org); [datadryad.org](http://datadryad.org)). Mark-up or Digital Object Identifiers (DOIs) can be assigned at various levels of granularity to allow search and retrieval of either parts or a whole.

Sometimes researchers need an entire article or most of one, especially for catching up on a topic or when writing an article. Sometimes they need less – just a part of an article such as a paragraph that describes a method or conclusion to check a fact or a picture to use in a class or a presentation. Sometimes they need more – the data on which an article is based, to extend their own research or build on the research of others. Properly designed electronic publications can provide this level of flexibility or fluid granularity in a way not easily accomplished in traditional models.

### Research highlights

This is all background that shows you my thinking on these issues; now let me give you some highlights from some research to back these assumptions. These examples come from the “Deep Indexing” study for CSA (now ProQuest), and data use, reuse, and sharing by scientists surveys for the NSF-sponsored DataONE project.

To test the desirability of direct access to tables and figures embedded in articles, we studied sixty scientists in seven universities and two institutes in US and Europe while they searched on a table and figures indexing prototype database for information relevant to their research projects. Scientists conducted over 350 searches, yielding data by direct observation, diaries, and pre and post searching surveys (Tenopir, Sandusky, and Casado, 2006.)

Research questions included:

- Do scientists need image indexing?
- What do scientists currently do with images?
- How might they use an image index?
- How effective is searching for images?
- How might image searching impact the

work of science?

Note that we did not study issues of the economic feasibility of such a service, if developed, nor whether libraries would be willing to pay for such an indexing feature. Instead, we were concerned with the possible uses (if any) that researchers could make of increased granularity in indexing of articles if it were available. Of course, any decisions CSA or ProQuest made had to take into account the financial viability of such a service.

This study found that without the existence of a special database, scientists in general search for photographs and maps more than tables, figures or graphs; use Google most often to locate images or graphical material; and consistently rate level of satisfaction with current capabilities and results of image or graphics searches as low. Some comments from the participants included: locating objects is "difficult"; and "in general, academic figures, tables, and graphs are not available to search" in current systems. However, several noted that the ability to search for figures might help them find information or data not reflected in the title or abstract of an article and help them find things previously lost in traditional abstracting and indexing tools. They generally reacted positively to the idea of such functionality and granularity to help both research and teaching.

The subjects had many suggestions of what would need to be present if the granularity of scholarly content was deconstructed into images. These suggestions or conditions for success included:

- images must be of high quality with the ability to enlarge thumbnail images;
- the context of the whole article is important and it may be dangerous to see images without the context;
- tables of contents should allow all component parts to be seen in one place and should be searchable;
- extraction of the data behind any table should be supported.

Research data deposit and access has become more common since the research described above. More recently, as part of the NSF-funded DataONE project (dataone.org), the Usability and Assessment Working Group has been surveying a variety of data stakeholders, including scientists who either need access to or create earth and environmental science data and libraries or librarians who may help provide data management services and who have constituents who need help in finding or storing data.

In a 2011 survey of scientists (Tenopir, et al, 2011), we found that although three-quarters of scientists agree with the statement "I share my data", only about a third (36%) agree that "others can access my data easily". This illustrates a gap between willingness and accessibility.

Several years later in a follow-up survey of scientists in 2014-2015 (submitted for publication), the gap had narrowed just slightly, with 78% of scientists saying they shared their data and 45% saying others can access their data. How they share their data may range from sending a data set when it is requested to uploading data into a data repository. Although most did not yet routinely upload data from preservation and sharing, in 2014, 82% of the approximately 1000 respondents said they would put at least some of their data in a central repository, and 45% would place all of their data in a central repository.

Although lack of access isn't yet seen as a major impediment to science (27% in 2011 agreed that it was a major impediment), half of them (50%) said it restricted their ability to answer scientific questions and 78% said they would use other's datasets if the data were easily accessible (Tenopir, et al, 2011).

Scientists said they do not share data in repositories for a variety of reasons, including:

- Insufficient time (45%)
- Lack of funding (34%)
- No place to put data (20%)
- Do not have rights to make data available (20%)
- Lack of standards (17%)

Figure 6: Reference support services by Academic Libraries for Research Data Management (Tenopir, Birch, and Allard, 2012).

## Reference support services, by type of institution...

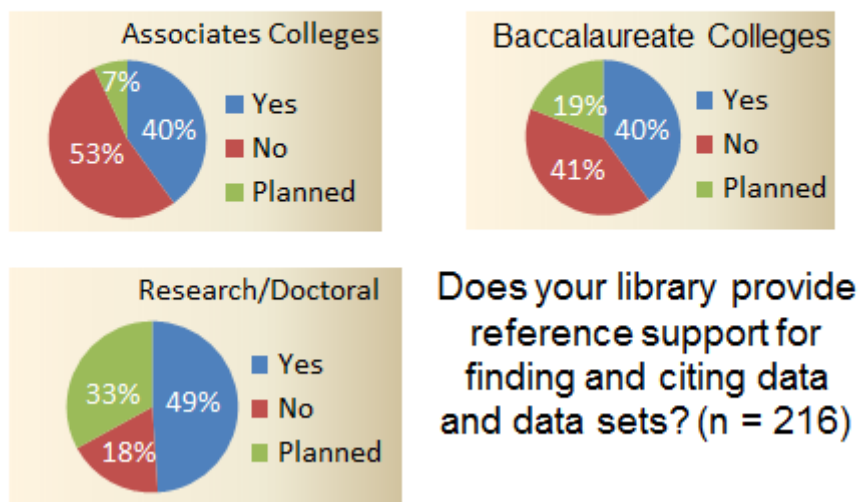


Figure 7: Technical Support Services by Academic Libraries for Research Data Management (Tenopir, Birch, and Allard, 2012).

## Technical support services, by type of institution...

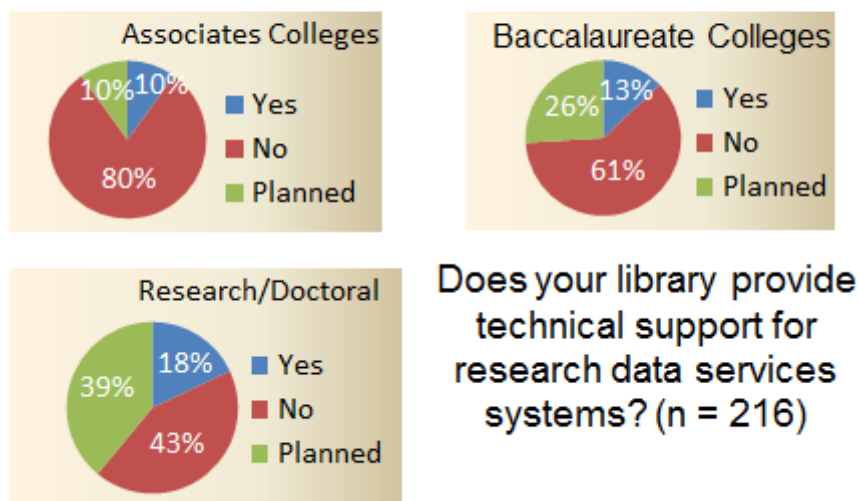
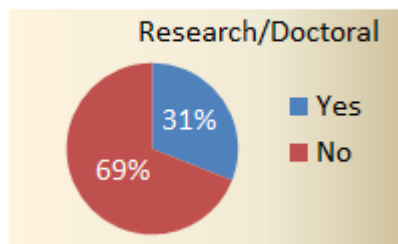
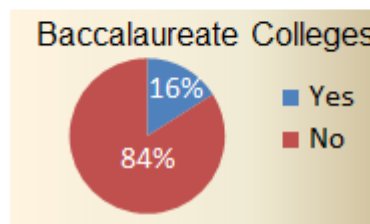
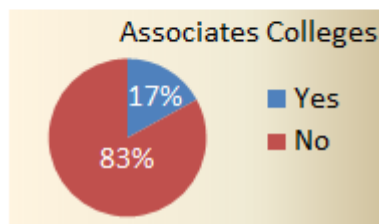


Figure 8: Staff Development in Research Data Management by Academic Libraries (Tenopir, Birch, and Allard, 2012).

## Staff development, by type of institution...



Has your library provided opportunities for staff to develop skills related to RDS? (n = 215)

- Sponsor does not require it (15%)
- Others do not need their data (13%)
- Their data should not be available (12%) (Tenopir, et al, 2011).

Some of these reasons for not sharing data cannot be easily resolved, but the major reasons of lack of time and lack of funding provide an opportunity for libraries to help.

Another survey for DataONE, assisted by the Association of College & Research Libraries, asked Directors of North American academic libraries if their libraries provided reference support for finding and citing data. A majority of research libraries said they either offered these services already, or are planning to (49% currently offer and 33% plan to offer) (Figure 6) (Tenopir, Birch, and Allard, 2012)

Far fewer research academic libraries offer technical support for data (18% of research libraries currently offer technical support, with an additional 39% saying they plan to) (Figure 7) (Tenopir, Birch, and Allard, 2012). Perhaps this is an opportunity for collaboration across campus units, across university libraries, or in conjunction with publishers, libraries, and data repositories.

An implication and opportunity for LIS educators can be found in the response to the question:

“Has your library provided opportunities for staff to develop skills related to research data management?” Just 31% of the 215 research/doctoral libraries, 16% of the baccalaureate colleges, and 17% of the two-year associate degree colleges say that they provide such opportunities (Figure 8). Continuing education opportunities or inclusion of such topics in classes could provide a service from LIS programs to the changing needs of the profession (Tenopir, Birch, & Allard, 2012).

There is a clear lack of skills development opportunities regarding data management in academic libraries. Educators and libraries and professional organizations can work together to resolve this skills gap.

### Conclusion

Electronic journals allow a rethinking of how scientists can communicate their research and how others will want to access the products of research to help them in their work. By building on concepts expressed in the past, we can build a granular view of formal scholarship, allowing access at many levels, in many ways, to the variety of scholarly outputs that goes into the whole picture of research. While access to component parts is an essential aspect of granularity, the data behind graphs and charts is also an important

component to enlarge the typical journal article.

In conclusion, from a lifetime of research:

- access to information, data, and visuals can help scientists in many ways, but affordable/sustainable services or products need to be developed;
- when posing research questions

or designing systems we need to think in many different levels of granularity, access, and utility; and

- Library and Information Science education and research can help in providing research, education, and services that help others form knowledge more effectively

---

## References

Eliot, T.S. 1934. The Rock. *Stories of the Human Spirit*. Ed. Peter Y. Chou. Available:

[.http://www.wisdomportal.com/Technology/TSEliot-TheRock.html](http://www.wisdomportal.com/Technology/TSEliot-TheRock.html). (15 October 2014).

Garvey, W. D., & Griffith, B. C. 1967. Scientific communication as a social system. *Science*. 157(3792):1011-1016.

Garvey, W. D., & Griffith, B. C. 1972. Communication and information processing within scientific disciplines - empirical findings for psychology. *Information Storage and Retrieval*. 8 (3):123-136.

"Granularity" Def. 1. Business Intelligence Dictionary. [Online]. Accessed <http://business-intelligence.com/dictionary/granularity/>. (22 April 2015).

Price, Derek John De Solla. 1963. *Little Science, Big Science...And Beyond*. Columbia University Press.

Taylor, Robert. 1986. *Value Added Processes in Information Systems*. Westport. Greenwood.

Tenopir, Carol and King, Donald, W. 2004. *Communication Patterns of Engineers*. Wiley-IEEE Press.

Tenopir, Carol, Sandusky, Robert J., and Casado, Margaret M. 2006. The Value of CSA Deep Indexing for Researchers. Prepared for CSA. Available: [http://works.bepress.com/carol\\_tenopir/1](http://works.bepress.com/carol_tenopir/1). (22 April 2015).

Tenopir, Carol, et al. 2011. Data Sharing by Scientists: Practices and Perceptions. Available: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0021101>. (22 April 2015). DOI: 10.1371/journal.pone.0021101.

Tenopir, Carol, Birch, Ben, and Allard, Suzie. 2012. Academic Libraries and Research Data Services. Association of College and Research Libraries. Available: [http://www.ala.org/acrl/sites/ala.org/acrl/files/content/publications/whitepapers/Tenopir\\_Birch\\_Allard.pdf](http://www.ala.org/acrl/sites/ala.org/acrl/files/content/publications/whitepapers/Tenopir_Birch_Allard.pdf). (22 April 2015).



## Chapter Eight

# Fostering Open Science Practice through Recognising and Rewarding Research Data Management and Curation Skills

Joy Davidson

Digital Curation Centre, UK  
Email: joy.davidson@glasgow.ac.uk

*Review status: peer reviewed*

---

### How has the research landscape changed in the UK?

Not too long ago, researchers primarily needed to worry about securing grant income, doing their research, and publishing their findings in an appropriate, subject specific journal. The process was straight-forward and there was little need to report activity in detail at the institutional level. However, with the advent of the Research Assessment Exercise (RAE) back in 2008, things began to change as research publication metrics relating to both quantity and quality had to be produced by participating Higher Education Institutions (HEIs). The RAE was:

conducted jointly by the Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW) and the Department for Employment and Learning, Northern Ireland (DEL). The primary purpose of the RAE 2008 was to produce quality profiles for each submission of research activity made by institutions (HEFCE, SFC, HEFCW & DEL. 2008).

In the run up to RAE 2008, many HEIs introduced institutional repositories and associated deposit policies to make the reporting process more accurate and efficient. A few years later, the emergence of Research Councils UK's *Common Principles on Research Data Policy* (RCUK, 2011) placed further demands upon researchers in terms of managing and sharing outputs to make research more accountable, open, and reusable. As part of this new landscape, data management

plans (DMPs) are now required at the grant application stage by the majority of Research Councils UK (RCUK) funders. The only exception is the Engineering and Physical Sciences Research Council (EPSRC) who do not want to see a DMP alongside the grant application but assume that one will exist locally. Bill Hubbard, Director of the Centre for Research Communications at the University of Nottingham, has captured the increasing complexity of the changing research landscape in Figure 1.

The majority of RCUK funders place the onus on researchers to provide evidence that research data management and sharing are being considered from the outset of new projects via the completion of a data management plan (DMP). However, things changed when EPSRC released its Policy Framework on Research Data in 2011. The policy included nine expectations for those in receipt of - or seeking to be in receipt of - EPSRC funding. Crucially, EPSRC placed the onus on the research institution to demonstrate that suitable infrastructure was in place rather than on the individual researcher. The deadline for compliance with EPSRC's nine expectations came into effect on May 1, 2015 and, in early June of the same year, a light-touch survey was issued to senior management in UK HEIs to assess progress. EPSRC's policy has been absolutely instrumental in unlocking institutional funding for the development of fledgling RDM support services and systems and has had practical implications for both researchers and support staff. The follow up to the 2008 RAE - the Research Excellence Frame-

Figure 1: View of the changing research landscape for researchers (Hubbard, 2015)



work (REF) - has complicated the research landscape even further. Now HEIs are required to measure and report on the impact of their research activities as well as the quantity and quality of their research outputs. Impact accounted for 20 per cent of the overall REF score in 2014. In the guidance provided by HEFCE, SFC, HECW, and DEL, Research Excellence Framework (REF) review panels were asked to assess the:

reach and significance of impacts on the economy, society and/or culture that were underpinned by excellent research conducted in the submitted unit [of assessment], as well as the submitted unit's approach to enabling impact from its research (HEFCE, SFC, HEFCW & DEL, 2014).

While the UK has been a leader in terms of driving forward the open science agenda through various governmental and funding body mandates, it is important to note that this movement is truly global in nature. Funding bodies in the US have also been early implementers of the open science movement and the European Union and South Africa are currently introducing mandates relating to the management and sharing of research data and publications.

To ensure that researchers and HEIs can operate effectively in this new research landscape, far greater cooperation and collaboration among the entire range of stakeholders involved in the research lifecycle is needed from the very outset of new research projects.

### What support services will researchers need to be effective in this new research landscape?

To equip researchers to embrace open science practices, HEIs need to ensure that adequate sup-

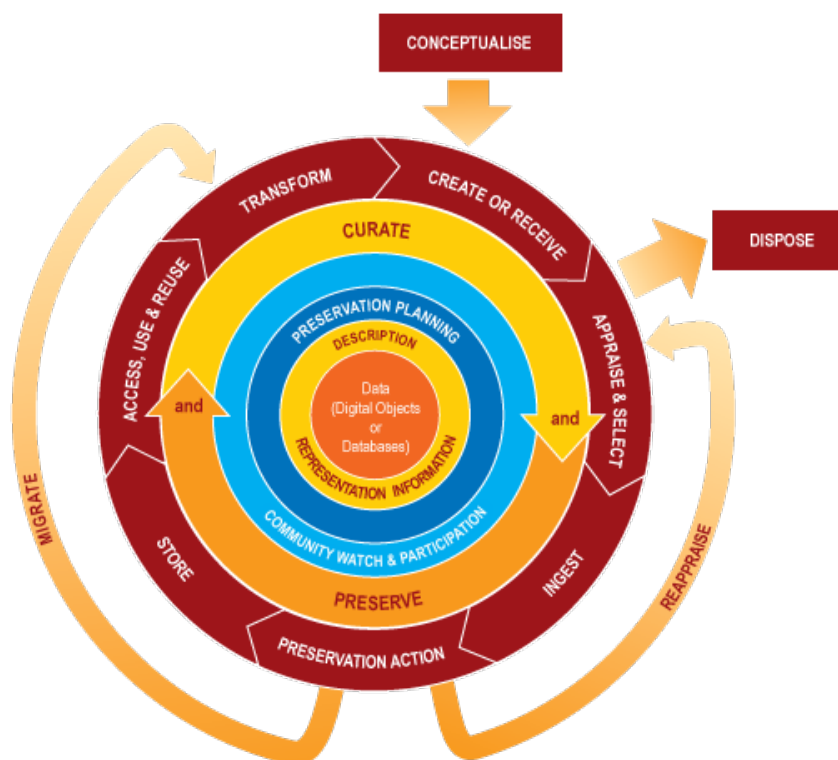
port systems and services are in place. Established in 2004 and funded by JISC, the Digital Curation Centre (DCC) helps UK universities build capacity and capability for research data management and curation. In 2007, the DCC developed its Lifecycle Model (Higgins, 2008) to assist in breaking down the range of roles, responsibilities and actions that need to be considered as part of good research practice.

In a practical sense, the model has helped to progress the development of procedures, tools, and support services for research data management and sharing within institutions. The Lifecycle Model has also been used to inform the development of digital curation curricula across the globe. However, while good progress has been made in defining services and educational programmes, there is still much to be done to embed the necessary research data management and curation skills into the daily workflows of all researchers and support staff.

Over the past ten years, the DCC has been involved in numerous international initiatives to help improve the quality and consistency of research data management and curation training and education. This has included participation in working groups to define digital curation curricula and leading several research projects to define, assess and benchmark skills required for RDM, curation and open science (for example: Research Data Management Skills Support Initiative (DaMSSI) in 2010; DaMSSI-Assessment, Benchmarking and Classification in 2011; Facilitate Open Science Training for European Research (FOSTER) in 2014).

A number of skillsets and aptitudes have been defined to reflect the range of competencies

Figure 2: Digital Curation Lifecycle Model (DCC Curation Lifecycle Model, 2015)



needed by different stakeholders across the curation lifecycle including ARMA's *Professional Development Framework for Research Administrators* (2011), CILIP's *Professional Knowledge and Skills Base for Information Professionals* (2013) and *Vitae's Information Literacy Lens on the Researcher Development Framework for Researchers* (2012). However, there has been a lack of standardised approaches that enable contributions to the research processes from a range of stakeholders to be represented consistently when reporting. Accordingly, it has been very difficult to see how – or if – curation skills acquired through formal education, professional development training, or on-the-job learning have translated into improved daily workflows across the research lifecycle. In addition, there are few reward structures in place that recognise those who are making use of their research data management and curation skills to undertake or to support open science. This gap in the recognition of curation skills can often make it difficult to incentivise researchers or support staff to put the necessary time and effort into acquiring these skills.

### How the CRediT taxonomy could help to join the skills acquisition and skills recognition gap

In light of the fact that many publishers now require the roles of authors listed in academic papers to be clarified, the CRediT contributor roles taxonomy was developed by a small group of journal editors, Harvard University, and the Wellcome Trust in 2012 to help make contribution reporting more consistent (Allen et al, 2014). Project CRediT is:

...led by The Wellcome Trust and Digital Science, facilitated by CASRAI and NISO and supported by the Science Europe Scientific Committee for the Life, Environmental and Geo Sciences. The project is developing and maintaining recommendations for a science-oriented contributor role taxonomy and its implementation (Project-CRediT, 2015).

The 14 term taxonomy that was developed aims to describe a more accurate and complete range of the contributions involved in producing research publications. The taxonomy was tested between August and November 2013 through an online survey of researchers who had recently

contributed towards academic publications. The taxonomy also helps to specify the degree of contribution (i.e., lead, equal, or supporting) more consistently. The taxonomy could help to provide evidence of research data management and curation skills being applied in a range of research and support roles and, by enabling these efforts to be recognised more formally by publishers and employers, help to incentivise and drive forward good practice.

In addition to being applied retrospectively to recognise contributions, there is scope to apply the taxonomy proactively when designing and describing educational programmes and professional development training courses in all disciplines. The proactive use of the taxonomy might lead to more effective course selection and the ability of participants - and their employers - to measure and reward learning outcomes over time. By employing a standard set of terms, the taxonomy may also enable better alignment between disciplines so that the skillsets of a range of stakeholders are more complementary. The alignment of curation related skillsets between disciplines has proven very difficult to date (Davidson et al, 2012).

By acknowledging and recognising that many different roles are involved in producing research outputs and employing a standard set of terms that describes these various contributions, the mapping of research data management and curation skills for researchers, librarians, administrators and other stakeholders is far more feasible. The potential value of the CRediT taxonomy for this purpose is currently being explored through the Research Data Alliance Interest Group on Education and Training (Davidson and Jung, 2015).

### **CRediT Taxonomy**

The next section of the paper will introduce the 14 CRediT taxonomy elements as they relate to the Digital Curation Lifecycle Model and make specific recommendations relating to the potential roles of Library and Information Science (LIS) professionals. Where appropriate, multiple

CRediT taxonomy elements have been clustered together under specific lifecycle stages.

### **Conceptualisation stage**

Coming up with research questions, seeking suitable funding calls, and developing pre-award data management planning should all take place during the conceptualisation stage of the curation lifecycle. It is important to consider all of the relevant roles and responsibilities relating to data sharing to ensure that adequate funding can be requested for any data cleaning or anonymisation that might be required. Table 1 reflects the relevant CRediT taxonomy elements for the conceptualisation stage.

Research in all disciplines is becoming increasingly data driven. This means that during the conceptualisation stage of the research project, librarians may start to play an important role in helping researchers carry out a data review to progress the development of new research ideas. This draws upon the established role of librarians in supporting literature reviews, but will help to ensure that researchers have undertaken a landscape analysis to ensure that any proposed data collection activity will not be duplicating data that already exists. Evidence that new research projects will not be duplicating data collection is something that some funding bodies are now actively seeking in grant applications, as can be seen in this extract from the Economic and Social Research Council (ESRC) data management planning guidelines:

Where research grant applicants plan to create new data as part of their ESRC-funded proposal, they must demonstrate that no suitable data are available for re-use. ESRC encourages the re-use of existing data and therefore encourages applicants and grant holders to consider the breadth of data available from various sources before committing to primary data collection (ESRC, 2015).

In cases where data do already exist, it might be the case that they are not suitable for reuse due to poor quality, lack of contextual metadata, or unsuitable data licences being applied. In-

Table 1: CRediT taxonomy elements for the conceptualisation stage (Allen et al, 2014)

|                                   |  |
|-----------------------------------|--|
| <b>#1 conceptualization</b>       | Ideas; formulation or evolution of overarching research goals and aims.  |
| <b>#8 data curation</b>           | Management activities to annotate (produce metadata), scrub data and maintain research data (including software code, where it is necessary for interpreting the data itself) for initial use and later reuse. |
| <b>#12 supervision</b>            | Oversight and leadership responsibility for the research activity planning and execution, including mentorship external to the core team.  |
| <b>#13 project administration</b> | Management and coordination responsibility for the research activity planning and execution.   |
| <b>#14 funding acquisition</b>    | Acquisition of the financial support for the project leading to this publication.  |

deed, in some cases, it may not even be possible to search for, or identify, existing research data held by HEIs. In such cases, librarians may be crucial in helping to document searches that have been carried out and in making the case in the grant application that re-creating data is necessary.

Librarians will also play a key role in contributing to the development of required data management plans for new grant applications and many library staff in UK HEIs are actively involved in developing customised, institutional guidance for inclusion in DMP tools (e.g. DMPonline). Effective curation starts with good data management planning and, in this respect, librarians will play a vital role in ensuring that valuable data are managed and curated over the entire digital curation lifecycle. Indeed, in the UK, many of the early data management and curation support services emerging in HEIs are being led by the library. In addition to general research data management planning support, librarians will be influential in determining current RDM and curation practice and capacity within the institution and in identifying future requirements using methodologies such as the Data Asset Framework (DAF).

Librarians' expertise around making information accessible and understandable will be crucial for longer term curation and reuse. In terms of improving the visibility of research data

generated by the institution, librarians will be instrumental in defining requirements for, and the establishment of, institutional data catalogues that will be harvested by national data discovery services such as Research Data Australia and Jisc's Research Data Discovery Service.

Research data management and curation requires dedicated effort and the allocation of resources. Fortunately, as stated in the *RCUK Common Principles on Research Data Policy*, funders agree that the use of public funds to support data accessibility and reuse are appropriate. Clarifications on the sorts of costs that might be eligible in grant applications were provided by RCUK following the DCC's *Research Data Management Forum on Funding for Research Data Management* (Ryan, 2013). While a range of RDM and curation activity costs are eligible within grant applications, they must be clearly justified – just as any other budget request would need to be. There is a real risk though that these eligible costs may be missed unless effective data management planning is carried out early and in consultation with key stakeholders. Librarians have a proven track record as trusted liaison points between researchers and central university services. By continuing to foster this pivotal role, librarians could play a crucial role in ensuring that adequate RDM and curation activities are identified and costed into new grant applications. Tools such as the *UK*

*Data Archive's Data Management Costing Tool and Checklist* (UK Data Archive, 2013), the DCC's *Five Steps to Decide What Data to Keep* (DCC, 2014) and the *Collaboration to Clarify the Costs of Curation* (4C, 2013 and 2015) will be useful references for librarians to consult when costing curation activities.

In the longer term, librarians will play a key role in developing and delivering effective training for research staff and students around research data management and curation themes, for example the MANTRA research data management course which was developed by EDINA at the University of Edinburgh (2010).

### **Create or receive stage**

During the creation stage of the curation lifecycle, the data management plan should be updated with more concrete information regarding specific research approaches and refer to the adoptions of relevant disciplinary standards. During the active stage of the project, researchers will be collecting and/or using data and performing analyses. In many cases, they will also develop code to enable them to perform specific analyses and/or to visualise their data more effectively. Maintaining these additional research outputs is essential for longer term reuse – both by those who created the data and by others. Relevant CRediT taxonomy elements for the creation stage can be seen in Table 2.

Librarians may have an active role to play in helping to define methodologies around data collection in new research projects. While researchers will be adept with disciplinary norms and standards of good practice within their particular community of practice, librarians will be influential in advising on broader metadata standards – particularly in light of making research outputs more visible, understandable and ultimately reusable to other disciplines as well as by the general public where appropriate. In a recent article, Markin highlights that:

Many libraries are playing a leadership role in this effort. Data storage and preparation can get complicated

quickly for the nonexpert, and it's useful to have someone knowledgeable who can guide you through the intricacies of naming and formatting data for easier access by others (Markin, 2015).

For researchers working with sensitive data, librarians may be well positioned to spot potential methodological conflicts between data protection and plans for data sharing and reuse as outlined in data management plans and/or pathway to impact statements. Such risks could then be flagged to researchers and ethics teams to ensure that suitable consent forms and terms and conditions for access and reuse are developed for the data.

In relation to this, librarians could play a role in helping researchers to assess the level of data cleaning and/or anonymisation that may be required to facilitate data sharing and reuse. Data cleaning and anonymisation can be costly activities and, as noted above, librarians may be pivotal in ensuring that additional costs relating to RDM and data sharing are identified and factored into grant applications. However, it is currently difficult to get recognition for this valuable work. The recent Expert Advisory Group on Data Access (EAGDA) report stated that:

Understanding user requirements and extracting, formatting, annotating and cleaning data to maximise its utility and value to other users can take up a significant proportion of staff time. These efforts are often considered to be activities that should be undertaken as "part of the day job" yet are rarely recognised or credited academically (Expert Advisory Group on Data Access, 2015).

In cases where data cleaning or anonymization costs are prohibitive, librarians may be called upon to offer advice on alternative approaches that will meet funders' data sharing expectations while respecting data protection laws. For instance, if a proposed social science research project aims to conduct video-taped interviews as part of the data collection process and the researcher has indicated that they would like to



Table 2: CRediT taxonomy elements for the creation stage (Allen et al, 2014)

|                           |  |
|---------------------------|--|
| <b>#2 methodology</b>     | Development or design of methodology; creation of models   |
| <b>#6 investigation</b>   | Conducting a research and investigation process, specifically performing the experiments, or data/evidence collection  |
| <b>#3 software</b>        | Programming, software development; designing computer programs; implementation of the computer code and supporting algorithms; testing of existing code components |
| <b>#5 formal analysis</b> | Application of statistical, mathematical, computational, or other formal techniques to analyse or synthesize study data.   |
| <b>#11 visualization</b>  | Preparation, creation and/or presentation of the published work, specifically visualization/data presentation.   |

share an anonymised version of this data after the project ends, it may be the case that the costs of anonymising the video data would be greater than the actual award is worth. In such cases, it may be more appropriate to state in the data management plan that an anonymised transcript will be shared as an output of the project rather than the video data itself.

Researchers often develop bespoke software to enable them to carry out specific analyses and/or to create visualisations of the data they are working with. To ensure that research findings are reproducible, access is needed not only to publications and the underlying data, but also the software, algorithms, and techniques that were employed to perform these analyses to enable validation and effective reuse. In some cases, the software developed to analyse or enable a visualisation of the data is more at risk than the research data itself. This is particularly true for researchers who are developing new tools and techniques for analysing existing, well curated data sets (e.g., historical weather data held by National Oceanic and Atmospheric Administration (NOAA)). In the same way that data management planning helps to ensure that the management of research data is considered from the outset of new research activity, the development of a software sustainability plan helps to ensure that any required software or code is maintained throughout the project and beyond. Michael Jackson of

the Software Sustainability Institute (SSI) explained:

It is easy to concentrate on the short-term issues when developing scientific software. Deadlines for publications, collaboration with others and the demands of a daily routine all conspire to prevent proper planning. A software management plan can help to formalise a set of structures and goals that ensure research software is accessible and reusable in the short, medium and long term. It also helps researchers to consider whether third-party software to be used within a research project will be available, and supported, for the lifetime of the project. They can also give funders confidence that software they have funded survives beyond the funding period, that there is something to show for their investment (Jackson, 2015).

As Jackson noted, researchers are often under pressure and may not consider some of these issues until it is too late. Librarians, as part of their overall data management planning and curation support during the conceptualisation and creation stages, might help researchers to consider whether such a plan is required for their research and help them to complete the plan if necessary. In 2014, the SSI collaborated with the Digital Curation Centre (DCC) to develop a software management plan service (SSI, 2015) based on DMPonline.

## Appraise and select stage

A key stage in the curation lifecycle is selecting what data must be kept beyond the life of the project. As a minimum, most funders expect sufficient data to be retained to enable validation of published research findings. However, data that cannot be reproduced or has potential longer term value may also be considered for longer term retention. Librarians could play a significant role in assisting researchers to assess what data must be retained to comply with funders' and publishers' expectations on reproducibility. Relevant CRediT taxonomy elements for the appraise and select stage of the curation lifecycle is shown in Table 3.

Recent reports have highlighted the worrying fact that a large proportion of published research findings are not reproducible. While reproducibility itself is not always a guarantee of integrity, an open and transparent approach is optimal as explained in a recent Nature Editorial:

Reproducibility, rigour, transparency and independent verification are cornerstones of the scientific method. Of course, just because a result is reproducible does not make it right, and just because it is not reproducible does not make it wrong. A transparent and rigorous approach, however, will almost always shine a light on issues of reproducibility. This light ensures that science moves forward, through independent verifications as well as the course corrections that come from refutations and the objective examination of the resulting data (Nature, 2014).

However, as the size and the complexity of the data being generated and analysed in research activity increases, it is clear that replication will not always be feasible. In such cases, the early accessibility to the underlying data and tools used to produce published findings becomes even more crucial.

In the era of Big Data and expensive science, it isn't always possible to replicate an experiment. However, it is possible to post the data and the computer software used to analyse it

online, so that others can verify the results (Organizing Committee of the Future of the Statistical Sciences Workshop, 2014).

Early openness amongst peers can help to identify any problems or mistakes in the data and ensure that these are corrected. However, it can often be difficult for researchers to know how and when they should share their data. Indeed, many researchers are often confused by mandates relating to data sharing and feel unsure about what data can be shared and with whom it could be shared. The Expert Advisory Group on Data Access (EAGDA) found that "many researchers are unclear as to which research datasets should be made accessible to secondary researchers. This judgement should take into account the size, complexity and generalizable utility of the data generated" (EAGDA, 2015).

It is important to remember that funding bodies are not advocating that any researchers share data that will breach data protection legislation or infringe upon IPR associated with commercial research activity or emerging patents. Indeed, funding bodies expect researchers to employ exemptions to data sharing as appropriate. The Engineering and Physical Sciences Research Council expects that "researchers and research students have a general awareness of the regulatory environment and of the available exemptions which may be used, should the need arise, to justify the withholding of research data" (EPSRC Expectations, 2011). Librarians can help researchers to identify what data can be shared and also help identify the best mechanisms to share their data at various points over the research lifecycle – from the use of safe havens for access to sensitive data during the active phase of research through to deposit in subject specific or institutional data repositories for wider visibility beyond the life of the project.

Ultimately, data sharing at appropriate points in the research lifecycle enables peer review and helps improve the overall integrity of the published findings. Research integrity is important for researchers' career development and reputa-



Table 3: CRediT taxonomy elements for the appraise and select stage (Allen et al, 2014)

|                      |   |
|----------------------|---|
| <b>#4 validation</b> | Verification, whether as a part of the activity or separate, of the overall replication/reproducibility of results/experiments and other research outputs |
| <b>#7 resources</b>  | Provision of study materials, reagents, materials, patients, laboratory samples, animals, instrumentation, computing resources, or other analysis tools   |

Table 4: CRediT taxonomy elements for the creation stage (Allen et al, 2014)

|                    |   |
|--------------------|---|
| <b>#9 writing</b>  | Original draft: Preparation, creation and/or presentation of the published work, specifically writing the initial draft (including substantive translation).  |
| <b>#10 writing</b> | Review and editing: Preparation, creation and/or presentation of the published work by those from the original research group, specifically critical review, commentary or revision – including pre- or post-publication stages |

tions, but equally vital for research organisations' overall credibility. In addition, research integrity helps to build confidence and trust in researchers and the findings which will be used to inform policy making. Finally, research integrity is crucial for ensuring that ongoing public investment is made available to support future research activity (Science Europe, 2015). However, not all research will be captured in a digital format. Many researchers work in a hybrid environment where analogue materials such as tissue samples or core samples form an integral part of the analysis. In some cases, funders may require that mechanisms for enabling access to non-digital materials are provided. As Markin (2015) pointed out "some divisions of the NSF require providing access only to digital data, while the ocean-sciences division of the NSF requires the sharing of sediment, core, and dredge samples as well". It is crucial that researchers consider how links to such analogue materials will be handled with regards to research integrity, reproducibility and validation of published findings. Librarians will play an important role in advising researchers on how to store, cite, and link the wide range of research materials collected and produced during their research activity.

### Access, use and reuse

During the access, use and reuse stage of the curation lifecycle, researchers will be working to

publish and share their research findings. This will involve understanding funding bodies' and publishers' requirements relating to timing and allowable embargo periods, as well as more practical aspects such as providing identifiers and statements indicating how underlying data might be accessed. Table 4 shows the relevant CRediT taxonomy elements for the creation stage.

Librarians have been instrumental in supporting open access with regards to research publications. Their experience with helping researchers to navigate through the complex maze of institutional policies, funding body requirements, and publishers' expectations will be an asset in assisting researchers to consider publishing data alongside their publications. As noted earlier, librarians may play a key role in supporting researchers to identify what data must – or should – be published and/or retained to enable validation of published findings or for broader reuse value. Data that is selected for publication and/or retention will require the application of a persistent identifier using services such as DataCite. The application of identifiers can offer benefits. On its website, DataCite states "Citable data become legitimate contributions to scholarly communication, paving the way for new metrics and publication models that recognise and reward data sharing" (DataCite, 2015).

Facilitating access to research outputs is an increasingly integral aspect of funded research activity. However, the effort required by librarians to enable effective access to research publications and related outputs is often underestimated by senior management. In addition to advising on stakeholder requirements, selecting an appropriate route for open access publication (i.e., green or gold), advising on the timing of deposit, for example, in relation to HEFCE's requirements for REF 2020 librarians will also need to deal with finding funds for Article Processing Charges (APCs), and ensuring that there are statements in published papers that specify how to access underlying data, and relevant software and code (RCUK Policy on Open Access, 2013). Additional effort will also be required to help researchers promote their work, to monitor usage, and to gather metrics. The Expert Advisory Group on Data Access (EAGDA) report stated:

As data access activities are subsumed into general staff time and not specifically credited, it was felt by some interviewees that data access is supported primarily through general goodwill of staff, which is not a sustainable basis for maintaining access (EAGDA, 2015).

Librarians' contribution to the publication process is crucial in a number of ways and cannot be sustained without adequate resource allocation and recognition of this vital support role.

## Conclusion

It is clear that the professions of both researchers and librarians are evolving as the research landscape changes. As demonstrated through the mapping to the CRediT taxonomy, there is no shortage in the number and range of opportunities available to librarians to become

active players in supporting RDM and curation as part of the open science movement. Librarians have consistently demonstrated flexibility and willingness to embrace change and this attitude in no small part has been a crucial factor in the early successes we've seen in the UK.

We must ensure that emerging LIS professionals have the capacity to contribute effectively to this changing landscape and that there are sufficient opportunities for ongoing professional development that are endorsed by professional bodies and employers. A number of new educational programmes are being developed, e.g., the Library and Information Science Centre's MPhil in Digital Curation (University of Cape Town, 2015). However, we must bear in mind that librarians already have very heavy workloads and a wide range of work related responsibilities beyond open science. Indeed, librarians are, in many cases, active researchers in their own right who secure grant funding and publish. The full range of professional activities must be taken into account when developing new career specifications for librarians and – equally important – must also be recognised by employers.

Researchers and research support staff will need to acquire new skills to work effectively as the research landscape changes. To foster a real change in practice though, and to see these communities of practice embrace open science, we must ensure that the acquisition and application of these new skills are recognised and rewarded. The CRediT taxonomy could offer an effective means of describing the broad range and level of contributions from both researchers and support staff in a more unified way and help to inform future changes in research assessment exercises and related reward structures.

---

## References

Allen L, Scott J, Brand A, Hlava M, Altman M. 2014. Publishing: Credit where credit is due. *Nature* 508. Available: <http://www.nature.com/news/publishing-credit-where-credit-is-due-1.15033> (05 August 2015).

Association of Research Managers and Administrators (ARMA). 2011. Professional Development Framework. Available: <https://www.arma.ac.uk/professional-development/PDF> (05 August 2015).

- Australian National Data Service (ANDS). Research Data Australia. Available: <https://researchdata.ands.org.au/> (04 August 2015).
- Cancer Research UK, Economic and Social Research Council, Medical Research Council, Wellcome Trust. 2015. Funders' Response to the Expert Advisory Group on Data Access (EAGDA) Report on Data Access. Available: [http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh\\_peda/documents/web\\_document/wtp059353.pdf](http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtp059353.pdf) (05 August 2015).
- Chartered Institute for Library & Information Professionals (CILIP). 2013. Professional knowledge and skills base (PKSB). Available: <http://www.cilip.org.uk/cilip/jobs-and-careers/professional-knowledge-and-skills-base/what-professional-knowledge-and-skills> (05 August 2015).
- Collaboration to Clarify the Costs of Curation (4C). 2013. Available: <http://4cproject.eu/> (05 August 2015).
- Collaboration to Clarify the Costs of Curation (4C). 2015. Curation Costs Exchange (CCEX) Available: Available: <http://www.curationexchange.org/> (05 August 2015).
- CRedit. 2015. Available: <http://credit.casrai.org/>. (03 August 2015).
- DataCite. 2015. Available: <https://www.datacite.org/> (05 August 2015).
- Davidson, J., Corral, S., Coulbourne, G., and Rauber, A. 2012. Education alignment. In: *Aligning national approaches to digital preservation*, N. McGovern and K. Skinner, K. (Eds.). Atlanta, GA: Educopia Institute Publications. 269-308. Available: <http://educopia.org/publications/anadp>. (05 August 2015).
- Davidson, J and Jung, C. 2015. Proposed work plan for Research Data Alliance (RDA) Education and Training Interest Group. [Electronic mailing list, 9 February]. Available: <https://rd-alliance.org/group/education-and-training-handling-research-data/post/proposed-work-data-science-curricula.html>. (05 August 2015).
- Digital Curation Centre (DCC). 2009. Data Asset Framework. Available: <http://www.dcc.ac.uk/resources/tools/data-asset-framework>. (05 August 2015).
- Digital Curation Centre (DCC). 2010. Data Management Skills Support Initiative (DaMSSI). Available: <http://www.dcc.ac.uk/training/damssi> (05 August 2015).
- Digital Curation Centre (DCC). 2011. Data Management Skills Support Initiative - Assessment, Benchmarking and Classification (DaMSSI-ABC) Available: <http://www.dcc.ac.uk/training/damssi-abc> (05 August 2015).
- Digital Curation Centre (DCC). 2014. Five steps to decide what data to keep. Available: <http://www.dcc.ac.uk/resources/how-guides/five-steps-decide-what-data-keep> (05 August 2015).
- Digital Curation Centre (DCC). 2015. DCC Curation Lifecycle Model. Available: <http://www.dcc.ac.uk/resources/curation-lifecycle-model> (05 August 2015).
- Digital Curation Centre (DCC). 2015. Available: <http://www.dcc.ac.uk> (05 August 2015).
- Digital Curation Centre (DCC). 2015. DMPonline tool. Available: <https://dmponline.dcc.ac.uk/projects> (05 August 2015).
- Economic and Social Research Council (ESRC). 2015. Data management planning for ESRC researchers. Available: <http://ukdataservice.ac.uk/manage-data/plan/dmp-esrc> (05 August 2015).
- EDINA, University of Edinburgh. 2010. MANTRA Research Data Management Training. Available: <http://datalib.edina.ac.uk/mantra/> (05 August 2015).
- Engineering and Physical Sciences Research Council (EPSRC). 2011. EPSRC policy framework on research data. Available: <https://www.epsrc.ac.uk/about/standards/researchdata/> (05 August 2015).
- Engineering and Physical Sciences Research Council (EPSRC). 2011. Expectations; Availa-

- ble: <https://www.epsrc.ac.uk/about/standards/researchdata/expectations/> (05 August 2015).
- Expert Advisory Group on Data Access (EAGDA). 2015. Report on governance of data access and annexes. Available: [http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh\\_peda/documents/web\\_document/wtp059343.pdf](http://www.wellcome.ac.uk/stellent/groups/corporatesite/@msh_peda/documents/web_document/wtp059343.pdf) (05 August 2015).
- Higgins, S. 2008. The DCC curation lifecycle model. *IJDC*, 3 (1):134-140. doi:10.2218/ijdc.v3i1.48
- Higher Education Funding Council for England (HEFCE). 2015. Policy for open access in the post-2014 Research Excellence Framework. Available: <http://www.hefce.ac.uk/pubs/year/2014/201407/> (05 August 2015).
- Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW) and the Department for Employment and Learning, Northern Ireland (DEL). 2008. Research Assessment Exercise (RAE). Available: <http://www.rae.ac.uk/>. (05 August 2015).
- Higher Education Funding Council for England (HEFCE), the Scottish Funding Council (SFC), the Higher Education Funding Council for Wales (HEFCW) and the Department for Employment and Learning, Northern Ireland (DEL). 2014. Research Excellence Framework (REF): Assessment framework and guidance on submissions. 2011. Available: <http://www.ref.ac.uk/media/ref/content/pub/assessmentframeworkandguidanceonsubmissions/GOS%20including%20addendum.pdf> (05 August 2015).
- Hubbard, B. 2015. Getting the rights right - or, When policies collide!, UKSG Webinar, 19 May 2015. Available: <http://www.uksg.org/webinars/oapolicies>. (05 August 2015).
- Jackson, M. 2015. Software management plan service prototype live. [blog, March 21 2015]. Available: <http://www.dcc.ac.uk/blog/software-management-plan-service-prototype-live> (05 August 2015).
- Jisc. Research Data Discovery Service. Available: <http://www.jisc.ac.uk/rd/projects/uk-research-data-discovery> (05 August 2015).
- Markin, K. 2015. Where Should You Keep Your Data? The Chronicle for Higher Education. June 23. Available: <http://chronicle.com/article/Where-Should-You-Keep-Your/231065> (05 August 2015).
- National Oceanic and Atmospheric Administration (NOAA). National Centers for Environmental Information (NCEI). Available: <http://www.ncdc.noaa.gov/data-access> (05 August 2015).
- Nature. 2014. Journals unite for reproducibility. Editorial in Nature Special Issue: Challenges in irreproducible research. Available: <http://www.nature.com/nature/focus/reproducibility/index.html>. (04 August 2015).
- Organizing Committee of the Future of the Statistical Sciences Workshop. Statistics and Science: A Report of the London Workshop on the Future of the Statistical Sciences. Available: <http://www.socialsciencespace.com/2014/07/statistics-crisis-of-reproducibility/> (03 August 2015).
- Project CRediT. 2015. Available: <http://credit.casrai.org/>. (03 August 2015).
- Research Councils UK (RCUK). 2011. Common Principles on Research Data Policy. Available: <http://www.rcuk.ac.uk/research/datapolicy/> (04 August 2015).
- Research Councils UK (RCUK) Policy on Open Access. 2013. Available: <http://www.rcuk.ac.uk/research/openaccess/policy/> [accessed August 4, 2015] (04 August 2015).
- Ryan, B. 2013. RCUK responses to questions raised at the DCC/RDMF special event on funding for research data management held at Aston University on 25th April 2013. Available: <http://blogs.rcuk.ac.uk/files/2013/07/RCUK-Responses-to-DCC-RDMF-Funder-Questions.pdf> (04 August 2015).
- Science Europe. Working Group on Research Integrity. 2015. Seven reasons to care about in-

tegrity in research. Available: [http://www.scienceurope.org/uploads/PublicDocumentsAndSpeeches/WGs\\_docs/20150617\\_Seven%20Reasons\\_web2\\_Final.pdf](http://www.scienceurope.org/uploads/PublicDocumentsAndSpeeches/WGs_docs/20150617_Seven%20Reasons_web2_Final.pdf) (04 August 2015).

Software Sustainability Institute (SSI). 2015. Software Management Service Prototype. Available: <https://ssi-dev.epcc.ed.ac.uk/> (05 August 2015).

UK Data Archive. 2013. Data Management Costing Tool and checklist. Available: <http://www.data-archive.ac.uk/create-manage/planning-for-sharing/costing>. (03 August 2015).

University of Cape Town. Library and Information Studies Centre (LISC), 2015. MPhil with a specialisation in Digital Curation. Available: [http://www.lisc.uct.ac.za/digitalcuration\\_mphil](http://www.lisc.uct.ac.za/digitalcuration_mphil) (August 5 2015).

Vitae. 2012. Information literacy lens on the Vitae Researcher Development Framework using the SCONUL Seven Pillars of Information Literacy. Available: <https://www.vitae.ac.uk/vitae-publications/rdf-related/information-literacy-lens-on-the-vitae-researcher-development-framework-rdf-apr-2012.pdf>. (04 August 2015).

# Chapter Nine

## Scholarly communication: a System in Transition\*

***Herbert Van de Sompel***

Los Alamos National Laboratory  
Email: hvdsomp@gmail.com

***Jenny Walker***

Independent Consultant  
Email: jenny-walker@msn.com

*Review status: Peer reviewed*

---

### Introduction

This paper, written by Jenny Walker, is based on the keynote presentation delivered by Professor Herbert Van de Sompel of Los Alamos National Laboratory. Professor Herbert Van de Sompel, Information Scientist, from the Los Alamos National Laboratory, New Mexico, United States of America, has been instrumental in addressing many issues on the path of transition from a paper-based scholarly communication system to a web-native digital environment. More than fifteen years ago, Van de Sompel worked on the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH) (Open Archives Initiative, 2015), a protocol for the recurrent exchange between systems of XML-structured metadata including Dublin Core.

More recent initiatives in which he has been instrumental include the Open Annotation Project, which ran from 2009 to 2013 (Open Annotation, 2015), Memento, which also ran from 2009 to 2013 (Memento, 2015), ResourceSync, running from 2012 to 2014 (NISO, 2014) and Hiberlink, running from 2013 to 2015 (Hiberlink, 2015).

All the above projects share some characteristics in that they concern the use of the web, the web architectures and the tools of the web trade in order to use the web as a platform for scholarly communication. Van de Sompel and his team are

extremely interested in matters of interoperability across scholarly systems. For example, the protocol for metadata harvesting comes from the perspective of repositories and interoperability between repositories. Van de Sompel's work in the last decade has involved issues not only of interoperability between repositories, but also interoperability with the broader web. Further, Van de Sompel's work is targeted at making information systems more robust, which leads to better scholarly communication.

This paper covers some of the challenges involved in moving from a print-based scholarly communication system towards one that is based solely on the web, thus creating a web-native digital environment for scholarly communication in which there is no equivalent paper form. This transition, whilst offering advantages, also engenders difficulties, which this paper explores.

The current scholarly communication system is largely based on the paper-based systems with which we have long been familiar. Even those examples of web-based systems are scarcely more than a scanned version of the paper-based system and do not represent a novel approach: the current system was not reinvented from scratch, but simply copied into the web. What might be expected from a radical transition to a web-native

---

\*The editors would like to acknowledge the contributions of Peter G. Underwood for this chapter.

digital environment where scholarly communication truly embraces the web in all its aspects?

## Background

The Open Annotation project looked at means of sharing annotation of resources on the web in a form that is independent of the platform used. The intention is to allow users to add, modify or remove information from a web resource without affecting the integrity of the resource itself, thus allowing social commentary, evaluation and other guidance to be added by users without affecting how others wish to use the web resource. The initiative is a direct reflection of the needs of scholars in many disciplines, derived from a study of how annotation has traditionally been used in a paper-based environment allied with consideration of solutions that could be used in a web-based environment. The scope has also been widened to consider how annotation could be used in areas other than scholarly communication.

Memento (2009-2013) (Memento, 2015) was a project funded by the United States National Digital Information Infrastructure and Preservation Program (NDIIPP) aimed at making content on the web that has been archived more easily located and used. By supplying the original web address and a chosen target date, the user was able to request an earlier version of a web resource, such as a web page. This would enable scholars to view the revision history and other versions of a web resource, though the intended scope of use is wider than scholarly communication. The Internet Archive Wayback Machine (<https://archive.org/web/>) and Time Travel (<http://timetravel.mementoweb.org>) are practical examples of the application of this idea.

ResourceSync (2012-2014) (NISO, 2014) was a joint project of the US National Standards Organization and the Open Access Initiative which revisited the design of the protocol for metadata harvesting, earlier explored in the OAI-PMH project. ResourceSync extends the notion of synchronising metadata across systems to synchro-

nising the web resources themselves across systems, thus facilitating the orderly updating of the contents of repositories. By automating this process, the new standard will economise on the time, effort, and resources required to manage repositories, also increasing the general availability of content available and reduce problems created by content that has become outdated, inaccurate, or has been superseded.

The background to this paper is the ecology of scholarly communication, but it will focus on one aspect – long term access to the scholarly record. In the future, will it be possible to revisit the materials that we publish today by recreating the context of the publication as it existed at a certain point in time? Is this possible for the paper-based system, for the current system and for a future system?

Users of the web often find that web addresses no longer function after a period of time: the “File 404 error” or “Page not found” often occurs, especially for older material. In many cases, the resource is still available but has been moved to a different address. This “linkrot” or “reference rot” is a substantial nuisance and threatens the integrity of the scholarly web. Furthermore, even working links may lead to material that has changed substantially as newer versions have superseded the original files. Hiberlink, a project which ran from 2013 to 2015, (Hiberlink, 2015a), is at the core of this paper: it is about combatting “reference rot” in the scholarly web.

Fundamental to an understanding of the issues to be discussed, is to understand the terms “HyperText Transport Protocol” (HTTP) and “Uniform Resource Identifier” (URI). Each item stored in association with a computer system has a name that enables the system to find it. The most familiar manifestation of a URI is a Uniform Resource Locator (URL), often termed a “web address”, where the location is combined with a designation of the scheme (for example, http) that is used to view the item.

## **Long term access to the scholarly record**

### ***Paper-based systems***

The familiar paper-based system represents one that tends to be stable and where its contents persists and can be located after long periods of time. The assumption built into the scholarly communication system is that if reference is made to an item in the system by providing its location and identity, then that item will be capable of being found. For example, in the paper-based journal system, an article that is published in a journal would contain references to other publications, mostly other articles, all printed on paper and held in library collections and archives. Thus, sometime after original publication it was possible to access a journal article and also the surrounding context such as the article references and the other articles in the same journal. The journals containing the referenced articles were likely to be held on the shelf of the same or other libraries; in the worst case scenario the reader would have needed to take the train or the bus to visit a couple of libraries or the inter-lending system between libraries would have been used. In a paper-based environment, it is eventually possible to reconstruct the entire context for an article.

### ***Web-based systems***

In the current version of the scholarly communication system articles are published in e-journals that are accessible via the web. An article is published in an e-journal and that article references other publications. In contrast with the paper-based paradigm, the references are “live” and link the user via web links to those referenced articles and other web-based items. It is no longer necessary to travel to other libraries or request an inter-library loan to get the article from another library. However, libraries are no longer archiving the electronic journals to which they subscribe; archiving is now in the hands of specialist organizations such as Portico, Lots of Copies Keep Stuff Safe (LOCKKS) and others (Portico Digital Preservation Service, 2015; LOCKKS, 2014).

In order to revisit an article on the web, the links in the article and the article references must remain valid, even after a significant period of time. Further, access to the archival material must be possible. However, links on the web are sometimes brittle, being vulnerable to “reference rot”, and those associated with scholarly publications on the web share this weakness, despite the controlled environment of scholarly publishing.

This problem of “reference rot” was identified early on in the transition from print to e-journals on the web. In order to address the issue of publisher mergers and the move of a publication from one location to another, the use of persistent identifiers for journal articles – the Digital Object Identifier (DOI) – was introduced about twenty years ago (DOI, 2015a). In addition, the DOI resolver system was developed to ensure that links pointing at these articles by means of a DOI continue to be valid and work, even when the articles change web location (DOI, 2015b). Each article is assigned a unique DOI on publication and this is a persistent identifier for that article throughout its life, regardless of whether responsibility for the publication moves from one publisher to another or the location of the web hosting is moved. The operation of the DOI effectively is to remove the actual web location of an article: rather, it transparently leads the user to its current location. More than fifteen years ago, a consortium of publishers created Crossref to assign DOIs and manage citation links for scholarly publications (Crossref, 2015). Crossref now has over seventy-five million DOIs registered for scholarly articles and other content items (books, chapters, data, theses, technical reports) and provides a very effective infrastructure for interoperability across the scholarly web.

Archiving in the journal system is not very effective. David Rosenthal, the inventor of the LOCKSS system, in his blog posting, “Patio Perspectives at ANADP II: Preserving the Other Half”, states that, on average, less than 40% of the typical journal collection of a North American mem-



ber of the Association of Research Libraries is archived (Rosenthal, 2013: para 3). That is very low and what is archived is unlikely to be endangered because it consists typically of the materials owned by large publishers, such as Elsevier and Springer, that are unlikely to vanish in the foreseeable future. Also, typically, what is archived is what can easily be found. Some of the journals that exist on the web are a both harder to find and less likely to be archived. At the University of Edinburgh, the UK Joint Information Systems Committee (JISC) has been instrumental in the development of a centre for digital expertise and online service delivery, known as EDINA (EDINA, 2015): as part of this work, the Keepers Registry has been introduced to keep track of the extent to which the digital journal literature is archived and by which organizations. These include the Archaeology Data Service, the British Library and the Library of Congress, Portico, the Global LOCKSS Network and the Scholars Portal (Keepers Registry, 2015).

Interestingly, the Keeper's Registry is based on the use of the International Standard Serials Number (ISSN), volume and issue number, rather than DOIs or URIs. This reflects a print-based view of journals rather than a growing reality in which consumers of scholarly information think in terms of disaggregated journal articles that exist on the web, each with its unique identifier. What is needed is a catalogue that works with DOIs to uniquely identify the articles and to easily determine whether an article is available in a particular archive.

In this web-based environment, therefore, it is not known whether the context surrounding an article can be recreated because it is not known what is being archived. But, understanding that less than 40% of the journal literature is archived, it is clear that attempts at re-creating the original context of a publication, its chain of references and other links, is unlikely to be successful because of the extent of the material that is missing from the archive.

Looking further at the current environment there is another problem to consider. When a new article is published, reference links are given to publications in the journal system, but there are also links to the web-at-large; links for items that are available on the web but are not considered to be at the core of the scholarly communications system. For example, project websites, software, ontologies, online debates, slides, blogs, videos: all are used or created as part of scholarly endeavour, but the community does not necessarily consider such items as a publication. Web resources are dynamic, changing over time; they are ephemeral, vanishing from the web. This is the real, evanescent, nature of resources on the web. So, when a journal article links to a web-at-large resource, there is a high probability that, sometime after publication of the article, the resource has disappeared or its content has changed. This is not hypothetical: it is happening today. The Hiberlink Project studies the extent of this problem and considers what hinders recreation of the original context surrounding an article.

### **Hiberlink**

The Hiberlink Project is studying, on a very large scale, this phenomenon of references to vanishing or changing web-at-large resources (Hiberlink, 2015a). The Hiberlink Project is a collaboration between the Los Alamos National Laboratory (LANL), New Mexico, and two groups at the University of Edinburgh: EDINA, which provides a number of information services to higher education in the United Kingdom, and the School of Informatics (Hiberlink, 2015b).

The problem domain being considered in Hiberlink is the basic scholarly communication domain, with a focus on the journal system in which journal articles may contain a mixture of references to resources on the web, consisting of some formal citations to scholarly resources and others to general web resources – “web-at-large” resources – that are not considered to be at the core of the scholarly record. Critical to the Hiberlink Project is an assessment of the extent of the

problem and, to this end, an assessment of the extent of “reference rot” has been undertaken, by assessing several large collections – corpora – of scholarly publications available online to determine what links still work and what material has been archived.

One of the corpora used in the Hiberlink research is that based on a subset of PubMed Central (PMC), which consists of about 480,000 articles published between 1997 and 2012. All these articles were checked for the presence of URIs. The number of links to web-at-large resources was shown to be growing steadily with each publication year. For example, of the articles in the PubMed Central corpus that were published in 2012, there were approximately 180,000 links to articles and 120,000 links to other web-at-large resources. For articles published in 2009 there were 100,000 links to articles and 40,000 links to web-at-large resources (Klein, Shankar, Van de Sompel & Wincewicz 2014).

### **Reference Rot**

The Hiberlink Project introduced the term “reference rot” to describe the combination of two problems involved in using URI references. Both these problems relate to the dynamic and ephemeral nature of the web and were both considered in the Hiberlink project.

1. Link rot

“Link rot”, as referred to earlier, whereby the link stops working as a result of the referenced resource at the end of the link having disappeared or having been moved to another location.

2. Content Drift

The resource identified by a URI may change over time and the content at the end of the URI may evolve to such an extent that it is no longer representative of the content that was originally referenced.

In certain cases, such as with popular culture, “content drift” is not such a problem; however, in the context of scholarly communication, it is very important for the integrity of the scholarly record

and the integrity of referenced items: at the time an article was written and a web resource was referenced, that web resource contained a certain item of interest which further illuminated the meaning of the article. However, when that web resource is revisited, some years later, the content may well have significantly changed and may no longer be so strongly linked to the content of the citing article.

For example, today, the URI of the Digital Library Conference in the year 2000 (DLC) no longer resembles anything like a web page for the Conference. Those responsible for the domain name did not keep up their registration payments and the domain name has been taken over by others. From a closer look at the DLC sites for 2004, 2005, and 2008 it is evident that there have been three different owners over the last eight years. This is a good example of “content drift”. Although this example may illustrate an extreme case, in that the domain owner did not maintain the domain, content drift also frequently occurs at the level of individual web pages that remain under ownership of the same custodian. Project web sites, for example, change as projects evolve and new content becomes available with the result that what was referenced at one time is no longer available at a later date.

The Hiberlink Project explored the extent of the “reference rot” problem. To assess this, Hiberlink has used articles published between 1997 and 2012 from three corpora: PubMed Central, arXiv, and a random sample of Elsevier articles. The PubMed Central corpus contained about 480,000 articles of which about 400,000 had URI references to other web-based resources. Of those, about 240,000 pointed to other articles and about 156,000 (or one third of all articles) pointed to web-at-large resources. Also, 1,600,000 URIs were found when parsing all three corpora: of these about 750,000 were references to articles and 480,000 to web-at-large resources, about a third of all references (Klein, Van de Sompel, Sanderson, et al., 2014).

The first part of the study looked at “link rot”,

determining whether or not the links still worked after a period of time. It was found that the older the publication and, therefore, the older the link, the higher the chances that the link no longer worked. For example, 80% of links that were created in 1997 no longer worked. For 2012 publications in the corpus, by early 2014, around 20% of links no longer worked. Within five years of publication, the rate of “dead” references was around 40%. Extrapolating from these numbers, in 2020 it is estimated that about 50,000 links in articles published in 2012 will no longer work. These statistics are indicative of a severe problem.

The situation is serious because it is not known whether the content at the end of a link put in place in 2005, for example, would be the same in 2014. Hiberlink looked at web archives to see if the content to which links that were created in 2005 and successive years could still be found. Web archives contain snapshots of resources as they evolve over time, so using the Memento infrastructure, web archives around the world were automatically searched to find the relevant snapshot of the linked web resource around the time it was referenced (Memento, 2015).

However, knowing whether or not a snapshot exists is not sufficient; through “content drift” the content of that web resource may have changed. If, for example, a link is put in place in 2005 and an archive snapshot is found that dates back to 1999, and another archive snapshot dated 2011, it is unlikely that either snapshot will be representative of what was referenced in 2005.

### **The window of representativeness**

Rather than looking for any archived copy of a particular resource, the Hiberlink Project looked for an archived copy that was likely to be representative of what the author creating the reference originally saw: typically, this was an archived copy dated to within a one-month period around the period of publication — 14 days prior to publication and 14 days after publication. Archived copies that fitted into this interval were found for only 20% of the referenced resources; for 80% of

the referenced resources, no suitable archived copy was found. This is not particularly surprising as what is presently available in web archives is a result of incidental archiving by systems that go about the regular business of crawling the web and placing items into the archives. This, then, is not necessarily the result of purposive action taken after determining what needs to be archived in relation to the needs of the scholarly communications system and the integrity of scholarly literature.

A closer examination of the referenced links in the three corpora reveals that the six most-used top-level domains of the URIs are **.org**, **.edu**, **.com**, **.gov**, **.uk** and **.de**. PubMed Central articles have a lot of links to the **.org** domain; Elsevier has a lot of links to the **.com** domain and arXiv to the **.edu** domain.

### **Pockets of persistence**

The Hiberlink Project not only quantified the problem, it also considered solutions to address the problem. Out of that work emerged the notion of creating “pockets of persistence”, relating to the need to be able to revisit the scholarly web of the past and the web of the present at some point in the future in a persistent, precise and seamless way. The challenge exists for the entire web, but some communities care more about addressing the issue than others, including the scholarly community, the legal fraternity, online journalism, and socially-constructed sources of information, such as Wikipedia.

The results of the Hiberlink Project suggest that there are three main components to address the “pockets of persistence” challenge:

1. Capturing referenced resources pro-actively
2. Appropriately referencing the resources once they are captured
3. Accessing the resources and/or their captures.

Rather than the haphazard approach to archiving currently adopted by web archives, Hiberlink proposes a pro-active archiving of web re-

sources that integrates seamlessly into the life cycle of an article and requires little, if any, explicit intervention by the author. Hiberlink involves the concept of a “seed collection”, for example of scholarly literature, legal documents, online journalism or Wikipedia articles. The seed collection for a particular community becomes the starting point for capture; it becomes the corpus of interest for which pockets of persistence can be created. All the items in a seed collection, or in the collection of interest, point at other items on the web which are vulnerable and may eventually disappear.

Hiberlink proposed that at important moments in the life cycle of items in the seed collection, snapshots be taken of the referenced items and that these are placed into a web archive, together with the referencing item. The point of intervention in the life cycle of items in the collection very much depends on the kind of collection. For example, the Hiberlink Project, identified that, for a corpus of scholarly literature, there are a number of really significant moments in the life cycle of journal publications. These include the research stage when the author is finding relevant items to cite and reference and decides to record them in a reference manager tool, the automated submission process, and during the review process just prior to publishing, or maybe even later on when the document is being interacted with. Such life cycle moments also exist for information sources such as Wikipedia. For example, when a substantially new version of an article is created and that article has external references, these could all be archived. The Wikipedia article and all external references could be archived.

There is already a lot of activity around this idea, such as the newly-created web archive, Perma.cc (Perma.cc, 2015). This is an effort led by the University of Harvard Law Library as part of a consortium of law libraries around the world that maintains a web archive of web resources referenced in legal documents. Perma.cc was created to address the substantial reference rot in legal

literature, including US Supreme Court decisions (USA, Supreme Court, 2015). This archive allows someone who is altering a legal document to enter the URI that they are planning to reference in their document and a snapshot of the resource will be taken. The URI of the archived snapshot will be provided and this can then be used for referencing rather than the URI of the document on the “live” web.

The Hiberlink Project is looking at ways in which to make this process more seamless. In the case of Perma.cc the author specifically has to go to the archives, enter a URI and retrieve a new URI that can be used for referencing. Hiberlink is experimenting with using the Zotero reference manager tool so that while an author is taking notes for a new publication, each time a page is bookmarked using Zotero, the system will automatically ‘push’ that resource into a web archive. The author is not necessarily aware that this action is taking place. It is being done behind the scenes just in case the author wants to reference that resource later on, in which case there will be a snapshot in a web archive. An experimental Zotero extension archives web resources as an author bookmarks them during the research process and ensures that the author has access to the original URI, the URI of the snapshot that was taken and archived and the date and time when the snapshot was taken (GitHub, 2015). These three components are all extremely important as will be described later.

Another experimental service, Hiberactive, integrates with a manuscripts submission system or a repository: when an author submits an article, Hiberactive issues requests to web archives to archive all web-at-large resources referenced in the article (Klein, Shankar, Van de Sompel & Wincewicz, 2014). At the moment when an author submits a manuscript, the repository to which the manuscript was submitted sends a notification to the Hiberactive service, indicating that there is a new document in the repository. Hiberactive fetches that document, and identifies all the URIs that are referenced, just as was done

with the PubMed Central corpus. For each retrieved URI that points to a web-at-large resource, Hiberactive places a snapshot in one of the web archives around the world. Again, this process provides the original URI, the URI of the capture, and the date and time of capture.

Once we have these captures, how are we going to actually reference them? Having the URI of the capture is not sufficient. The web archive has the date and time on which the snapshot was taken but this is not recorded in the document itself. This is problematic as having disposed of the original URI, it is not possible to revisit the original resource should you wish to do so. Software development is a prime example of why you might want to do this. If a piece of software was referenced two years ago you would want to be able to revisit and see exactly how that software was at that moment and not how it is today. Further, for some purposes, you might also want to see how it has evolved and see what the current version of that software is. This would not be possible without the original URI. More importantly, by linking to the capture of the URI, you are now completely dependent on the long term existence of the archive in which the capture was placed. You have thereby replaced one link rot problem with another as web archives are also not guaranteed to last forever (Van de Sompel et al., 2013).

WebCite, which commenced operation ten or more years ago, was the very first web archive to address the issue of link robustness for scholarly communication (WebCite, 2015). An author could submit a URI, get a snapshot of a resource as well as a URI for that resource. In 2014 the service was suffering financial problems and was at a point where it could no longer accept new captures. There was considerable uncertainty about whether the system could be kept active. Despite active fund-raising, the service is still in jeopardy.

Mummify.it was one of the very first commercial web archiving services. The service existed for about six months before closing down; the only

remnant of this web archive is a snapshot in the Internet Archive (Mummify.it, 2013).

While web archives can disappear, they can also become (temporarily) inaccessible. Some time ago, a Russian blocking order prevented Russian citizens from accessing the parent site of the Internet Archive's Wayback Machine, a non-profit library of over 485 billion snapshots of web pages taken on various dates (Internet Archive, 2015). The blocking order was originally made to ban a single web page, entitled "Solitary Jihad in Russia", a brief text detailing the "theory and practice of partisan resistance" (Carey, 2015). The implication here is that, had one included the URI of the capture in a reference and that capture reference was to the Internet Archive, it would not be possible to visit it from Russia. There would simply be no access.

The examples above illustrate that it is not a good idea to dispose of the original URI because the original URI is a key to finding snapshots in all the web archives around the world. Without the original URI it is impossible to find sources in web archives other than the one in which the specific source was deposited. This means that the success of the approach is fully dependent on the long term existence of that one archive.

### **The proposed solution**

Hiberlink proposes that the original URI be used for referencing but that, to ensure a robust link, the reference be augmented – or "decorated" – with other archival information, namely, the URI of the specific archived capture of the referenced resource and/or the date and time of referencing. Further, it is proposed that the reference information be made available in a form that a computer can process. This will allow consumption of the information in various ways. Using the original URI the original referenced resource can be revisited as it evolves over time. Using the URI of the capture, the user can revisit that capture for as long as the web archive in which it was created remains operational. And, thanks to the protocol developed in the earlier-mentioned

Memento Project and its associated infrastructure, a combination of the original URI and the date and time of referencing can link to other captures which can be found in web archives taken close to the time the item was originally referenced.

The Memento extension for the Chrome browser is available for download (Shankar, 2015). With this extension, and by right-clicking on a link, you can revisit the linked resource as it was at some point in the past. You can specify the date for which you would like to see the resource and in this way you can “time-travel” the web as it used to exist. This extension also supports the aforementioned link decorations, which are formally specified at <http://robustlinks.mementoweb.org/spec/>. The link decorations can also be made operational using a JavaScript application, `robustlinks.js`, that can be linked or embedded in a web page that contains decorated links (Robust Links, 2015). In November 2015, *D-Lib Magazine* published a paper by Herbert Van de Sompel and Michael Nelson that illustrates decorated links in action (Van de Sompel & Nelson, 2015).

## Conclusion

The archiving of online scholarly resources is not at all comprehensive. Today, the archival activity has granular perspective in which each resource is treated as an autonomous item without dependencies on other resources. This perspective is no longer realistic and it will become less so in the future.

The examples given in this paper primarily concern journal literature. However, the environment is changing and, in the future, journal literature may no longer be central to the scholarly record. There is a wide variety of other means of communication emerging which will be web-native and will have a greater degree of interconnectedness with other resources and will be more dynamic, changing more rapidly over time. It will be increasingly important, if not essential, to be able to wind back the clock to review what the scholarly record looked like at a particular moment in time, together with its temporal context. Ultimately, this is about the long-term integrity of the scholarly record.

---

## References

Carey, G. 2015. Russia won't go Wayback, blocks the Internet Archive. *Digital Trends*, (26 June). Available: <http://www.digital-trends.com/web/russia-censors-wayback-machines-485-billion-archived-web-pages/> [27 November 2015].

Crossref. 2015. *About Crossref*. Available: <http://www.crossref.org/> [27 November 2015].

DOI (Digital Object Identifier). 2015a. Home page. Available: <http://www.doi.org> [27 November 2015].

DOI (Digital Object Identifier). 2015b. *Resolve a DOI Name*. Available: <http://dx.doi.org> [27 November 2015].

EDINA. 2015. *Who we work with*. Available: <http://edina.ed.ac.uk/about/whowework-with.html> [27 November 2015].

GitHub. 2015. *Hiberlink Zotero plugin*. Available: [https://github.com/hiberlink/zotero\\_hiberlink](https://github.com/hiberlink/zotero_hiberlink) [27 November 2015].

Hiberlink. 2015a. *About the Project*. Available: <http://hiberlink.org/about.html> [27 November 2015].

Hiberlink. 2015b. *Partners*. Available: <http://hiberlink.org/partners.html> [27 November 2015].

Internet Archive. 2015. *Wayback Machine*. Available: <https://archive.org/web/> [27 November 2015].

- Keepers Registry. 2015. *Information about archiving agencies*. Available: <http://thekeepers.org/registry.asp?action=agencies> [27 November 2015].
- Klein, M., Shankar, H., Van de Sompel, H. & Wincewicz, R. 2014. HiberActive: Pro-active archiving of web references from scholarly articles. Presentation at *Open Repositories 2014*, Helsinki, Finland, 9-13 June. Available: <http://www.doria.fi/handle/10024/97609> [27 November 2015].
- Klein, M., Van de Sompel, H., Sanderson, R., Shankar, H., Balakireva, L., Khe Zhou & Tobin, R. 2014. Scholarly context not found: one in five articles suffers from reference rot. *PLOS One*, 9(12): e115253. doi: 10.1371/journal.pone.0115253. Available: <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0115253> [27 November 2015].
- LOCKSS (Lot of Copies Keep Stuff Safe). 2014. Home page. Available: <http://lockss.org/> [27 November 2015].
- Memento. 2015. *About the Memento Project*. Available: <http://mementoweb.org/about/> [27 November 2015].
- Mummify.it. 2013. Home page of discontinued web archive service Mummify.it [<http://mummify.it>], captured on 14 February 2014. Available: <https://web.archive.org/web/20140214233752/https://www.mummify.it/> [27 November 2015].
- NISO (National Information Standards Organization). 2014. *Open Archives Initiative ResourceSync Framework Specification*. Available: <http://www.openarchives.org/rs/toc> [27 November 2015].
- Open Annotation. 2015. *Welcome*. Available: <http://www.openannotation.org/spec/core/> [27 November 2015].
- Open Archives Initiative. 2015. Home page. Available: <https://www.openarchives.org/> [27 November 2015].
- Perma.cc. 2015. *About Perma*. Available: <https://perma.cc/about> [27 November 2015].
- Portico Digital Preservation Service. 2015. Home page. Available: <http://www.portico.org/> [27 November 2015].
- Robust Links. 2015. *Robust links: links that refuse to die*. Available: <http://robustlinks.mementoweb.org/> [27 November 2015].
- Rosenthal, D. 2013. Patio perspectives at ANADP II: preserving the other half. *DSHR's blog* [20 November]. Available: <http://blog.dshr.org/2013/11/patio-perspectives-at-anadp-ii.html> [27 November 2015].
- Shankar, H. 2015. *Memento time travel* [Chrome browser extension]. Chrome web store. Available: <https://chrome.google.com/webstore/detail/memento-time-travel/jgbfpjledahoajcppakbgilmojkaghgm?hl=en&gl=US> [27 November 2015].
- USA (United States of America), Supreme Court. 2015. *What's new* (section 2). Available: <http://www.supremecourt.gov> [27 November 2015].
- Van de Sompel, H. & Nelson, M. L. 2015. Reminiscing about 15 years of interoperability efforts. *D-Lib Magazine*, 21(11/12). doi: 10.145/november2015-vandesompel. Available at: <http://dx.doi.org/10.1045/november2015-vandesompel> [27 November 2015].
- Van de Sompel, H., Klein, M., Sanderson, R. & Nelson, M. L. 2013. *Thoughts on referencing, linking, reference rot*. Available: <http://mementoweb.org/missing-link/> [27 November 2015].
- Web Cite. 2015. *WebCite Consortium FAQ: What is the history of this service?* Available: <http://webcitation.org/faq> [27 November 2015].