Research issues in Information Studies in a changing local and global environment. Some African perspectives

Editors

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Foreword

Africa joined the rest of the world in the global information arena through the adoption of modern Information and Communication Technologies (ICTs), which have brought a profound transformation of the information and knowledge landscape on the continent. These technologies are by far the most spectacular and revolutionary technologies ever developed with respect to the creation, distribution, dissemination and repackaging of information and the interactive sharing of knowledge. Africa has suddenly become more exposed to open markets – including the academic market – and it has become an imperative for governments and institutions to invest in innovation and knowledge production, which includes the field of Library and Information Science (LIS).

This new information paradigm is a complex phenomenon that introduces new economic, socio-cultural as well political challenges. We are, more than ever, dependent on the creation of, access to, and sharing and manipulation of information. This has created new power relationships and also raised questions and concerns about the fundamental freedom of people, the right to freedom of expression and communication, the right of access to information, and the fair distribution of information in the market place – all areas of concern for information professionals, both practitioners as well as academics.

It is within this context that we welcome this book, which focuses on the current research issues and trends in the broader field of Information Studies. The selected topics are extremely relevant to the current global discourse in this field. The authors, who are all from Africa, add much needed perspectives on LIS issues on the continent. My hope is that this book will make a positive contribution not only to the local discourse on LIS research and teaching in Africa, but also to global discourse. I am confident that the book will lead to fruitful discussions in Information Studies and be a useful read for researchers, educators, practitioners and students from around the world.

Congratulations to my colleague Prof. Dennis Ocholla for taking the lead with this very important initiative. I also want to thank and congratulate the authors and others, including the publisher, who have made this book possible.

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Preface

This book, *Research Issues in Information Studies in a Changing Local and Global Environment*, is tied to the recognition that Africa is producing less than 3% of the world's publications globally, yet consumes over 90% of publications originating from outside the continent. Even with increased access to information resources from the web electronically, Africa still lacks relevant teaching and research content for its growing number of universities and Library and Information Science/Studies schools. This book is written by Library and Information Science (LIS) faculty staff and practising information providers and librarians, mainly from South Africa, and is based on recent conference papers, most of which have been published in peer-refereed journals (also largely within South Africa). The book consists of thirteen chapters focusing on the following broad themes: research issues, information seeking, knowledge management, social and community informatics, ICT and development, informetrics and LIS education, which are also common research themes found in the region.

Chapters one, two and three focus on research issues. Chapter one, "Challenges of post-graduate research: global context, African perspectives, is by Stephen Mutula, a professor at the University of Botswana. Mutula categorises the challenges under three terms, namely research capacity, research productivity and research utility, and discusses: low throughput; decreasing government subsidies; inadequate research capacity; poor preparation/grooming of students for postgraduate programmes; inconsistent postgraduate research guidelines; stringent statutory research permit requirements; bureaucracy in the admission process; slow thesis examination process; poor supervision; balancing occupations (jobs) and academic work; inadequate facilities; and heavy teaching loads. He argues that the continent is not making discernible progress in addressing these challenges, especially in comparison to the progress being made in the developed world, and suggests interventions to minimise them. The second chapter, also written by Stephen Mutula, is entitled "Research challenges and opportunities in a digital dispensation: An African perspective." Here he recognises that universities are expected to undertake research and generate and publish results that can be widely interrogated, improved upon, shared and applied for enhanced national and international development, and notes that the digital era affords great opportunities as well as challenges with respect to enhancing research, especially in university environments. Among the opportunities he discusses are the wider dissemination of research findings; enhanced visibility of the university; immediate access to information by researchers (24/7); collaboration and partnership; sharing of results; short turnaround times and increased output; access to large numbers of respondents; and increased channels of publication. The challenges he

mentions include poor or unformulated research strategies; absence of information repositories; lack of awareness and skills; lack of institutional preparedness; licensing constraints; cost of digital content; poor quality of research output; perceived low quality of Internet sources; information overload; intellectual property restrictions; and the high cost of digital preservation. He proposes means to ameliorate the situation while leveraging Information and Communication Technologies (ICTs) to enhance the research environment. Chapter three is an informetric study: *"South Africa's regional and international research collaboration: An informetric study of participating countries, 1986-2005"*. Omwoyo Bosire Onyancha, who is an associate professor at the University of South Africa and a recognised African informetrician, reports on the findings of an informetric study of countries participating in collaborative research with South Africa spanning 20 years – ten during and ten after apartheid in South Africa. He observes that 'multiple country-author' papers and the number of collaborating countries were on the rise since 1986, with the USA topping the list of countries collaborating with South Africa internationally. The strengths of association (or research collaboration) were low in both categories of countries, and international collaboration yielded a higher average of citations per paper. The subject categories of research collaboration yielded various similarities and differences between regional and international collaborations.

Chapters four and five focus on social and community informatics. Chapter four, by Jerry Le Roux, an associate professor at the University of Zululand, is entitled *"Social and community informatics, past, present, & future: An historic overview"*. Jerry, who has a PhD in history, uses his trained eye to view the origins, meaning, development, and current status of the concepts 'social informatics' and 'community informatics'. He recognises the multidisciplinary nature of social and community informatics but notes that although community informatics shares many similarities with social informatics, community informatics focuses more specifically on the relationship between communities and information technology and how information technology can be designed or redesigned and used to benefit a community. The chapter therefore briefly examines the origins and development of these new research areas since the late 90s and recognises the sterling contributions of Rob Kling in this domain.

Hesbon Nyagowa, academic registrar at the Kenya Polytechnic College of the University of Nairobi, who is also finalising his PhD at the University of Zululand, writes on *"Mechanisms through which information systems' (IS) capabilities create benefits for e-schools: A theoretical perspective"* in Chapter five. Hesbon recognises that a variety of school systems have evolved in the new millennium to meet the demands of the complex society and work life of the 21st century, providing some interesting examples, and notes that researchers and practitioners variously recommend the integration of IS in all organisations

in every sector of the economy. Hesbon surveys literature on IS benefits in traditional firms and applies these in theorising how similar benefits may accrue to e-schools. He concludes with a suggestion on an approach to measuring IS benefits in e-schools.

Chapters six and seven focus on knowledge management and Indigenous Knowledge (IK). In Chapter six, *"Perceptions of knowledge management by LIS scholars.A core/ periphery model analysis"*, Omwoyo Bosire Onyancha and Dennis Ocholla (a professor at the University of Zululand) note that the term 'knowledge management' (KM) lacks a universally accepted definition, and consequently describe the term using the most common co-occurring terms in knowledge management literature as indexed in the Library, Information Science and Technology Abstracts (LISTA) database by using core/periphery analysis and the co-occurrence of words as subject terms from 1981-2007. They identified the following as compound terms with which KM co-occurs most frequently during the stated period: information resources management, information science, information technology, information services, information retrieval, library science, management information systems and libraries, among others. Core terms with which KM can be defined include resources, technology, libraries, systems, services, retrieval, storage, data and computers. The chapter concludes by offering LIS professionals' general perceptions of KM based on their use of terms. Chapter seven, on IK, is co–authored by Dorothy Njiraine, a senior librarian at the University of Nairobi, who is finalising her PhD at the University of Zululand, Dennis Ocholla, and Omwoyo Bosire Onyancha. In this article, entitled *"Indigenous Knowledge (IK) research in Kenya and South Africa: An informetric study"*, the three authors apply informetrics using descriptive bibliometrics to determine the state of Indigenous Knowledge (IK) development in Kenya and South Africa by analysing data from 1990 – 2008 in international databases (OCLC – Online Computer Library Center, MEDLINE and AGRICOLA) and national databases – South Africa's Southern African Bibliographic Information Network (SABINET) databases, i.e. Current and Completed Research: CCR, Union Catalogue of Theses and Dissertations: UTD, and Index to South African Periodicals (ISAP) and Kenya's Greenstone Database.

Chapters eight, nine, ten and eleven focus on information seeking. Chapter eight, *"The relationship between user studies, information seeking behavior and information architecture, with special reference to web design"*, is written by Janneke Mostert, a senior lecturer at the University of Zululand. Mostert recognises that the global embrace of the Internet, and specifically the WWW, has led to a proliferation of websites that aim to attract the attention of potential clients; a well designed website provides an information user with a seamless experience enabling effortless navigation of the site in their efforts to find information. The chapter therefore explores the relationship between information seeking

and web design and provides useful insights and considerations for information seekers and web designers. In Chapter nine, Margaret Mgobozi, a librarian and PhD student at the University of Zululand, reviews literature on *"Issues and challenges on the use of scholarly electronic journals by the academic community. A literature review"*, and explores and reviews studies on the theme confirming that the scholarly activities of the academic community appear to have been gradually transformed by the introduction and use of electronic journals. The reviewed studies demonstrate that the level and understanding of electronic journal utilisation by the scholarly communities of various disciplines differ, and recognises the challenging role of academic libraries in the provision of scholarly information. The tenth chapter is co-authored by Blessing Mbatha, Lynnette Naidoo and B. Ngwenya, a lecturer at the University of South Africa. In *"Complexities of e-learning in an ODL environment: The experience of students at the University of South Africa (UNISA)"*, the three authors investigate the challenges faced by Communication Science students in the electronic learning (e-learning) environment at the University of South Africa (UNISA) in order to improve the university's services to students, ensure an efficient learning experience, and bridge the transactional distance in an Open Distance Learning (ODL) context. The chapter reveals that two of the main obstacles faced by students were poor access to facilities and the lack of provisional guidance on e-learning from the University. Recommendations on overcoming these obstacles are provided. Chapter eleven deals with a crucial aspect of information access that affects most people searching for information all over the world, but more crucially in developing countries such as those in Africa, which has a large pool of ill-prepared or under-trained information users. The chapter, entitled *"Information literacy education in universities. Some Southern African perspectives"*, is co-authored by George Theodore Chipeta, a lecturer at Mzuzu University in Malawi, Daisy Jacobs, a senior lecturer at the University of Zululand, and Janneke Mostert. The three authors report on the offering and teaching of IL in these institutions of higher learning and provide an extensive background to the concept of IL. They note that problems encountered in the teaching and learning of IL include inadequate time, poor computer skills, inadequate venues and equipment for teaching and students' practicals, and lack of cooperation. Recommendations for overcoming these obstacles are provided.

The last two chapters – twelve and thirteen – focus on Library and Information Science education and training. Chapter twelve, entitled *"Which way for LIS Education and training in South Africa? Some considerations from contact and distance learning"*, is written by Mabel K. Minishi-Majanja, an associate professor at the University of South Africa. Mabel discusses the status of and trends in higher education in South Africa and their implications for LIS education, with useful insights for LIS educators. The last chapter (thirteen) is a

feasibility study on *"Library and Information Management Education and Training in Swaziland: a review of Opportunities and Challenges"*, **by** Khosie C Ndlangamandla. A librarian in the government of Swaziland who recently completed her masters degree at the University of Zululand, she reviews and discusses major concepts that relate to Library and Information Management as a profession and how these in turn relate to education and training. The chapter also highlights the current state of Library and Information Management education and training in Swaziland, and lists the opportunities and challenges of providing education and training.

I wish to extend my gratitude to all the esteemed contributors to this book, to Prof Johannes Britz from the University of Wisconsin in Milwaukee, USA, who agreed to write the foreword, to our students for their inspiration, and to our family members for their unwavering support. I also wish to commend Catherine Ocholla for copy-editing the book for us.

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Contents

Chapter One

Challenges of postgraduate research: global context, African perspectives

Stephen M. Mutula

Introduction

Universities the world over are recognised as institutions established for the advancement of knowledge, scholarship and innovation. Postgraduate programmes are considered conduits through which universities develop research capacity and generate the high-end skills required for a functional economy and to address complex issues such as the 2008/9 global financial recession, climate change, poverty alleviation, etc. Postgraduate research takes various forms but generally requires those admitted to such programmes to have completed a bachelors degree or a diploma. Consequently, nomenclatures such as postgraduate diploma, masters degree, Master of Philosophy, PhD or higher PhD are commonly encountered in tertiary education systems. Postgraduate qualifications may be classified as traditional/ academic or professional degrees. Traditional postgraduate qualifications tend to be generic, while professional ones reflect a deeper understanding of a discipline (Postgraduate Research, 2009). Requirements for admission into postgraduate programmes vary from institution to institution or from one jurisdiction to another. For example, in Australia, Canada and the United States, admission for a PhD may require prerequisite study over and above normal graduate study. Such prerequisites may take different forms, such as Masters course work, distinction in a bachelors degree, or a distinguished academic track record. Another trend is to award a doctorate based on the evaluation of one's research and publication track record in a given field. The duration of a given postgraduate qualification also tends to vary from institution to institution, even within the same jurisdiction. For example, a full time masters degree may take from nine to twelve months (e.g. in the UK) or up two years or more (in Africa) to complete, while a part-time masters degree, depending on the institution or jurisdiction, may take four years or even more. For a PhD, the duration lies between two and six years, with the average duration being four years (Mouton, 2007).

Generally, postgraduate research is not intended to yield groundbreaking results, discovery or innovation (Postgraduate Research, 2009). Most of the time, it is actually an apprenticeship for mastering systematic research processes. Ticinch (2006) agrees that the objective of postgraduate research is not to make breakthrough inventions or major scientific discoveries; rather it is a mechanism by which graduate students learn how to undertake a

systematic investigation based on work done by peers in the field, and then to extend or add to the current state of knowledge. More emphasis is placed on systematic investigation than on the degree to which knowledge is enhanced. The doctorate recipient in the past was expected to assume some teaching role premised on the concept of 'doctor' (Latin – 'docere' – to teach).

There are variations to the implementation and award of postgraduate qualifications. For example, the net product of a PhD is a thesis that has to be assessed by independent experts in the discipline. Some institutions also insist that theses, particularly at PhD level, be defended in a *viva-voce* oral examination where candidates present their research before an expert panel. Likewise, titles arising from the completion of a postgraduate study vary. For higher research levels, the qualification name tends to be general (with some exceptions), while for lower level qualifications (first degree, etc.) the qualification carries with it the discipline's name. For example, at bachelor level, it is common to include the discipline in the qualification award, e.g. BSc (Chemistry), but a corresponding degree would be an MSc (without the name of the specific discipline). Similarly, at doctoral level, the degree would simply be a PhD with no mention of the discipline. Higher postgraduate qualifications represent the generic mastery of research techniques. In professional doctoral qualifications, i.e. where a demonstration of in-depth knowledge of the discipline is the main outcome, the discipline is included (e.g. Doctor of Business, Doctor of Engineering, etc.). In some universities, particularly in the developed world, candidates are awarded Higher Doctorates, which is a demonstration of substantial contribution to their discipline through research. Usually, such awardees already have a PhD. Higher Doctorates carry the title of the discipline (Postgraduate Research, 2009).

Kearney (2008) observes that research degrees continue to denote advanced study in a chosen discipline with a view to pursuing an academic career. In this respect, expertise in research methodology and investigative skills are required. There is a growing demand for masters and doctoral degrees related to a specific field of professional activities, such as business studies or administration. These degrees are sometimes referred to as taught qualifications that may occur concurrently with workplace activity. They involve some degree of research on the part of faculty members and students. This trend is common in Europe and OECD countries. In these postgraduate programmes, demand drives supply, with national education systems being forced to adapt to this changing paradigm. This demand has resulted in the emergence of new providers beyond the traditional market for higher education in such places as the United Kingdom, United States, Australia, New Zealand, Germany, France, etc. Traditional markets for higher education are now establishing offshore campuses to tap into the new market occasioned by the paradigm shifts in postgraduate

degrees in places such as East Asia, Eastern Europe and the Gulf States where there is a great demand for English, computer science, business studies, and other subjects.

The purpose of postgraduate research is, among other things, to (Mutula, 2009):

- Test assumptions or observations
- Provide theoretical frameworks to help readers understand the information reported by individual scholars
- Create new knowledge
- Disseminate and apply the results of a research activity.

Research can generally be subdivided into basic, applied/action, collaborative, contract and/ or sponsored research. Basic research aims to create new knowledge and is not directly related to technical or practical problems (e.g. a study conducted to analyse online public access catalogue use). Applied or action research seeks to solve problems by developing solutions and recommendations that can be used to improve practices (for example, conducting a study on how information systems can be used to reduce poverty). Collaborative research is jointly conceptualised and/or funded by a university and a partner. Contract research occurs when a request is made by industry or a government agency for a specified research project to be carried out with identified aims and objectives. Finally, sponsored research is when funding is based on a proposal that is submitted on a competitive basis. Most postgraduate research falls within the realm of basic research, although there is also some applied and collaborative research. For the most part, applied, collaborative, contract and sponsored research tend to be undertaken by faculty members (because of their proven expertise).

Postgraduate research is a form of apprenticeship taken under the supervision of senior faculty members. The faculty member involved in the supervision of postgraduate research must have the right expertise to play the role of promoter or supervisor. The skills they require include but are not limited to (University of South Africa & National Research Foundation 2007):

- Guiding postgraduate students towards sound preparation of research
- Assisting with methodological choices
- Documenting and publishing research
- Maintaining both supportive and professional relationships
- Helping the candidate challenge dominant ideas, redefine problems, and develop a theory.

In a survey of postgraduate students, the Task Group on the Future of Graduate Research Supervision at the University of Botswana (University of Botswana, 2009) listed the following as reasons given by students for pursuing graduate studies: advancing or

improving one's academic qualification in order to become more competitive in the job market; a requirement for promotion by the employer; enhancing their personal career, life, development and academic credentials; expanding intellectual knowledge and gaining a deeper understanding of one's profession or subject of study; and the desire to contribute to research and applicable science or knowledge. The general perception of the role of postgraduate studies seems to place less emphasis on research and more on better career prospects. There seem to be stringent requirements for a thesis or dissertation to significantly extend knowledge or generate new products and services.

For students planning to pursue postgraduate research, the choice of the institution that will meet their expectations is critical. The Task Group on the Future of Graduate Research Supervision at the University of Botswana (University of Botswana, 2009) found that in the choice of the institution, students were motivated by:

- Reputation of the university or programme
- Quality of education at the university
- Access to postgraduate education
- Affordability of fees
- Familiarity with the system of the institution
- Level of financial support offered
- Facilities available
- Diversity of postgraduate programmes
- Availability of skilled faculty staff
- Provision of scholarship and grants.

Enhancing postgraduate research

The research quality of a university is measured by the excellence of its library facilities, quality of ICT infrastructure, supportive institutional framework, qualified staff, diversity and strength of postgraduate programmes, level of research funding, links with the international scholarly community and industry, provision of grants for young researchers, mentorship programmes, integration and the use of ICT in teaching and research, availability of digitised local content, functional institutional repository, international students and faculty members, and the quantity of collaborative and multidisciplinary research, among other characteristics (Mutula, 2009).

To further enhance the quality of research, it is important that seminars and workshops are built into postgraduate programmes to impart knowledge and skills in areas such as time management, project management, business communication, oral examination, thesis writing, responsible conduct during research, formatting research essays, citing and referencing techniques, using archival sources, content analysis, critical discourse analysis,

ethnographic research, action research, quantitative or qualitative research, literature reviews, and basic and applied research (University of Botswana, 2009).

During 2008, as a visiting professor at the Department of Library and Information Science at the University of Zululand (DLIS, UZ), I learnt a few research best practices regarding students' supervision. Most impressive was the research output attributed in part to a close working relationship between staff and postgraduate students. Furthermore, postgraduate students seemed rigorously vetted before admission into postgraduate programmes. They were also guided in the selection of their research topics and the department provided leadership in setting the research agenda based on niche areas such as social informatics, informetrics, user studies, etc. Regular reports of progress based on well formulated research schedules functioned as a powerful feedback and tracking tool. The practice of team supervision and joint authorship between the faculty and students also helped accelerate research output (Mutula, 2008). The other positive attribute of the research portfolio of DLIS (UZ) included the use of ICT in teaching; documentation of research output; an annual DLIS report; and the publication of annual DLIS conference proceedings online. Similarly, the inclusion of research projects in the undergraduate curriculum and engaging post-doctoral or visiting faculty members enhanced the research profile of the department while enriching the postgraduate programmes. However, there was concern over the heavy teaching loads of faculty staff members and the large numbers of students at undergraduate level that required remedial interventions (Mutula, 2008).

Challenges of postgraduate research

Postgraduate education in general and postgraduate research in particular faces challenges of demand, supply, quality and returns on investment with respect to both providers and clientele (Kearney, 2008). As already noted, postgraduate research challenges are not confined to developing countries alone but are also experienced in the developed world. However, developed countries such as Germany, Australia, Canada, the United States and New Zealand have made some progress in trying to address challenges of research in their institutions (Scholtz, 2007). Research in most universities in Africa is poorly coordinated. Often, variations exist in the approach and even requirements for the fulfillment of postgraduate research in the same university, for example in the number of years it takes to complete masters or doctoral degrees for full-time as well as part-time students. Research and development in third world countries was negatively affected when there was a shift in focus from higher to basic education by the World Bank and IMF during the 1980s and part of the 90s. The ramifications of the shift of this policy are reflected in the unimpressive figures of student completion of postgraduate programmes. It takes on average 6 to 8 years to

complete a PhD in most African universities because of inadequate resources and bureaucracy in the admission approval process, which involves departments, faculties and universities (Manyika and Szanton, 2001).

In South Africa, the transformation of technikons [polytechnics] into universities of technology created a serious research skills shortage. Lamprecht (2008) pointed out that the South African government and the public are dissatisfied with the quality of graduates from universities in terms of the nature and appropriateness of their qualifications, training, and competitiveness in some fields. The former Minister of Education in the Mbeki government, Naledi Pandor, noted that the drop-out and through-put rates of most universities were bad, not only because of poor pre-university schooling, but also due to poor teaching at the universities (Ministry of Education, 2006). The Southern African Regional Universities Association (2008) noted that there was a 60% university dropout rate in South Africa. The students affected were mainly from poor families who dropped out before completing their studies on account of pregnancy, finding campus life too boring and structured, social and personal problems, having to care for sick relatives, peer pressure, and more. Biermann and Jordaan (2008) carried out a study on research skills in South African universities and found that students at graduate level experienced a large array of problems related to writing and information retrieval skills and presenting original work. Students from the first year were also exposed to a culture of copying, especially within the programming fields. They also found that the state of research at the universities of technology was poor because of the scarcity of research expertise, inexperienced supervisors, and supervisors working in fields outside their specialisations. This resulted in low research outputs and generally discouraged students who would have opted to continue with their postgraduate studies.

Botha and Simelane (2007) observed that in most South African universities, research was either not published or not digitised, making it largely inaccessible. The University of Stellenbosch's 2007 Annual Report suggested that the university faced challenges related to student access and success; backlog with regard to facilities, equipment and other capital; and decreasing government subsidies, impelling universities towards far reaching structural changes. Moahi (2007), in a study on library and information science research in Botswana between 1980 and 2006, found that most research was of a descriptive nature and lacked the empirical rigor that would make any impact on national development. She noted that the country had seen few cross-disciplinary research endeavours, and more often than not, no collaborations between practitioners and academics. Moreover, research in East, Central and Southern Africa was also generally not informed by a research agenda. This is despite the fact that, increasingly, the complex global environment demands academics to work with

others across disciplines to address emerging priorities that cut across traditional disciplinary boundaries.

Oosterlinck (n.d.) observes that most universities have a structure that is relatively hostile to society's major problems requiring an interdisciplinary approach. Often, academic research suffers from more time being spent on data collection than on analysis and robust reporting. Findings that are not clearly presented and explained for the end user to understand are of little value in terms of their application. It is also common to find students wanting to cover several objectives in a single project, which calls for elaborate data collection and analysis, making it difficult to relate one objective to the next. Such research more often than not lacks definite focus. Although there is no unanimity on the number that is suitable for a research project such as a dissertation, 3 - 5 objectives is considered realistic.

Zakri (2006) outlines what he believes to be three main challenges affecting the research process, namely research capacity, research productivity and research utility. Research capacity refers to the availability of research facilities and the availability of trained human capital. Research utility focuses on the relevance of research outcomes as they relate to the national development agenda or priorities. Because national or international development is a cross disciplinary subject, research should try to involve researchers from different disciplines, otherwise the outcome would be of limited value. Research product refers to the optimisation of the available resources in order to enhance the quality of research. Zakri notes that universities in developing countries are not fully geared towards solving development-related problems. The study found gaps in linking research with development priorities. For example, there are weak links between knowledge producers and knowledge users and between knowledge production and innovation.

Postgraduate research processes that are carried out to meet the requirements for the award of a qualification face other unique challenges. A study focusing on LIS schools in East, Central and Southern Africa on the supervisor-supervisee relationship among postgraduates revealed the following (Mutula, 2009):

- Delays in receiving feedback
- Lack of guidelines stipulating supervision
- Poor supervision – no schedule for meetings, no records of discussions, etc.
- No mechanisms for redress (40%)
- Supervisors were always too busy to meet students
- Lack of support for students from non-LIS disciplinary backgrounds
- Inadequate preparation for postgraduate study
- Heavy teaching loads for faculty members
- Unnecessary administrative assignments.

Other challenges that were identified in the study include: poor quality of the students admitted, students' delays in submitting their work, and the inability of students to balance work or occupations and their studies. The students were asked when they consulted their supervisors and responded as follows: once a week (28%); once in four weeks (16%); once in two months (16%); once in more than two months (8%); 3 to 4 times a year (4%); no time specified – depends on the supervisor (16%); and by mutual agreement (16%). Fifty-six per cent (56%) of the respondents preferred one supervisor, while 32% preferred more than one. Those who preferred more than one supervisor stated that they required one supervisor to cover the absence of the other (when necessary), and more supervisors meant a wider range of opinion, which added value to the research process. Whereas some supervisors guided students on what sources to use (64%), others (32%) did not. Those candidates who preferred one supervisor said that if a supervisor is well-versed on a subject, there is no need for more supervisors. They noted that with more than one supervisor, there are delays in getting feedback because one has to wait for both parties to agree. And often there are conflicting views or opinions, thus confusing students. The study by Mutula (2008) also revealed the following challenges: delays in approving the topic (44%); unnecessary delays in getting feedback (36%); supervisors' unavailability (36%); problems balancing work or occupations and school (44%); intimidations by supervisors (28%); difficulties in finding relevant literature (28%); and delays from external examiners (24%).

The Task Group on the Future of Graduate Research Supervision at the University of Botswana (University of Botswana, 2009) found that the timely completion of postgraduate degrees at the University of Botswana varied from 14% - 37% of the total number of students registered for masters, MPhil and PhD degrees. Factors affecting the rate of completion were found to include: the availability of or access to the supervisor; commitment on the part of both supervisor and candidate; design of a work plan; and the frequency of meetings between the supervisor and the candidate. Delays in completing postgraduate studies were attributed to a lack of facilities such as equipment, software, chemicals, etc.; problems combining studies and work or occupations (for part-time students); inadequate financial support; poor preparation at undergraduate level for research; inadequate guidelines for writing theses/ dissertations; inadequate supervision; and the change of project focus midway, among others. From the perspective of supervisors, delays in completing postgraduate projects were caused by laziness on the part of candidates, heavy teaching loads of the faculty staff, poor research culture, inadequate institutional support, lack of research skills on the part of students, some students expecting supervisors to do the work for them, red-tape in the examination process, and delays in securing research permits.

Among the recommendations suggested to alleviate the problems cited above were the following:

- The staff members supervising students should be given lighter teaching loads and other responsibilities
- Thesis writing should be optional (32%)
- Guidelines for supervision should be provided (40%)
- Schedules for meetings between students and supervisors should be defined and agreed on (32%)
- Feedback on submitted work should be provided within a week (32%)
- Students should be allowed frequent meetings with the HOD to discuss progress and the behaviour of errant supervisors (28%)
- Matching student topics and supervisor skills (36%)
- External examiners should be carefully selected to ensure they can examine theses in time.

Opportunities for postgraduate research in Africa

Despite the challenges facing postgraduate research, especially in Africa, there are still considerable glimmers of hope. Some governments are recognising the importance of research and are increasing support for research in universities. South Africa now spends 1% of its gross domestic product on R&D. International support for research is also growing from bodies such as the Overseas Development Agency (ODA), which provided $105.5 billion in 2005, a figure that was expected to increase to $130 billion by 2010 (Zakri, 2006). Postgraduate students are now freely accessing hundreds of scientific and professional journals, papers, documents, encyclopedias, reports, presentations and lectures from services such as African Journals Online (AJOL). This shows considerable progress in comparison to the situation prevailing only a few years ago. Several bibliographic networks or digital libraries, such as SABINET (Southern Africa), Ain Shams University Network (ASUNET) in Egypt, and the African Online Digital Library have made possible access to resources that include digitised theses and dissertations, e-books, and databases. Moreover, a number of universities in Africa, like their counterparts in the rest of the world, are increasingly using their web-based online public access catalogues (OPACs) as gateways not only to information outside their libraries, but also to their own local digitised content. For example, the University of Botswana library's OPAC is used to provide access to digitised full-text past examination papers. At the University of Pretoria in South Africa, the library provides access to its institutional repository that contains locally generated content (Pienaar and Deventer, 2007). Rhodes University, also in South Africa, publishes electronic theses and dissertations (ETD) and makes them available on the university's intranet. Overall, digital content is increasingly being generated in Africa as many tertiary institutions, especially

universities, turn to e-learning. Such digital content consists of a variety of learning materials that range from basic text to multimedia, e.g. assignments, reading lists, course notes, course syllabuses, course objectives and external content links.

Libraries are also transforming or translating their print collections into electronic format through the digitisation or subscription to e-journals (with or without print alternatives) as a strategy to make them more accessible and to enhance resource sharing (Youngman, 2007). Scholars and publishers are now required to make their publications available through Open Access so that they can be easily and widely accessed (Association of Research Libraries, 2006). These tools are needed to ensure that scholars involved in research know what their counterparts are doing elsewhere, thus enhancing collaboration, the sharing of knowledge and best practices.

Conclusion

African universities are faced with several challenges that hamper effective postgraduate research. Most countries do not have funding for postgraduate research. Consequently, only a few students are able to attain higher degrees. Universities must try to find alternative ways of generating third-stream money. Diversifying research efforts into areas considered niche rather than duplicating what other universities are already doing is important. Such niche research areas would form the basis for postgraduate student dissertations as well as for joint studies between faculty members and students. These niche research areas should be aligned with national development priorities and international agendas, with students' projects demonstrating the relevance of such priorities. Investing in Open Access and institutional repositories (departmental, national, academic, specialised, etc.) as well as capacity building through the training of researchers would enhance the research environment. Research should be coordinated in order to avoid duplication and instead make optimal use of the resources available. It is very important to impart information literacy to postgraduate students to develop their ability to seek, organise and apply information. Students' theses should be digitised and made available online to make them more accessible, 24/7. It is also important for universities to work closely with industry in research endeavours in order to address market needs. This collaboration could enable research in an industrial environment. Improving the quality of undergraduate programmes would lay a strong foundation for postgraduate programmes.

Other actions that our universities need to implement in order to enhance the capacity of the research environment include: offering faculty-wide postgraduate programs (rather than departmental-based degrees), improving capacity through collaboration and partnership to

facilitate skills and technology transfer, and ensuring that research is tailored to help address poverty and make life much easier.

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Chapter Two

Research challenges and opportunities in a digital dispensation: an African perspective

Stephen M Mutula

Introduction

The growth in the use of Information and Communication Technology (ICT) in higher education affords university academics and researchers, especially those in developing countries, a unique opportunity to bridge the knowledge gap between them and their colleagues in developed nations. ICT is increasingly being perceived in higher education as crucial to the continued survival of universities and research institutes. The World Bank's 1998/99 World Development Report called for radical changes, including the infusion of ICT in post-secondary education, if Africa is to equip its labour force with the skills needed to survive in the new technological age. Many universities in Africa are acquiring various ICTs for use in teaching and research. However, Adeya (2001) warns that access to ICT does not necessarily lead to immediate application. Hopkins (1996) pointed out that in acquiring ICTs universities very often exhibit a blind faith in technology – a sort of technological determinism – that merely installing a machine will lead to its efficient use. But this is usually not the case, as is increasingly evident in a number of universities in Africa.

The role of universities generally includes knowledge creation; knowledge synthesis and delivery; credentialing (electing or screening students); training scholars; social integration; networking (e.g., faculty, students, alumni, community and business leaders); and supporting communities in a variety of ways (Rangaswamy, 2000). Most research work in higher education is undertaken by faculty and postgraduate students because most universities, colleges and schools that offer graduate education and training require that students write a masters or doctoral dissertation. Research activities largely involve the provision of professional, technical, administrative or clerical support and/or assistance to staff directly engaged in research and experimental development; management of staff who are engaged in research; and the supervision of students undertaking postgraduate research courses (James Cook University, 2003). Research tests assumptions and observations and creates new knowledge that can be used to improve services. Research also provides the theoretical framework needed to understand the information reported by individual scholars. In the context of LIS, many types of research studies exist, but the two major categories are basic and applied research. Basic research seeks to create new knowledge and is not directly related to technical or practical

problems, while applied research seeks to solve the practical problems that library and information scientists face (James Cook University, 2003). Research carries with it a responsibility to disseminate and apply the results of research activity. Consequently, universities the world over are under immense and constant pressure to generate knowledge that can help address problems facing contemporary society. Pressure is exerted on universities in part because they are public organisations funded from public coffers. Consequently, they must demonstrate accountability for the money they receive from government to fund their operations.

Challenges facing researchers, especially in African universities, tend to dominate contemporary research literature. In Africa, for example, literature tends to focus on challenges relating to the descriptive nature of research and the lack of empirical rigor; paucity of cross-disciplinary research endeavours; limited collaboration between practitioners and academics; a poor link between research and national development agendas (Moahi, 2007); decreasing state subsidies (Botha and Simelane, 2007); inadequate research expertise and inexperienced supervisors (Biermann and Jordaan, 2007); the high subscription costs of scholarly journals; language barriers; limited publishing infrastructure; lack of incentives for researchers; inadequate mentoring frameworks; and weak or no partnerships with government, industry, public, donors, etc. (Lor, 1998). However, research challenges and opportunities in the digital dispensation have yet to receive adequate treatment.

Research quality indicators

There are various indicators used to measure the quality of research output. The legal profession considers the quality of research in the context of the quality of the researchers. Such researchers should have (University of Melbourne, 2008): a substantial body of high quality work published over a sustained period of time; a reputation of excellence in their field; and a demonstration of research leadership within university environments. Moreover, researcher excellence may take a number of different paths. Some researchers may aim to primarily influence the academic community and the quality of their work is recognised through academic quality indicators. Others may aim to influence policy and the quality of their work may in part be measured by the impact of outcomes in the public domain.

Quality researchers are also recognised according to a number of other indicators, including but not limited to the publication of a book (or a chapter in a book) by a reputable scholarly body; publication of scholarly articles in leading journals; positive reviews of the researcher's authored or edited books; citations of works by the researcher by leading scholars in the field; and use of the researcher's work by government, industry, etc. Other indicators include: journal editorship; membership in the advisory committees of journals;

invitations to speak at conferences, particularly as a preliminary speaker; partnership in research collaborations or research networks; fellowships or honorary positions at other universities; awards or honours for research by government or non-governmental bodies; membership in government, industry, or non-governmental advisory boards where such membership is attributable to research expertise; obtaining competitive external research grants; high levels of successful research supervision of students; leadership role in developing links; and their mentoring role over junior research staff and research students (University of Melbourne, 2008).

Paradigm shift in the research process in a digital dispensation

The academic environment in universities the world over is undergoing tremendous transformation. This transformation is well captured in the words of Prof. Frank Youngman when he opened a digital scholarship conference at the University of Botswana on December the 12th, 2007. He observed that, *"The teaching and research work of academic institutions has been based historically on the printed page; libraries with their physical collections of books, journals and documents have been at the heart of universities; however, academic work is being transformed as the shift takes place from print media such as books to the Internet and digital media including graphics, audio and video. A different kind of student is also emerging ('the iPod generation') with greater computer literacy and different kinds of expectations from the university experience. This transformation has been brought about by globalisation and the revolution in technology, especially the Internet and World Wide Web"* (Youngman, 2007).

Among the transformations taking place in universities is the increasing trend towards the online delivery of information, with libraries responding by making attempts to digitise material that was once only in print format. This action is necessary to facilitate the delivery of collections to users 24/7 via intranets, the Internet and other fast and emerging networks. Similarly, digital information resources are increasingly being relied on as primary or complementary information sources of scholarship. Scientific journals that were a few years ago produced largely in print form are now rolled out first as e-versions before their print editions can appear. Libraries are also transforming their print collections into 'e-collections' through digitisation or subscription to e-journals (with or without print alternatives) as a strategy to make them more accessible and to enhance resource sharing.

Opportunities for research in the digital dispensation

The developed world is effectively leveraging ICT to enhance research capacity. The US National Institute of Health (NIH) requires its funded researchers to deposit their final peer-reviewed manuscripts in its online digital archive. The US Congress also requires research

supported by major government funding agencies to be freely available online within six months of publication in a journal. In Canada, the Social Sciences and Humanities Research Council operates on the principle of open access; scholars and publishers are required to make their publications available through open access so that they can be easily and widely accessed (Association of Research Libraries, 2006).

In the UK, the biomedical research funding agency requires recipients of research grants to submit an electronic copy of the final manuscripts of their research papers into its electronic archive. Likewise, the European Union has implemented policies requiring grantees to deposit journal articles and conference proceedings in open online archives. The German Research Foundation (DFG) expects the research results it funds to be published and made available digitally and on the Internet via open access (Association of Research Libraries, 2006). In Africa, although some attempts are being made by universities to place their research output online, most universities are yet to use ICT effectively to enhance the research process. Among the institutions that are making good progress in their attempts to provide their research outputs online are Rhodes University (online theses and dissertations), the University of the Western Cape (institutional repository), University of Pretoria (institutional repository), and the University of Botswana (institutional repository).

Doing research in the digital environment has a number of benefits. For one, it boosts the visibility of universities on the web and enhances their competitiveness. It also enables researchers to know what their global counterparts are doing, thus enhancing collaboration and the sharing of knowledge and best practices. By seeing what others are doing, it becomes possible to reduce the duplication of research efforts. Research in the digital environment can also facilitate access to a wide range of literature housed in electronic databases, digital libraries, and the institutional repositories of other universities, and consequently help address the dearth of information resources that universities in Africa are faced with. The use of ICTs enhances output as well as accuracy because of the increased use of computers. Through digital scholarship, it is possible for universities to:

- Enhance quality research
- Make contributions to global knowledge
- Enhance content development
- Help bridge the knowledge gap between the north and south
- Provide access for greater numbers of students to higher education
- Make access to higher education more democratic and liberalised.

The digital environment enables universities to provide e-learning – the use of a variety of ICTs to facilitate student-oriented, active and open, life-long learning (University of Botswana, 2001) – to enhance classroom teaching and improve the quality of research

(Department of Education and Youth Affairs, 2001). Through e-learning, group work, self-directed learning, and the maintenance of students, electronic portfolios of their work (Livingstone, 2004) can be achieved. The web provides the opportunity for reporting research and other academic activities across the globe.

The digital dispensation provides opportunities and a wider scope for research within and across disciplines from emerging disciplines such as social informatics, which draws from information science, sociology, computer science, information technology, information systems, management sciences, social work, anthropology, and communication sciences (Babier *et al.*, 2002). Hedstrom (2002) observes that research in almost every discipline depends on well-managed, reliable, and readily accessible digital resources. The decision by Google, for instance, to digitise print materials from the collections of five major research libraries of Harvard University, Stanford University, the University of Michigan at Ann Arbor, the University of Oxford, and the New York Public Library, would immensely facilitate access by researchers to the full texts of the scanned books in their millions from the participating libraries.

The digital environment provides universities with opportunities to increase the productivity of faculties by expanding geographical reach. Moreover, within such an environment, information needed for research is not necessarily located on campus, and both professors and students can find and use them at any time and anywhere with a web connection. From the perspective of libraries, their role to enhance research is further enabled. OPACs are now used as gateways to information within and outside information centres. The catalogue is no longer just an inventory or a finding aid (that it used to be) for what the information centre owns, but is now rather a portal to everything that the information centre can access within and outside the organisation (Stueart, 2006). Publishers have also transformed, becoming not only suppliers, but also providers of information directly to the users (libraries), thus cutting the costs of intermediaries.

Scientists in sub-Saharan Africa, where there is a dearth of information resources to support research, are increasingly freely accessing hundreds of scientific and professional journals, papers, documents, encyclopedias, reports, presentations and lectures from services such as *African Journals Online* (AJOL). This represents considerable progress in comparison to the situation prevailing only a few years ago. Several bibliographic networks, such as SABINET (Southern Africa), the African Digital Library, the African Online Digital Library and Ain Shams University Network (ASUNET) in Egypt, have made it possible to access resources such as digitised theses and dissertations, e-books, databases, and much more.

Kraut *et al*. (2003) note that the Internet has changed communication and is enabling researchers to observe new or rare phenomena online and to do research more efficiently, enabling them to expand the scale and scope of their research. The Internet has also enabled scientists to collaborate by increasing the ease with which they can work with geographically distant partners or share information (Walsh & Maloney, 2002). Research enabled through the Internet lowers many of the costs associated with collecting data, especially with respect to human behaviour, as ICT can enable the hosting of online experiments and surveys, allow observers to watch online behaviour, and offer the mining of archival data sources. Through online research, data can be collected from thousands of participants with minimal intervention on the part of experimenters; for instance, Internet chat rooms and bulletin boards provide a rich sample of human behaviour that can be mined for studies of communication (Nosek, Banaji, & Greenwald, 2002).

The Internet also provides an opportunity to publish results quickly, although in some cases this also results in the risk that research of low quality is published, especially if the research has yet to be published in a peer reviewed journal. The detailed transaction logs that people leave when using the Internet for a wide variety of activities provide a wealth of potential data for study. Online research also allows a degree of automation and experimental control that could otherwise be difficult to achieve without the use of computers. Moreover, a primary advantage of the Internet for research is the low marginal cost of each additional research participant. Unlike traditional laboratory experiments or telephone surveys, where each new participant must be encountered, instructed and supervised by a person, most online experiments and surveys are automated, with a low marginal cost (Kraut *et al*., 2003).

Challenges of research in the digital dispensation

Despite the potential ICT offers in research, there are several challenges facing researchers in the digital environment, especially in parts of the developing world such as Africa. Mutula *et al*. (2006), in an empirical study of e-learning at the University of Botswana, identified the following problems facing students: shortage of computers; lack of clarity of online content; poor Internet connectivity; the difficulties associated with locating information over the Internet; the inability to cope with the workload (e.g. too many readings); problems with presenting information in particular formats; and lack of appeal of content, among others. On the question of how well materials were presented online, some respondents felt that materials were not well presented. As to whether the online course was designed with their needs in mind, of the 86 respondents who answered this item, 58 (67.4%) said yes, 17 (19.8%) said no, and 11 (12.8%) did not know. Gerhan and Mutula (2005), in a study of bandwidth problems at the University of Botswana, found that a shortage of computers is

often cited at the university as one major factor hampering effective e-learning. Students also often complain of poor Internet connectivity.

In Nigerian Universities, it is reported that some faculties and departments acquire computers before deciding what to do with them. Moreover, ICTs are purchased but never used, and in some cases the Internet has never been utilised by academic staff for a variety of reasons (Idowu, Adagunodo & Popoola, 2003), e.g. inadequate training of lecturers in new skills, and/or unwillingness by the lecturers themselves to learn new skills (Holt & Crocker, 2000). Zayim, Yildirim, & Saka (2006), in a study of technology use among members of the medical faculty in a Turkish university, found that faculty members whose ranks were lower than professor had higher self-efficacy beliefs and were more likely to be early adopters of technology. By and large, there is shortfall of African scholarly publications on the Internet attributed to, among other factors, the digital divide, low levels of awareness about the potential of ICT, high cost of Internet access, inadequate training and skills, lack of resources, poor quality of research, etc.

Within most African universities, research findings, particularly theses and dissertations, are not placed online, making their identification and use difficult. This also leads to the unnecessary duplication of research work. Additionally, institutions such as libraries and archives, museums, cultural collections, and other community-based access points have largely not acquired information technologies to make their content widely accessible (World Summit on Information Society, 2003). This problem causes a paucity of research materials and limits further research. Consequently, the research generated is of poor quality. In the digital research environment, information, especially on the Internet, is growing at a phenomenal rate without adequate tools for its bibliographic control, searching, filtering and retrieval. The search engines are inadequate tools as they do not review the documents, directories and gateways, and only cover limited materials.

The digital dispensation places a heavy demand on library and information professionals. Stueart (2006) notes that information facilitators in the information age are being called upon to help people use resources, enhance outreach services to various users (such as faculty members), and work with users at the desktop to show them how to use databases, for example. The librarian is also seen as an information consultant involved in behind-the-scenes activities, for example helping software designers develop systems that fit users' information seeking behaviour. They are also increasingly getting involved in developing and imparting information literacy. Stueart (2006) points out that the changes that have occurred in the information environment have also made librarians negotiators who are responsible for identifying needs; facilitators who provide effective search strategies; educators familiar with literature and information in many formats; and information

intermediaries responsible for providing current awareness services and liaisons between the seeker of the information and the information itself. The librarian is now also perceived as a knowledge manager responsible for supporting the knowledge access process or directing users to other knowledge experts.

Most countries in Africa lack pervasive Internet connectivity, making it difficult to share research findings with other researchers within and across institutions. This is exacerbated by the fact that social and community informatics infrastructures have not pervaded the breadth and depth of African rural settings, although e-government is increasingly being adopted. Weak community and social informatics infrastructure means that researchers outside their stations have to walk long distances in order to access the Internet, especially if they do not have their own connectivity either at home or at their places of work.

Research in the digital era is made difficult because there is currently no sampling frame that provides an approximate random sample of Internet users, unlike random digit dialling in the case of telephone numbers, which provides an approximate sample of countries' populations, especially in the developed world. The problem of representativeness is compounded because many online surveys and experiments rely on opportunity samples of volunteers. As a result, it is not exactly clear how to go about the task of appropriate generalisation (Kraut *et al.*, 2003). Moreover, Internet–based surveys pose challenges of generalisation as response rates to online surveys are typically lower than comparable mail or telephone surveys, and when given the choice of electronic or paper-based questionnaires, respondents still overwhelmingly choose paper (Couper, 2001).

The basic ethical principles underlying research involving human subjects, namely respect for persons, beneficence and justice, are difficult to uphold in Internet-based research. This is because Internet research involves two potential sources of risk: harm resulting from direct participation in the research (e.g. acute emotional reactions to certain questions or experimental manipulations), and harm resulting from a breach of confidentiality (Kraut *et al.*, 2003). Kraut *et al.* (2003) point out that doing research online often leads to loss of control by the researcher over the context in which data is procured when subjects participate in experiments. Moreover, ensuring informed consent, explaining instructions, and conducting effective debriefings, may be more difficult than in the traditional laboratory experiment. Observations in chat rooms and bulletin boards raise difficult questions about the rights of participants, including privacy and lack of informed consent.

Hedstrom (2002) outlines further research challenges in the digital dispensation. In particular, digital collections are vast, heterogeneous, and growing at a rate that outpaces our ability to manage and preserve them. There are no effective and cost-effective methods to

preserve dynamic databases, complex websites, analytical tools, or software for the long term. Digital resources are also impossible to interpret or use without accompanying tools for analysis and presentation. Moreover, current methods rely on significant human intervention for selection, organisation, description and access because most tools for information retrieval, such as search engines, have yet to be perfected. The threat of the interrupted management of digital objects becomes critical because such objects cannot withstand some period of neglect without resulting in total loss. There are also questions of intellectual property rights, privacy and trust that need to be addressed by researchers. Access to digital content is sometimes hampered by interoperability problems, especially across widely distributed and heterogeneous digital archives. Moreover, with the translation of what was largely in the print environment into digital megacollections, other issues arise, including the integrity of the scholarly research process, publications and communications; intellectual property rights; and privacy and security, among others.

Universities in Africa suffer from internal and external digital divides characterised by disparities in access to new computers, specialised software, broadband, quality networks (based on the segment of the network to which one's computer is connected), and much more. The digital divide in African universities is also caused by the low utilisation of existing ICT resources. Mutula (2004) observed that libraries in Africa that had implemented ICTs generally experienced under-utilisation of the technologies on account of lack of sound IT exploitation skills as well as restrictions imposed on their use in some universities. Westra (1993) also observed that Internet access in libraries was restricted because of the high costs of providing equipment and services. For example, in some Kenyan and Zambian university libraries, Internet access was restricted to postgraduate students and staff only. Such under-utilisation has been reported at the University of Zambia, University of Nairobi, Copper Belt University in Zambia, and the University of Botswana (Chifwepa, 2003; Yeboah, 1999; Adeyemi, 2002; Subair and Kgankenna, 2002).

The International Telecommunications Union [ITU] (2002) states that the "so-called new or the 'quality' digital divide is not attributable to the lack of equipment or connections, but … quantity [and] to quality". Warschauer (2002) adds that bridging the digital divide is about much more than providing Internet and computer connections, because access to ICT is embedded in a complex array of factors encompassing physical, digital, human and social relationships. Green (2000), citing data from the *Education Week* teacher survey, observed that when teachers were asked why they do not use software or the Internet for instruction, they reported the following reasons, which have nothing to do with access: i) The lack of time to prepare and preview software or websites; ii) Lack of training on software; iii) Too much time is required to use technology; iv) Technologies are not aligned with the

curriculum and assessment; and (v) It is difficult to find software to meet students' needs. Lenhart *et al*. (2003) note that not all 'have nots' necessarily want to be 'haves'; nor do they necessarily view their engagement with ICTs as a positive force that would transform the quality of their lives.

Most content providers of digital material are in the developed world, and they are increasingly changing from the purchasing model to licensing, which often overrides the conventional exceptions to copyright as contained in national legislations (such as fair use and fair dealing). This makes it difficult for the information provider to freely avail such information for academic use without breaking license agreements, thus further alienating developing countries from mainstream information (Kiggundu, 2007). The high cost of digital information is reflected in the high costs of access to external databases and the procurement of digital information. This makes it increasingly difficult for libraries, especially in Africa, to subscribe to new journals and books and also maintain existing subscriptions. Libraries the world over have well established traditions of archiving hardcopies of all the materials that they acquire, be they journals, books, newspapers, pamphlets, etc. But increasingly, it is becoming more and more difficult in the digital era for libraries to continue with this long established practice because content providers are insisting that once subscription ceases, access to entire databases also ceases. Whereas such restrictions are not applicable to print resources, they are being imposed on electronic resources.

Some journal publishers have terminated their print versions and now concentrate solely on web accessible versions. This, coupled with the proliferation of a wide range of content in the form of e-journals, e-books, institutional repositories, databases and digital libraries, is an obstacle to users who must be connected in order to access such resources. African universities in the developing world generate large amounts of local content in terms of research and publications, but most of these research outcomes do not find their way into international information systems. This is partly because most of the content is offline (Ballantyne, 2002).

Most universities in the African environment suffer serious bandwidth bottlenecks. Gerhan and Mutula (2005) conducted a study on the use of the Internet at the University of Botswana to determine the length of time required in a queue to gain physical access to a computer and the length of time required for a response from those computers when connected to the Internet. The respondents cited four reasons for low Internet and computer use, namely insufficient computers, inadequate training, slow response times, and restrictions in the time allocated to each user. Mwiyeriwa and Ngwira (2003) noted that in university libraries in Malawi, in spite of the wide variety of electronic resources that were freely available through the Program for the Enhancement of Research Information (PERI)

and Health Internetwork Access to Research Initiative (HINARI), the Internet connections were poor, thus discouraging potential users.

The National Universities Commission (2006) in Nigeria observed that universities in that country do not have web presence and perform poorly in webometric rankings, and this can potentially lower their esteem in the eyes of stakeholders such as potential students and funding agencies. This may also affect academic exchange with reputable universities from other parts of the world for teaching and research. The National Universities Commission pointed out that Nigerian universities were performing poorly in respect of research in the digital dispensation because of the scant attention paid to presenting research findings in web-searchable forms; low impact local journals without Internet links; non-publication in electronic journals; absence of Nigerian universities on the Internet (website addresses) in a form that can be picked up by the Cybermetric Research Group (2007); and the shortage of up-to-date websites.

Clark Kerr, on "The uses of the university" as quoted by Rangaswamy (2000) of Pennsylvania State University, observed that "of the 75 institutions founded before 1520 AD, which are still doing much the same things in much the same places, about 60 are universities". Christensen (1997) noted that educators are resistant to change. Academics with science backgrounds have also been found to be earlier adopters of electronic journals than those in the social sciences and humanities (Tenopir, 2003).

Way forward and conclusion

The digital era offers great opportunities as well as challenges for research in university environments, especially in Africa. However, for universities to make optimal benefits using these technologies, a number of interventions are necessary. Universities need to develop research strategies that would define and make available the resources needed, determine qualitative measures of research, define how ethical issues can be observed online, define methods for the peer review process, promote collaboration and partnerships with industry and government, promote the commercialisation of research products, provide mentorship, and provide a complaints resolution mechanism. Sawyer (2004) observes that research capacity development in most African countries represents an instance of market failure because explicit public policies do not exist to reinforce and ensure that higher education and research receive adequate investment from both private and public sources for infrastructure development, especially of laboratories, equipment, libraries, and systems of information storage, retrieval, and utilisation.

Libraries have a critical role to play in digital scholarship. Libraries can develop mechanisms that enhance easy access to e-information and e-content by creating portals, gateways,

and hypertext links to resources. Libraries can also transform their print collections into on-line content through digitisation or subscription to e-journals. Libraries need to transform their collection development policies to support digital scholarship because scientific journals that were, only a few years ago, published in print form, are now rolled out first as e-versions. Digital scholarship processes are supported by a range of content in the form of e-journals, e-books, institutional repositories, databases and digital libraries. These resources must be harnessed by libraries if they are to meet their obligations in the digital environment. There is also a need for libraries to put in place relevant infrastructure to support the integration of various media, such as text, graphics, animations, and video and audio in teaching and research processes.

Because of the increased number of iPod users and enhanced digital literacy in society, libraries, in partnership with some faculties, need to enhance digital literacy competencies among their staff and students. Libraries must also strive to develop resources such as institutional repositories to support digital scholarship. Institutional repositories contribute to the visibility and international standing of universities and research organisations, especially with respect to scholarly communication. Such repositories are also convenient in harnessing local content, which is necessary for building the knowledge society. In order for digital scholarship to thrive and become institutionalised in universities, especially in Africa, open access principles should be pursued.

The evolving digital environment demands that libraries put in place mechanisms to harness e-information to support digital scholarship. Libraries in universities and other research environments should consult with authors, publishers, and other stakeholders to work together to develop suitable business models for Africa that would address issues of restrictive copyright regimes and how to further enhance access to digital content. Kiggundu (2007) suggests that developing countries should take a firm stand with regard to provisions in the Copyright and Neighbouring Rights Act of 2000 that expressly prohibits the inclusion of restrictive contractual terms in any contract entered into with information providers, and also by advocating in WIPO and WTO for such restrictive terms to be prohibited worldwide. For libraries in universities to play their rightful role in the new digital dispensation to support research, governments must also play their part by providing adequate infrastructure and enacting enabling policies that promote open Internet access to bridge the widening digital divide that hampers the implementation and support of digital scholarship.

To summarise, within academic environments around the world, there have been various responses and interventions to changes in the paucity of resources, including the establishment of digital libraries, institutional repositories, open access, federated search engines, e-learning, and more. The Southern African Regional Universities Association

(SARUA) Leadership Summit held at the University of Botswana on Open Access from November 20th to 21st 2007 highlighted the importance of raising awareness about institutional repositories in the core business of universities and in support of scholarly communication. The summit reiterated the strategic importance of institutional repositories as contributors to the visibility and international standing of universities and research organisations in the realm of scholarly communication, and more generally for local content which is necessary for local contributions to the knowledge society. Universities, researchers, and scholars should provide leadership by placing their research output on institutional repositories.

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Chapter Three

An informetric study of South Africa's research collaboration between 1986 and 2005

Omwoyo Bosire Onyancha

1 Introduction

South Africa's regional and international relations during the apartheid era were highly strained. Prior to the inception of the Government of National Unity in 1994, the country was alienated from most of the world's mainstream economic, social and political discourse (Levy, 1999). India was the first country to slap South Africa with trade-related sanctions in July 1946 (Wehr, Burgess & Burgess, 1994). The country's apartheid system came under regular attack from the international community from 1952 onwards, culminating in the country's withdrawal from various influential international organisations, notably the United Nations Educational Scientific and Cultural Organization (UNESCO) in 1956, the International Labour Organization (ILO) in 1961, and the World Health Organization (WHO) in 1965 (Saunders & Southey, 2001). Schoeman's (1988) "South African Sanctions Directory" indicates that, generally, most of the country's sanctions came to effect in the 1980s. These sanctions touched on almost every sector of national development, from trade and commerce, to sports, health and education. The sanctions meant that the free flow of goods and persons to and from South Africa was curtailed; cross-border knowledge, skills and technology sharing and transfer was almost non-existent. New innovations during this period were therefore minimal.

Unsurprisingly, these sanctions also affected research collaboration between South African scholars or researchers and institutions and their colleagues or counterparts from the rest of the world. One sanction that had a profound impact on research was the academic boycott instigated by the international academia. Coovadia (1999:1507) explains that the academic boycott against South African researchers resulted in many scientists from overseas refusing to visit South Africa or to invite white or black South Africans unless "the conditions of selective support were met". The Physicians for Human Rights (United Kingdom) and the Johannes Weir Foundation (as cited in Coovadia, 1999:1507) concluded in their report on health care under apartheid that overall, "The academic boycott had a negative impact on academic work, research, scholarship, and postgraduate teaching." Things have since changed, as reflected in the numerous joint research ventures that have been initiated by various institutions in the country in partnership with external agencies. A glance at the

National Research Foundation's (NRF) website yielded the following research collaboration initiatives (NRF, 2009):

- **South Africa/Oman Joint Science and Technology Research.** Joint research between the South African researcher community and their colleagues in Oman. The call for responses towards possible collaborative activities between South African and Omani researchers was made on behalf of the Department of Science and Technology (DST) in 2009. The focus areas of research for this possible joint partnership are science and technology.

- **South Africa/Poland Joint Science and Technology Research.** Joint partnership between Polish and South African researchers that aims to develop relations to the mutual benefit of the two countries in science and technology.

- **NRF/CNRS International Scientific and Technological Cooperation.** This joint research venture is between the French National Center for Scientific Research and the National Research Foundation and focuses on the fields of education, culture, sport, science and technology.

- **South Africa/Hungary Joint Science and Technology Research.** This bilateral inter-governmental agreement between Hungary and South Africa was entered into in 1997. Cooperation focuses on the fields of science and technology with the aim of strengthening relations between the two countries in the area of scientific research.

- **South Africa - Kenya Joint Science and Technology Research Programme.** Initiated in 2009, the call for proposals outlines the areas of joint research as biosciences, space science, indigenous knowledge systems, environmental and climate change, mathematical sciences, and energy.

- **Swedish Research Links Programme.** This programme is intended to support international research collaboration, funds and joint activities such as workshops, seminars, exchange research visits, and joint publishing.

- **South Africa/Argentina Joint Science and Technology Research.** South Africa and Argentina entered an agreement in 2006 to jointly conduct research in science and technology.

- **NRF/DFG Joint Science and Technology Research.** Joint research between South African and German researchers in all recognised branches of the natural and social sciences, engineering and the humanities. The call was made in 2009.

Further collaboration includes South Africa's Medical Research Foundation's (MRC's) collaboration with the Centre for Health Informatics Research and Development (CHIRAD) in the UK. The memorandum of understanding between the two institutions was signed in February 2004 (MRC, 2007). The Human Sciences Research Council [HSRC] (2005) also collaborates with virtually all sub-Saharan African countries in its 10 research programmes, namely: Assessment of Technology and Education Evaluation (ATEE); Child, Youth and Family Development (CYFD); Democracy and Governance (D&G); Employment and

Economic Policy Research (EEPR); Human Resources Development (HRD); Integrated Rural and Regional Development (IRRD); Knowledge Management (KM); Social Aspects of HIV/AIDS and Health (SAHA); Surveys, Analyses, Modelling and Mapping (SAMM); and Social Cohesion and Integration (SCI).

Studies on research collaboration in South Africa have shown that the country's research publications are mainly internally co-authored (Onyancha & Ocholla, 2007; Onyancha, 2009). This implies that although the sanctions imposed on South Africa retarded the country's potential growth and performance, the sanctions were a 'blessing in disguise', so to speak, in terms of strengthening internal collaborations. The cited studies (i.e. Onyancha & Ocholla, 2007; Onyancha, 2009) were conducted in order to examine and identify the collaborative patterns, trends and extent of HIV/AIDS research in Eastern and Southern African countries. A larger and broader study by Tijssen (2007) set out to highlight Africa's contribution to worldwide research literature. One of the variables this author considered was Africa's domestic and international collaboration. He noted that 'single institute' papers from African countries contributed an average of 15% to the total African output each four-year period, beginning from 1990 - 1993. Domestic co-publication declined steadily from 48% to 34% while worldwide domestic cooperation continued to increase. Tijssen (2007:310) attributed this pattern of co-publication to African researchers' reliance on foreign partners when publishing their research findings in foreign journals.

> The extremely high share of international co-publications may indicate a structural dependence of African science, owing to the resources offered by advanced countries to help alleviate infrastructural and financial constraints, are hampering many African science systems.

A critical review of Tijssen's study also reveals that research collaboration, particularly at international level, increases research visibility which (in turn) increases the research impact. Adams, Gurney & Marshall (2007) shared this view in their study when they observed that "collaborative research is also identified as contributing to some of the highest impact activity". Likewise, Katz & Hicks (1997:541) noted: "Collaborating with an author from the home institution or another domestic institution increases the average impact by approximately 0.75 citations while collaborating with an author from a foreign institution increases the impact by about 1.6 citations." These and other factors or gains associated with research collaboration (see Onyancha & Ocholla, 2007) have resulted in various governments' and institutions' increased focus on collaboration between international and domestic researchers.

2 Purpose

This chapter sought to highlight South Africa's patterns and trends of research collaboration between 1986 and 2005 (one decade during apartheid and one in post-apartheid South Africa) in order to:

1. Examine the trends of single- and multiple-country author papers;
2. Compare the number of countries collaborating with South Africa;
3. Identify the countries with which South Africa collaborates;
4. Determine the subject focus areas of research collaboration;
5. Measure the strengths of association between South Africa and each of the collaborating countries; and
6. Measure the impact of South Africa's research collaboration with the country's main collaborators.

3 Methods and materials

The Thomson Reuters' (formerly known as the Institute of Scientific Information and thereafter Thomson Scientific) Citation Indexes, namely the Science Citation Index (SCI), Social Sciences Citation Index (SSCI), and Arts and Humanities Citation Index (A&HCI), were the principal sources of data. Data was extracted from these databases through the online Web of Science, Thomson Reuters' portal to the citation indexes. Because the three databases share a search platform, a single search query, "*AD=South Africa*", was used to extract all documents that contained the words "South Africa" within the author's address field. The search was then refined by date of publication and document type to obtain only *articles* published between 1986 and 2005 (one decade during and one after the apartheid era). The author's address field was identified as the most appropriate field within which the search could be conducted in order to retrieve only the records that contained at least one South African institutional address.

The search was limited to only *articles* because scientific research is mainly disseminated through journal articles as opposed to other document types such as books, book chapters, book reviews, technical reports, working papers, letters to editors, biographies, bibliographies, news items, reprints, theses, and dissertations. The extracted data was stored in spreadsheets prepared using Microsoft Excel for further analysis. Data analysis was conducted using several analytic technologies (Sitkis, UCINET for Windows, and Microsoft Excel and Access software) based on the following objectives:

a. To examine the trends of single- and multiple-country author papers. Normally, the term 'co-authorship' is used to refer to "an instance in which two or more individuals jointly author" (Diodato, 1994:6). Because the term 'author' may refer to individual as well as corporate authorship, this study introduces two terms – 'single-country-' and 'multiple-country-authorship/author paper(s)' – to refer to papers authored by

South Africa only (papers that contained two or more authors but whose institutional affiliation was South African only) and those authored by South Africa in partnership with at least one other country (papers that contained two or more authors from a foreign country and at least one author from a South African institution), respectively.

b. To compare the number of countries collaborating with South Africa. The number of countries was computed in each 5-year period from 1986 to 2005. The growth and percentage increase of the number of countries was also computed.

c. To identify the countries collaborating with South Africa. Regional (African) and international (foreign) countries were identified from the authors' address fields. The research output resulting from collaboration with respective countries was calculated based on the number of times the name of a particular country appeared in the authors' address field. In all cases, the name of the country was counted only once irrespective of the number of times it appeared in a given record.

d. To determine the subject focus areas of research collaboration. The reason for this was two-fold, namely:

    i. To explore the shifts of focus by examining the top 10 subject categories originating from papers co-authored outside South Africa in each 5-year period; and

    ii. To identify the subject areas of collaboration between South Africa and regional (African) countries on the one hand and foreign countries on the other. Regional and foreign co-authored papers were isolated and analysed separately to identify the subject categories that yielded high frequencies of occurrence.

e. To measure the strengths of association between South Africa and each collaborating country. Each country's raw frequency counts were subjected to further analysis using the UCINET software's normalise function to generate normalised frequency counts, which in turn were used as indicators of strengths of association between South Africa and each collaborating country. The normalised frequency counts ranged from 0 to 1. The closer the figure was to 1, the stronger the collaborative ties between the respective country and South Africa. The reverse meant weaker relationships.

f. To measure the impact of South Africa's research collaboration with the country's main collaborators. Two approaches were used to measure the impact of South Africa's research collaboration:

    i. Regional and foreign citation counts and citations per paper were separately analysed in order to find out whether or not there were differences in research impact between foreign and regional collaborations.

    ii. Citations and citations per paper that contained at least one South African institution's name and no name of an institution outside South Africa were compared with the citations or citations per paper of all papers containing South Africa in the authors' address field to find out whether or not

collaboration with an outside country increases South Africa's research impact and if so, by how much.

The number of citations per paper was used as an indicator of impact in both cases.

4 Results and discussion

The results are presented and discussed under each objective as outlined in Section 2 above.

4.1 Trends of single- and multiple-country author papers

As mentioned in the methodology, single-country-author papers refer to papers authored about South Africa by only South African researchers (represented in Fig 1. as SA). The papers increased slightly from 2605 in 1986 to 2867 papers in 1987, a percentage increase of 10.1%. Apart from occasional increments, the number of single-country author papers declined steadily from 1988. The papers decreased from 2770 in 1988 to 2522 in 1989, with a further drop to 2477 in 1990. Generally speaking, the number of single-country author papers decreased from 2605 in 1986 to 1815 in 2005. It is projected that this trend will continue as long as there are continued collaborations between South African researchers and their colleagues in other countries.

Multiple-country author papers, on the other hand, continued to increase from 1986, the year in which South Africa's co-authored papers with other countries totaled 332. The following year (i.e. 1987) yielded 424, a percentage increase of 27.7%. There was a slight drop in 1988 by 46 papers followed by a growth rate of 4.2% in 1989, when a total of 394 papers were registered. Thereafter, the growth of multiple-country author papers accelerated at an almost exponential rate and peaked at 1754 in 2004. In fact, the trend indicates that the growth rate of multiple-country author papers steadily increased at a higher rate than the total number of South African papers, especially after 1994 when South Africa's apartheid regime was replaced with the Government of National Unity. This shows how South Africa's collaborative space has opened up, both regionally and internationally.

4.2 Number of collaborating countries

Fig. 2 provides the number of countries that collaborated with South Africa in the publication of research articles between 1986 and 2005. This number, as with the number of multiple-country author papers, steadily increased from just 73 in 1986 - 1990 to 145 in the 2001 - 2005 year period. It was noted that the growth rate slowed down from 43.8% to 11.5% over the 20 years investigated in this study. This trend is not entirely unique as the number of participating countries would initially grow at a fast rate and stabilise at some stage when the distinction between core and periphery participants becomes clear. In any case, a country can only collaborate with so many countries.
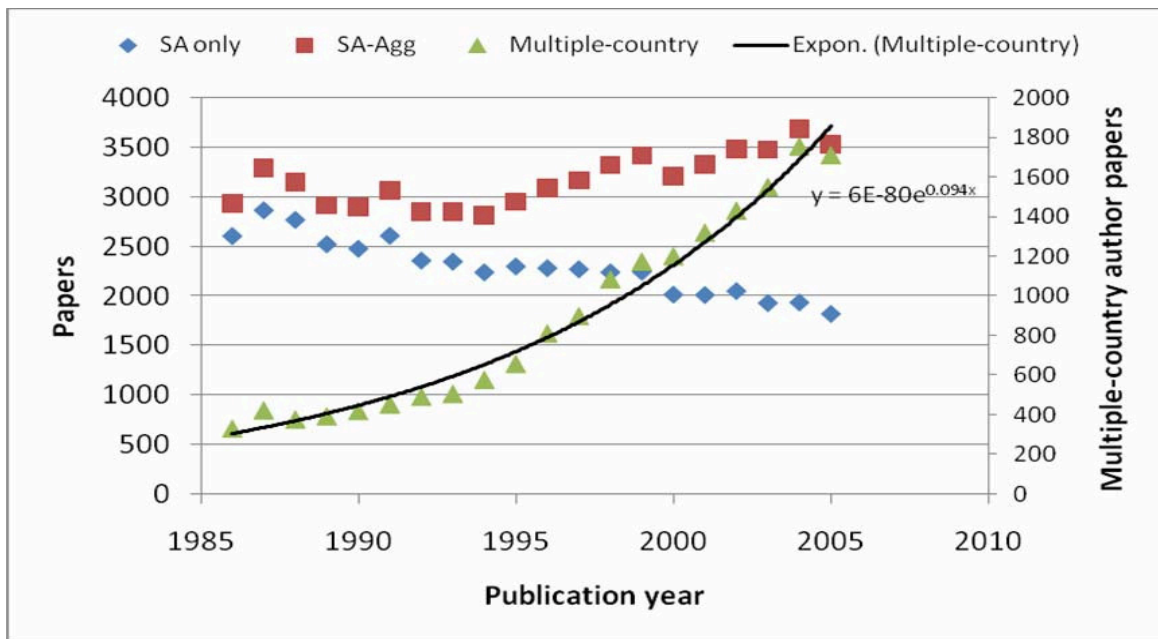
Figure 1 Trend of single-country author (South African only) papers in relation to total (South African) publications output
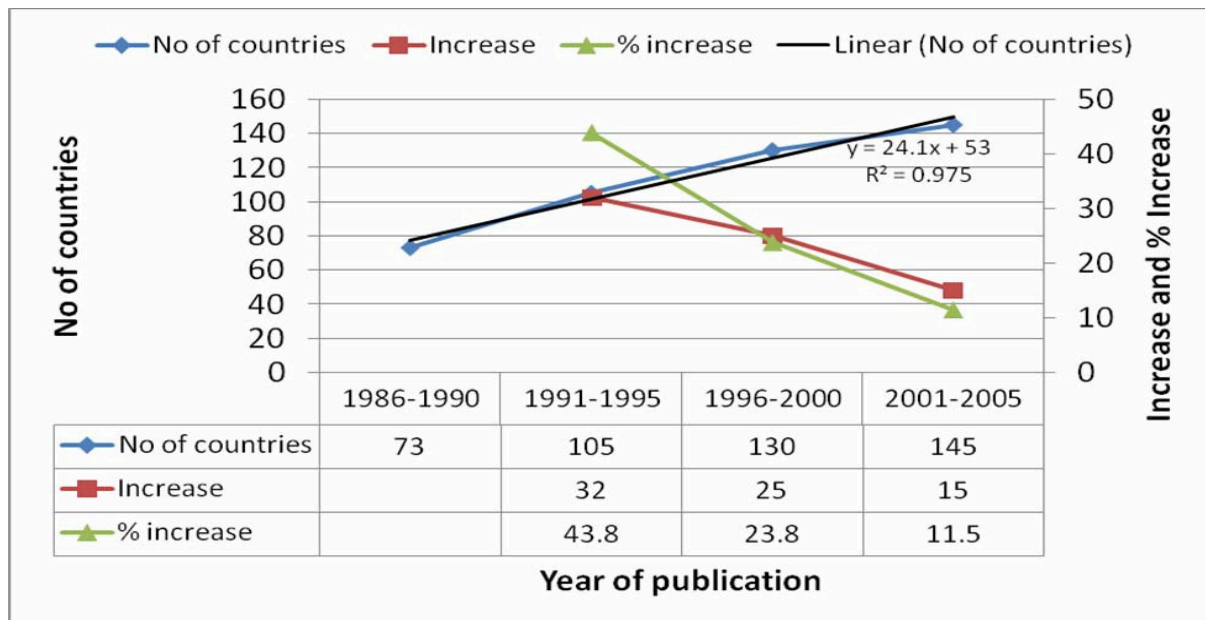
Figure 2 Growth in the number of collaborating countries

Table 1 South Africa's African country collaborators, 1986-2005

	Papers	%[a]	%[b]	%[c]		Papers	%[a]	%[b]	%[c]
ZIMBABWE	224	0.35	17.95	1.23	COTE IVOIRE	13	0.02	1.04	0.07
NAMIBIA	180	0.28	14.42	0.99	MALI	12	0.02	0.96	0.07
KENYA	168	0.26	13.46	0.93	ALGERIA	11	0.02	0.88	0.06
NIGERIA	123	0.19	9.86	0.68	ZAIRE	11	0.02	0.88	0.06
BOTSWANA	102	0.16	8.17	0.56	SUDAN	8	0.01	0.64	0.04
ETHIOPIA	77	0.12	6.17	0.42	GABON	8	0.01	0.64	0.04
ZAMBIA	51	0.08	4.09	0.28	CONGO	7	0.01	0.56	0.04
TANZANIA	45	0.07	3.61	0.25	ANGOLA	5	0.01	0.40	0.03
MOZAMBIQUE	44	0.07	3.53	0.24	ERITREA	5	0.01	0.40	0.03
UGANDA	42	0.07	3.37	0.23	MAURITIUS	4	0.01	0.32	0.02
EGYPT	37	0.06	2.96	0.20	RWANDA	4	0.01	0.32	0.02
MALAWI	37	0.06	2.96	0.20	CENT AFR REPUBL	4	0.01	0.32	0.02
CAMEROON	31	0.05	2.48	0.17	GUINEA	2	0.00	0.16	0.01
SWAZILAND	30	0.05	2.40	0.17	GUINEA BISSAU	2	0.00	0.16	0.01
GHANA	22	0.03	1.76	0.12	SEYCHELLES	2	0.00	0.16	0.01
SENEGAL	19	0.03	1.52	0.10	BURUNDI	1	0.00	0.08	0.01
MADAGASCAR	17	0.03	1.36	0.09	CHAD	1	0.00	0.08	0.01
BENIN	15	0.02	1.20	0.08	COMOROS	1	0.00	0.08	0.01
LESOTHO	15	0.02	1.20	0.08	LIBYA	1	0.00	0.08	0.01
TUNISIA	15	0.02	1.20	0.08	MAURITANIA	1	0.00	0.08	0.01
BURKINA	14	0.02	1.12	0.08	NIGER	1	0.00	0.08	0.01
MOROCCO	14	0.02	1.12	0.08	SIERRA LEONE	1	0.00	0.08	0.01
GAMBIA	13	0.02	1.04	0.07	TOGO	1	0.00	0.08	0.01

%[a]: Country's % contribution to South Africa's total publication output (N=63426)

%[b]: Country's % contribution to regionally multiple-country author papers (N=1248)

%[c]: Country's % contribution to all multiple-country author papers (N=18147)

4.3 Regional versus foreign country collaborators

Overall, 46 African countries participated in research collaboration with South Africa between 1986 and 2005. Table 1 shows that Zimbabwe was leading with 224 articles, followed by Namibia (180), Kenya (168), Nigeria (123), Botswana (102), Ethiopia (77), Zambia (51), Tanzania (45), Mozambique (44) and Uganda (42). An assessment of each country's contribution as a percentage of regionally co-authored papers reveals that the core regional collaborators were Zimbabwe, Namibia, Kenya, Nigeria and Botswana. These countries participated in the delivery of approximately two-thirds of regional multiple-country author papers (i.e. 63.86%). The rest of the African countries (i.e. 41) shared the remaining papers (451 or 36.14%).

Table 2 South Africa's international country collaborators, 1986-2005

	Papers	%[a]	%[b]	%[c]	Country	Papers	%[a]	%[b]	%[c]
USA	5811	9.16	34.39	32.02	RUSSIA	275	0.43	1.63	1.52
ENGLAND	3274	5.16	19.37	18.04	DENMARK	251	0.40	1.49	1.38
GERMANY	2126	3.35	12.58	11.72	PEOPLES R CHINA	243	0.38	1.44	1.34
AUSTRALIA	1627	2.57	9.63	8.97	NORWAY	182	0.29	1.08	1.00
CANADA	1214	1.91	7.18	6.69	FINLAND	152	0.24	0.90	0.84
FRANCE	1152	1.82	6.82	6.35	ARGENTINA	146	0.23	0.86	0.80
NETHERLANDS	810	1.28	4.79	4.46	HUNGARY	140	0.22	0.83	0.77
BELGIUM	626	0.99	3.70	3.45	GREECE	124	0.20	0.73	0.68
ITALY	625	0.99	3.70	3.44	CHILE	121	0.19	0.72	0.67
SCOTLAND	550	0.87	3.25	3.03	IRELAND	117	0.18	0.69	0.64
ISRAEL	548	0.86	3.24	3.02	WALES	116	0.18	0.69	0.64
SWITZERLAND	544	0.86	3.22	3.00	MEXICO	113	0.18	0.67	0.62
JAPAN	469	0.74	2.78	2.58	CZECH REPUBLIC	108	0.17	0.64	0.60
SWEDEN	422	0.67	2.50	2.33	NORTH IRELAND	100	0.16	0.59	0.55
SPAIN	401	0.63	2.37	2.21	PORTUGAL	87	0.14	0.51	0.48
NEW ZEALAND	336	0.53	1.99	1.85	TAIWAN	83	0.13	0.49	0.46
AUSTRIA	329	0.52	1.95	1.81	SOUTH KOREA	81	0.13	0.48	0.45
POLAND	320	0.50	1.89	1.76	SAUDI ARABIA	80	0.13	0.47	0.44
INDIA	269	0.42	1.59	1.48	TURKEY	80	0.13	0.47	0.44
BRAZIL	260	0.41	1.54	1.43	UKRAINE	70	0.11	0.41	0.39

%[a]: Country's % contribution to South Africa's total publication output (N=63426)

%[b]: Country's % contribution to international multiple-country author papers (N=16899)

%[c]: Country's % contribution to all multiple-country author papers (N=18147)

Besides Kenya and Nigeria, the other three countries are in the Southern Africa Development Community (SADC), of which South Africa is also a member. Other SADC countries which recorded a reasonably high number of multiple-country author papers with South Africa were Zambia (51), Tanzania (45), Mozambique (44), Malawi (37), Swaziland (30), Madagascar (17) and Lesotho (15). Explaining this phenomenon, Onyancha and Ocholla (2007:252) observe that countries tend to collaborate more with their neighbouring countries. In their study on HIV/AIDS research collaboration in Kenya and South Africa, Onyancha & Ocholla (2007) found that Kenya collaborated more with countries in the Eastern African region while South Africa's regional collaboration largely involved Southern African countries.

Internationally, South Africa's country collaborators numbered 126. The USA was leading with 5811 papers, followed by England (3274), Germany (2126), Australia (1627), Canada (1214), France (1152), the Netherlands (810), Belgium (626) and Italy (625). The bibliometric principle of a few entities (i.e authors and journals) accounting for most publications seems to hold in this study because the USA, England and Germany accounted for 66.34% of the international multiple-country author papers. This pattern was also reflected in regional research collaboration. A total of 123 countries produced the remaining 33.66% of the publications. Notably, researchers based in institutions in the USA were the main collaborators with South African researchers (see also Onyancha & Ocholla, 2007; Jacobs, 2008; Sooryamoorthy, 2009a).

A comparison of the research output from the two categories of collaboration (i.e. regional and international) reveals that there was more collaborative activity at international level than there was at regional level. This implies that South African researchers are collaborating more with international researchers than regional researchers. Tijssen (2007:308, 310) explains thus:

> *A fair share of the internationally co-authored publications can be attributed to genuine international cooperation, where researchers share and exchange ideas, resources and facilities. Part of it will result fron non-African scientists and scholars with dual appointments, or those researchers on working visits and temporary stays in African countries (e.g. for field work) that list both their home address and temporary address, and vice versa in the case of scientists with a home country in Africa… The extremely high share of international co-publications may indicate a structural dependence of African science, owing to the resources offered by advanced countries to help alleviate infrastructural and financial constraints are hampering many African science systems.*

This argument is corroborated by Sooryamoorthy (2009a), who has also observed that interantional collaboration is preferred to domestic collaboration in the publication of South Africa's scientific papers. Domestic collaboration, in this case, refers to regional collboration, i.e. collaboration between South Africa and another African country. Similar findings were noted by Onyancha & Ocholla's (2007) study on HIV/AIDS research and Jacobs' (2008) study on natural and applied sciences. While noting that twelve (out of the 15 countries investigated) African countries' papers were largely produced through collaboration, Narvaez-Berthelemot, Russell, Arvanitis, Waast & Gaillard (2002) observed that South Africa's international collaboration accounted for less than 30% of the total country's scientific publications. The authors did not, however, compare regional (i.e.

African) collaboration and international collaboration, in which case they would have noted similar patterns as witnessed by Onyancha & Ocholla (2007), Jacobs (2008) and Sooryamoorthy (2009a).

4.4 Strengths of association between South Africa and its collaborators

In bibliometrics, the strengths of association between participating entities are computed using different approaches. The use of Krsul's (2002) methematical function is one such approach. The other approach involves the normalisation of raw frequency counts using UCINET's analytic approaches. The latter was used to examine how strong the partnerships between South Africa and its country collaborators were. According to the author of UCINET (Borgatti, Everett & Freeman, 2002), the euclidean technique of normalisation "standardizes the euclidean norm to be one… achieved by dividing the rows, columns or matrix by the current Euclidean norm" thereby producing values for each pair of factors in a matrix. The values reflect the strength of association of the participating elements in a matrix. International collaborations produced the following normalised frequency counts for the top country collaborators: USA (0.065), England (0.037), Germany (0.024), Australia (0.018), Canada (0.014), France (0.013), the Netherlands (0.009), Belgium (0.007), Italy (0.007), Scotland (0.006), Israel (0.006), Switzerland (0.006), Japan (0.005), Sweden (0.005), and Spain (0.005).

Regionally, South Africa's strengths of association with African countries registered the following scores: Zimbabwe (0.003), Namibia (0.003), Kenya (0.003), Nigeria (0.002) and Botswana (0.002). Ethiopia, Zambia, Tanzania, Mozambique, Uganda, Egypt and Malawi scored 0.001 each. The rest of the countries yielded zero normalised frequency counts, which implies minimal partnerships with South Africa. Because a score of 1.00 would indicate absolute collaboration, it follows that the strength of association values generated by South Africa's regional and international collaborators indicate very weak relationships. This pattern is also reflected in the percentage contribution of each country in relation to the total number of publications produced by South Africa between 1986 and 2005 (i.e. 63426), shown in Tables 1 and 2 as %[a]. For instance, the leading international collaborator – the USA – participated in the authorship of a mere 9.16% of South Africa's total publications, followed by England (5.16%), Germany (3.35%), and Australia (2.57%), while South Africa's leading regional collaborator – Zimbabwe – contributed an even smaller portion (i.e. 0.35%) of the country's total research output.

4.5 Citation impact of South Africa's regional and international collaboration

Table 3 presents the number of articles and citations that were respectively produced and received by regional-only and international-only collaborations. This analysis compares the citation impact of South Africa's regional and international collaborations.

Table 3 Research impact of South Africa's regional and international collaboration, 1986-2005

	1986-1990	1991-1995	1996-2000	2001-2005
Papers				
Regional	73	87	334	754
International	1891	2644	4998	7366
Citations				
Regional	945	3972	6525	11424
International	41988	64960	103979	109619
Citations/paper				
Regional	12.95	45.66	19.54	15.15
International	22.20	24.57	20.80	14.88
H-index				
Regional	18	28	38	47
International	84	96	106	99

The table reveals that throughout the entire period of study, international collaborations registered higher scores in terms of the number of citations and the h-index. However, there was a mixed pattern when comparing the citation impact of the two types of collaboration with the number of citations per paper. International collaboration's average citations were higher than those of regional collaboration in 1986 - 1990 (22.20) and 1996 - 2000 (20.80), while regional collaboration emerged on top in 1991 - 1995 (45.66) and 2001 - 2005 (15.15). This generally reveals that while international collaboration yielded more citations, its citation impact (measured by citations per paper) was slightly lower than the regional collaboration's. The higher values of the h-index in international collaboration can partly be attributed to a higher number of papers produced through international collaboration than regional collaboration.

When expressed as a percentage of the total number of multiple-country author papers, the number of papers (*n*) that received *n* number of citations (h-index) in each category of collaboration (i.e. regional and international), in that order, was as follows: 1986 - 1990 (24.66%, 4.44%); 1991 - 1995 (32.18%, 3.63%); 1996 - 2000 (11.38%, 2.12%); and 2001 - 2005 (6.23%, 1.34%). This further confirms the observation that regional collaboration's citation impact was higher than the international collaboration's citation impact. However, this does not imply that South Africa's researchers should be encouraged to collaborate more at regional than at international level. The international visibility of South Africa's research is equally crucial for the sharing of knowledge, resources and facilities.

Table 4 Comparison of citation impact of internally and externally authored papers, 1986-2005

	South Africa only				South Africa with the rest of theWorld			
	Papers	Citations	Cites/paper	h-index	Papers	Citations	Cites/paper	h-index
1986	2605	27640	10.6	59	2937	34137	11.6	65
1987	2867	29308	10.2	58	3291	38427	11.7	69
1988	2770	29502	10.7	58	3148	37692	12.0	67
1989	2522	21889	8.7	49	2916	30697	10.5	61
1990	2477	25875	10.5	56	2897	35797	12.4	69
1991	2609	25873	9.9	56	3063	38426	12.6	69
1992	2356	24890	10.6	53	2849	36711	12.9	69
1993	2346	22210	9.5	50	2853	35045	12.3	67
1994	2237	21990	9.8	53	2815	34010	12.1	68
1995	2297	20872	9.1	49	2955	37096	12.6	65
1996	2279	19866	8.7	49	3091	37508	12.1	69
1997	2268	18866	8.3	46	3167	36848	11.6	67
1998	2238	18400	8.2	46	3323	42423	12.8	68
1999	2244	17013	7.6	41	3418	39338	11.5	66
2000	2011	16108	8.0	44	3212	39664	12.4	70
2001	2007	13801	6.9	37	3327	39281	11.8	65
2002	2047	13848	6.8	36	3478	33803	9.7	59
2003	1925	11284	5.9	34	3475	34759	10.0	62
2004	1931	10471	5.4	31	3685	34280	9.3	60
2005	1815	7746	4.3	28	3526	26829	7.6	49

In his analysis of the citation impact of internal (South African authors) and international collaboration (South African and foreign), Sooryamoorthy (2009b:185) observed that: "Internationally collaborated publications get more than double the number of citations as against those without any international collaboration." The author did not, however, examine the citation impact of regionally co-authored papers, nor did this paper delve into individual author collaborations.

Table 4 compares the citation impact of papers that were authored within South Africa with those co-authored between South African scholars and any other scholar(s) from outside South Africa. Results reveal that throughout the entire period of study, there average citations per paper (as an indicator of citation impact or research impact) was higher in international collaboration than that generated by papers authored within South Africa. A similar pattern was witnessed in the analysis of the h-index, which is another indicator of measuring impact.

4.6 Subject focus in South Africa's regional and international research collaboration
A subject content analysis of literature on any given subject field or discipline is intended to serve different purposes, e.g.: (a) To monitor the changing level of interest by researchers in a given subject; (b) Track the introduction of new terms that reflect innovations and

discoveries in the knowledge base; (c) Mirror what happens to subject access as the knowlede base and environment of a discipline grows and changes; (d) Describe a concept or topic using the related terms; and (e) Establish core terms on which a particular subject's curriculum can be developed (see Macias-Chapula, Sotolongo-Aguilar, Magde & Solorio-Lagunas, 1999:565; Bierbaum & Brooks, 1995; Onyancha & Ocholla, 2009).

This study examined the subject categories that were the focus of both regional and international collaboration in order to check for shifts in research interest and identify the subject areas of local and international scholars in their collaborations. A total of 230 subject categories were identified in international collaborations and 159 subject categories in regional collaborations. The most common subject area in the international collaboration category was astronomy & astrophysics, which yielded 1071 (6.34%) records, followed by biochemistry & molecular biology (728), plant sciences (666), ecology (657), zoology (538), mathematics (474), pharmacology & pharmacy (465), immunology (459), infectious diseases (459) and microbiology (450). Regionally, South Africa's collaboration with African countries mainly focused on veterinary sciences, which yielded 101 (8.09%) records, followed by ecology (86); public, environmental and occupational health (80); environmental sciences (71); plant sciences (70); zoology (66); infectious diseases (59); tropical medicine (53); multidisciplinary sciences (50); and biochemistry & molecular biology (49). A comparison of the subject areas of international and regional collaboration reveals that their research priorities were different. Although most of the research focus areas in international collaboration featured in the regional collaboration category, the way they were ranked or their importance differed greatly. For instance, whereas 'veterinary sciences' was number 20 in international collaboration, it was first regionally. This perhaps suggests that local researchers' interests (or rather research among African scholars) differ from the interests of international scholars. While regional research areas are largely dictated by unique problems that are common in most countries in Africa, subject areas of research in international collaboration are usually determined by the international community which, in most cases, funds the research. It is not unusual to find that in their collaborations with regional colleagues, international scholars steer research such that it focuses on research areas (i.e. niche areas) of the latter's institution or country of affiliation, especially in situations where their countries or institutions are the main or sole funding institutions or countries. On the other hand, regional collaboration focuses on common ailments or problem areas which may explain leading subject categories such as veterinary sciences, ecology, public health, environmental sciences, plant sciences, and tropical medicine.

None of the patterns above (regionally and internationally) reflect South Africa's research output in different subject categories as shown in Sooryamoorthy's study (2009a).

Sooryamoorthy identified the most researched areas as: general and internal medicine, plant sciences, zoology, multidisciplinary sciences, ecology, biochemistry & molecular biology, surgery, veterinary sciences, and marine & freshwater biology. It follows that the most productive research areas undertaken through collaborative initiatives are not always the most researched subject areas in a country.

With respect to shifts in collaboration in the top ranking research areas, Fig. 3 reveals that astronomy & astrophysics, which dominated the scene from 1986 to 2000, was in second position behind ecology in the 2001 - 2005 year period. Ecology therefore emerged as the most researched area in South Africa's overall collaborative research. It was 7th in 1986 - 1990, 9th in 1991 - 1995, and 4th in 1996 - 2000. Other subject areas that maintained their presence in the top ten subject categories include astronomy & astrophysics, biochemistry & molecular biology, plant science, zoology, and ecology.
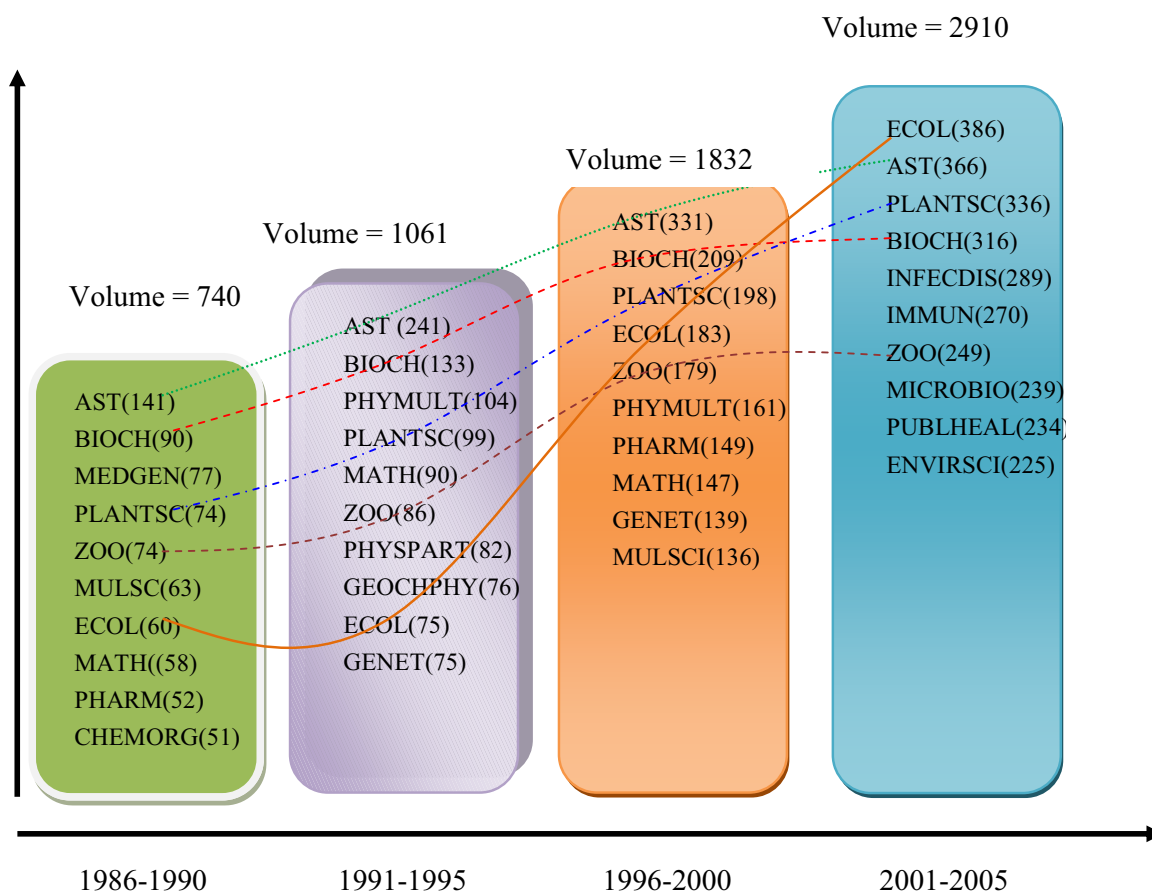

Figure 3 Shifts in collaboration in selected subject focus areas

Table 5 Subject focus areas in international and regional collaboration, 1986-2005

INTERNATIONAL COLLABORATION (N=16899)				REGIONAL COLLABORATION (N=1248)			
RANK	SUBJECT CATEGORY	Papers	%	RANK	SUBJECT CATEGORY	PAPERS	%
1	ASTRONOMY & ASTROPHYSICS	1071	6.34	1	VETERINARY SCIENCES	101	8.09
2	BIOCHEMISTRY & MOLECULAR BIOLOGY	728	4.31	2	ECOLOGY	86	6.89
3	PLANT SCIENCES	666	3.94	3	PUBLIC, ENV & OCCUPATIONAL HEALTH	80	6.41
4	ECOLOGY	657	3.89	4	ENVIRONMENTAL SCIENCES	71	5.69
5	ZOOLOGY	538	3.18	5	PLANT SCIENCES	70	5.61
6	MATHEMATICS	474	2.80	6	ZOOLOGY	66	5.29
7	PHARMACOLOGY & PHARMACY	465	2.75	7	INFECTIOUS DISEASES	59	4.73
8	IMMUNOLOGY	459	2.72	8	TROPICAL MEDICINE	53	4.25
9	INFECTIOUS DISEASES	459	2.72	9	MULTIDISCIPLINARY SCIENCES	50	4.01
10	MICROBIOLOGY	450	2.66	10	BIOCHEMISTRY & MOLECULAR BIOLOGY	49	3.93
11	MULTIDISCIPLINARY SCIENCES	447	2.65	11	MEDICINE, GENERAL & INTERNAL	49	3.93
12	PHYSICS, MULTIDISCIPLINARY	429	2.54	12	GEOSCIENCES, MULTIDISCIPLINARY	41	3.29
13	GENETICS & HEREDITY	426	2.52	13	AGRICULTURE, DAIRY & ANIMAL SCIENCE	38	3.04
14	GEOSCIENCES, MULTIDISCIPLINARY	419	2.48	14	FOOD SCIENCE & TECHNOLOGY	38	3.04
15	MEDICINE, GENERAL & INTERNAL	411	2.43	15	IMMUNOLOGY	38	3.04
16	PUBLIC, ENV & OCCUPATIONAL HEALTH	394	2.33	16	ENTOMOLOGY	36	2.88
17	GEOCHEMISTRY & GEOPHYSICS	361	2.14	17	PARASITOLOGY	35	2.80
18	MARINE & FRESHWATER BIOLOGY	358	2.12	18	METEOROLOGY & ATMOSPHERIC SCIENCES	30	2.40
19	ENVIRONMENTAL SCIENCES	345	2.04	19	VIROLOGY	30	2.40
20	VETERINARY SCIENCES	340	2.01	20	ASTRONOMY & ASTROPHYSICS	28	2.24

Volume: volume of co-published papers in the top 10 subject categories in each year period

Subject categories: *AST* (Astronomy and Astrophysics); *BIOCH* (Biochemistry and Molecular Biology); *MEDGEN* (Medicine, General and Internal); *PLANTSC* (Plant Science); *ZOO* (Zoology); *MULSC* (Multidisciplinary science); *ECOL* (Ecology); *MATH* (Mathematics); *PHARM* (Pharmacology and Pharmacy); *CHEMORG* (Chemistry, Inorganic and Nuclear); *PHYMULT* (Physics, Multidisciplinary); *PHYSPART* (Physics, Particles and Fields); *GEOCHPHY* (Geochemistry and Geophysics); *GENET* (Genetics and Heredity); *IMMUN* (Immunology); *MICROBIO* (Microbiology); *ENVIRSCI* (Environmental Science); *PUBLHEAL* (Public, Environmental and Occupational Health)

Conclusion and recommendations

Research collaboration between South Africa and other countries increased since 1986; most research collaboration was recorded after 1994 when the Government of National Unity was formed. The pattern of growth of collaborated publications post-1994 was exponential. This pattern is likely to persist now that South African scholars are gaining recognition, both in the region and internationally. Onyancha & Ocholla (2007) observe that South Africa continues to attract skilled manpower from the rest of Africa. The country boasts a well developed and quality education system which attracts students, especially at postgraduate level, from other neighbouring countries. South African institutions of higher learning continue to dominate various ratings of African research institutions and organisations, e.g. the Academic Ranking of World Universities [ARWU] drawn by the Institute of Higher Education of Shanghai Jiao Tong University *(http://www.arwu.org/)*; World University Ranking of the Times Higher drawn in collaboration with a private company, QS - Quacquarelli Symonds (*http://www.topuniversities.com/*); World Universities' Ranking on the Web, maintained by Interlab (*http://www.webometrics.info/*); and of late, SCImago Institutions Ranking (*http://www.scimagoir.com/*). These rankings may perhaps be influencing the decisions of scholars and students from African states to migrate to South Africa, thereby boosting the country's publication output through collaborative research.

The USA continues to top the list of countries that collaborate with South Africa. Previous studies (e.g. Jacobs, 2008; Narvaez-Berthelemot *et al.*, 2002; Onyancha & Ocholla, 2007; Sooryamoorthy, 2009a) indicate that the USA was the leading collaborator. Generally, industrialised nations (or developed countries) contribute the highest number of externally collaborated publications. For instance, the leading three countries' (i.e. the USA, England and Germany) publications accounted for over 60% of the total multiple country-author papers. This pattern may change as scholars from the rest of Africa improve South Africa's regional collaboration, particularly because some universities in the country are promoting visits by scholars from the rest of the continent. There are also attempts by researchers from the East to actively engage in collaborative research with South African researchers, as reflected in the NRF's and other agencies or councils' calls for collaborative research (see Section 1).

Other factors that may influence South Africa's collaboration patterns in research include donor funding and geographic proximity (see Lariviere, Gingras and Archambault, 2006; Moed, Glanzel and Schmoch, 2004; Molatudi, Molotja and Pouris, 2009; and Narin, Stevens and Whitlow, 1991; Onyancha and Ocholla, 2007). Katz (1994) argues that in intra-national collaboration, cooperation among countries decreases with the distance of collaborating partners. Liang and Zhu (2002) also observe that (1) geographical proximity is

an important factor determining the pattern of inter-continental research collaboration and that (2) continental mean collaborative strength increases as the distance between regions decreases. A country's size and political and economic reasons; mobility and migration at the individual level; historical, cultural and linguistic proximities on collaboration patterns at the national level; neo-colonial ties; and language may also influence the choice of collaborating countries (see Lariviere, Gingras and Archambault, 2006; Moed, Glanzel and Schmoch, 2004; Molatudi, Molotja and Pouris, 2009; Nagpaul, 2003); Narin, Stevens and Whitlow, 1991; Onyancha and Ocholla, 2007).

Impact-wise, South Africa's external research collaboration yielded higher citation impacts than internally collaborated research (Onyancha & Ocholla, 2007; Sooryamoorthy, 2009b). Generally, South Africa's domestic/ regional and/or internal collaboration yielded lower citation impact values when compared to internationally collaborated publications. This, in our view, presents a strong case to justify international collaboration on the part of South African researchers: their international visibility as well as citation influence would be improved. Skills and knowledge transfer between collaborating scientists would also be enhanced.

Similarities and differences in the subject focus areas of regional and international research collaboration were noted in this study. Among the top subject areas that featured in regional collaboration but not in international collaboration were tropical medicine; agriculture, dairy & animal science; food science & technology; entomology; parasitology; meteorology & atmospheric sciences; and virology. Blignaut (2005) made an attempt to outline problems that are characteristically unique to most African countries. Most of these problems fall into the subject categories listed above. Africa's problems are likely to define the collaborative research areas of interest of African scholars because research is intended to solve the socio-economic and political problems unique to a particular geographical region. Areas that are of high priority to industrialised nations are not necessarily priority areas of research in developing countries, particularly in Africa. Africa's priority areas would include illiteracy, hunger, poverty, human and animal diseases, environmental degradation, poor education, poor infrastructure, high levels of unemployment, high population rates, water shortages, rural and urban electrification, and more.

Unfortunately for Africa, most decisions about the subject areas of research collaboration, especially at international level, are made by foreign countries which fund most research in developing countries. This affects South Africa to some extent. However, South Africa has the potential, in terms of its financial and human resources, to dictate the choice of subjects for collaboration both regionally and internationally. These areas would include those highlighted by Blignaut (2005), e.g. subsistence agriculture; land productivity;

population growth; food production; animal rearing and its effect on limited land; extensive use of biomass and firewood for cooking, heating and lighting purposes; the harvesting of wood for energy purposes leading to a loss in biodiversity, vegetation and eventually land degradation and desertification; the lack of the monetary and capital means to develop and maintain boreholes for water; river or government-operated water wells or boreholes; sanitation, mostly in the form of pit latrines in poor areas, which affect the quality of the ground-water supply and make clean water a luxury; lack of educational opportunities for the rural youth, whose main tasks are to fetch water and wood or to herd animals; practices that void the soil of its nutritional value, making it impenetrable by water should it rain; erosion caused by rainy seasons; the growing failure of rural areas to provide sufficient livelihoods and to support those that depend on these areas, leading to the people's movement to the cities and thus increased urbanisation, urban sprawl, social disintegration, increases in various kinds of criminal activities, disillusionment, frustration, loss of self-esteem, etc.; the consequences of the prevalence and impact of HIV/Aids; and pending land reforms.

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Chapter Four

Social and community informatics.
Past, present, & future: an historic overview

CJB Le Roux

1 Introduction

Although the relationship between technology and society has been the subject of study and debate since the industrial revolution in the 19th century, the concepts "Social Informatics" (SI) and Community Informatics (CI) represent relatively new fields of multi-disciplinary study that developed out of what has been described as the separate and unconnected discussions by computer scientists, sociologists, educationists and others on the role of Communication and Information Technology (ICT) in society.

While both Social Informatics and Community Informatics developed out of the complex relationship that came to exist between society and information technology in the 1990s, Community Informatics, unlike Social Informatics, came to focus more narrowly on the inter-relationship between information technology and communities and how the first shapes the latter and vice versa (Fourman, 2002).

Social Informatics observes the interaction between society and information communication technologies (ICT) at the following levels:

a. The micro level,
b. The macro level, which refers to general changes in society (the information society) due to the introduction of ICT,
c. The use of ICT as a general tool for studying social phenomena (ranging from data mining to computer assisted data collection, overlapping with various aspects of social science methodology),
d. The application of ICT in specific areas of social sciences and humanities (such as computer modelling of social science data, design of information systems in areas related to social sciences (e.g. application in public sector, social services, etc.) (Social informatics, Concept).

Developments in computer and information technology, especially the transformation of the Internet over the past two decades, have played a major role in the popularisation and acceleration of Social Informatics (SI) and Community Informatics (CI) as new fields of multi-disciplinary research and study. The popularity of these new areas of study and research is clearly reflected in the amount of information available on the Internet. A brief

search of the Internet returned 65,400 results for the term "social informatics" and 53,400 result for the term "community informatics" (Google, April 2010).

2 The etymology and history of the terms Social Informatics (SI) and Community Informatics (CI)

The late Dr. Rob Kling from Indiana University in the US is widely associated with the development and popularisation of the concept of social informatics. He was, however, not the first to examine and study the influence of technology, particularly computer technology, on society and vice versa. This honour belongs to the German computer scientist Karl Steinbuch who first used the term "informatik" in 1957 in a paper entitled "Informatik: Automatische Informationsverarbeitun" (Informatics).

Initially, the term "Informatiks" (English: Informatics) referred to computer science as the science of computing and information automating interactions. In 1962, the term "informatique", referring to computing science, was adopted by Philippe Dreyfus in France. The term was subsequently adopted by computer scientists in other parts of Central Europe. "Informatics" thus initially had a restricted connotation referring to computer or computational sciences (Bauer).

By 1966-1967 the term had, however, come to attain a wider interpretation thanks to the work done by the Russian information scientist, Alexander Mikhailov. Mikhailov, of the Russian Scientific and Technical Information Institute, who worked at the Russian Academy of Sciences (VINITY) 1, a large Soviet documentation centre for science and technology, redefined "informatika" as an independent discipline that refers to the "theory of scientific information", and not merely applied information technology, that investigates the structure, properties and specific content of scientific information, as well as the regularities of scientific information activity, its theory, history, methodology and organisation. He was recognised for his ground-breaking research and work by the Soviet Academy of Science in 1983 (Mikhailov).

Today the term "informatics" is much more broadly defined as a field that covers artificial intelligence, cognitive science, computer science, information science (processing, management, and the retrieval of information), social science and information technology (the study, design, development, implementation, support, or management of computer-based information systems). The restriction to scientific information has been removed, as for example in business informatics or legal informatics. Since most information is now digitally stored and processed, computation has become central to the concept of informatics, and the representation, processing and communication of information have been added as objects of investigation since they are now fundamental to any scientific account of information (Fourman, 2002).

Kling, apparently, was first introduced to the concept of social informatics by the Norwegian sociologist Dr. Stein Bråten and his computer science colleague Kristen Nygaard during a visit to Oslo in the early 1980s. Bråten and Nygaard used the term "*sosioinformatik*" to refer to the relationship between society and ICT (History of the Term).

Community Informatics as an independent discipline, on the other hand, had its immediate origins and formulisation in the early 21 century with the establishment of a research network in 2003. Community Informatics, as pointed out above, places specific emphasis on the application of information and communications technology (ICT) to enable and empower communities (Gurstein, 2007:11).

The question is however whether Community Informatics, despite the different emphasis it places on the relationship between society and ICT, is not merely a sub-division or sub-set of Social Informatics? Kling clearly thought so. Gurstein however disagrees. He argues that while the two disciplines may share a similar background and share similar areas of research, such as Computer Science, Sociology, Information Science, Library Science, Education, Rural, Regional and Development Studies, etc., they are indeed separate and independent disciplines with radically different approaches to the same problem (Gurstein, 2007:42).

3 Social informatics, community informatics, technological determinism and social constructivism

From the above it is evident that while Social Informatics and Community Informatics may have different approaches to similar problems such as the "digital divide" they have many things in common. Both schools of thought evolved out of earlier schools of thought such as "technological determinism" and "social constructivism" (Oostveen, 2007).

For instance, the school of technological determinism argues that:

a. The development of technology itself follows a predictable, traceable path largely beyond cultural or political influence; and

b. Technology has "effects" on societies that are inherent rather than socially conditioned, and thus society organises itself in such a way as to support and further develop a technology once it has been introduced (Oostveen, 2007).

Technological advances are thus seen as the primary or causal element in processes of social change. As a technology stabilises, its design tends to dictate users' behaviour, thereby diminishing human society in the process, meaning that human society becomes subject to technology advances and development. The weakness of this theory is that it largely ignores the social and cultural circumstances under which the technology was developed in the first place. Technology, as the main driver of social and cultural change, thus bypasses the cultural "payload" or influence of human activity in terms of its possible uses. Technology's role in

cultural advancement is therefore completely ignored by the technological determinists (Smith & Marx, *1994).*

The determinist philosophy is perhaps best summarised by the early 20th century historian Charles Beard, who described technology "as a force that marches in seven league boots from one ruthless, revolutionary conquest to another, tearing down old factories and industries, flinging up new processes with terrifying rapidity." Beard saw ideology and technology as by-products of economic-capitalist interest (Beard, 1927:1-11).

A staunch 20th century supporter of technological determinism was the Canadian academic and English language specialist Marshall McLuhan, who is famous for the phrase "The medium is the message". McLuhan was of the opinion that the form of a medium embeds itself in the message, thereby creating a symbiotic relationship by which the medium influences how the message is perceived (Gordon, 2002).

The school of social constructivism, on the other hand**,** varyingly referred to as the **"**social shaping of technology" or the "social construction of technology" (SCOT), argues that society, and thus knowledge, is not technologically but sociologically constructed through the creation and sharing of social artefacts and their collectively shared meaning. Organisational, political, economic, and cultural factors are thus seen as important in the development of technology.

The downside of this line of thinking is that it tends to concentrate on social groups and communities rather than on society as a whole. Thus, whereas Social Informatics operates at the micro, meso and macro levels, as pointed out above (Robbin, 2005; Oostveen, 2007), social constructivism tends to concentrate mainly on the micro-level. The origin and development of this school of thinking has been largely attributed to the work of the cognitive psychologist Lev Vygotsky in the 1960s (Vygotsky, 1978; Williams *et al.,* 1996).

A good example of social constructivist thinking being applied to the design of information technology or ICT is the highly popular web-based, open-source, distant learning management system (LMS) called Moodle ("Modular Object Orientated Developmental Learning Environment"), designed and developed by the Australian computer scientist and educationalist Martin Dougiamas at Curtin University of Technology in Perth, Australia early in the 21st century. Moodle was designed to use pedagogy and group learning rather than tools or tool sets as the core of its learning philosophy and functionality. Moodle is currently being used by more than 200 countries, representing more than 50,000 registered sites worldwide (Moodle Stats, 2010). It is currently also the official LMS platform at the University of Zululand.

4 Social informatics (si) defined

Kling defined Social Informatics as "The systematic and interdisciplinary study of the design, uses and consequences of information technologies (IT) that takes into account their interaction with institutional and cultural contexts". Because it concerns itself with the study of information and communication tools in cultural and/or an institutional contexts (Kling *et al.,* 2005), Social Informatics is different from both the determinist and constructivist schools in that it takes a more global or holistic approach to the study and examination of how the social aspects of computers, telecommunications and related technologies shape organisational and social relations on the one hand, and how society and social forces influence the design and use of information technology on the other (Kling, 2001).

Social Informatics therefore seeks to answer a much wider range of questions about the present and future consequences of ICT developments and their influences on society than Community Informatics. Moreover, Social Informatics places extensive emphasis on the fact that understanding which social changes are possible, which are plausible, and which are most likely to have an impact on the future, is empirically rather than purely theoretically based (Kling, 2001).

5 Community informatics defined

Community Informatics differentiates itself from Social Informatics in that it examines a different "problematique". It largely concerns itself with:

a. both the "practice" and the "research" of the use of ICT in a community while Social Informatics is more concerned with "research and study";
b. how ICT is used in specific concrete, identifiable communities while Social Informatics is more concerned with the general and abstract category of "society" and the "social" or "societal" aspects of computerisation.
c. specific applications of ICT in a community context with a focus on health, economic development, education, etc., while Social Informatics is concerned at the more general social or organisational systems level;
d. the design and development of ICT hardware and software and its application in communities, while Social Informatics appears to have little direct interest in the design or development aspects of ICT, and
e. finally, where Social Informatics is concerned with simply describing and understanding the role of ICT in the world, Community Informatics sees itself as being actively involved in changing the role and significance of ICT in the community (Gurstein, 2007:42-43).

While these differences are significant, Gurstein does concede that the possibility for confusion exists. He agrees that an informatics approach to social structures would to some

degree be parallel to an informatics approach to community structures and community processes. He also agrees that there is a clear link and nesting of community structures and community processes within these social structures and processes (Gurstein 2007:44).

6 Social informatics research areas

Social informatics research largely comprises three empirical approaches, namely *normative*, *analytical* and *critical*. The normative approach refers to research aimed at recommending alternatives to professionals who design, implement or develop policy about ICT. The second, the analytical approach, refers to research theories about ICT in institutional and social or cultural contexts. The third approach refers to research examining ICT from a multi-dimensional perspective that does not automatically or uncritically accept the goals and beliefs of the groups or entities that design or implement specific ICTs (Kling *et al.,* 2000:16-18). Because of its strong multi-disciplinary nature, the Social informatics study and research spectrum covers areas and topics that include:

- Social software development for [online] social and Community networks,
- Citizen journalism
- Convergent media
- Information literacy
- Web-based multimedia and social software (blogging, Wikis and RSS)
- E-society
- E-learning
- The impact of ICT on the micro-, meso- and macro-organisational levels
- Social networks and social virtual worlds
- Knowledge management
- E-government
- Social influences on information systems' development projects in government agencies and rural information issues
- Social capital
- Digital and social exclusion
- The history of information systems and management
- The history of software development
- Organisational informatics
- The technical, economic, political, psychological, aesthetical and ethical considerations in the design and use of information technology
- What should and should not direct the development and application of information technology
- The digital divide.

7 Community informatics research areas

Many of the research areas covered by Social Informatics are also covered by Community Informatics. The Community Informatics Research Network (CIRN) website makes it clear that Community Informatics extensively concerns itself with community based approaches to the design and implementation of ICT. Currently, according to the CIRN website more than 200 researchers from more than 50 countries around the world representing disciplines in Community Development, Development Studies, Computer Science, Information Science, Social Science, Planning, Management, and Social Administration are currently associated with the CIRN Network in Community Informatics (CIRN).

One common area of research to both Social as well as Community Informatics is the "digital divide" referred to above. The term, which had its origins in America in the early-1990s, originally referred to the gap or divide in ownership of computers among certain ethnic groups. By the mid-1990s the term had shifted in meaning to refer to those who do not have dedicated broadband access to the Internet and the so-called "new economy". Computer ownership today is no longer seen as the deciding norm; high-speed connectivity to the Internet is. In 2005 the United Nations based International Telecommunications Union(ITU) defined the digital divide as "Simply understood to be the gaps between ICT 'haves' and 'have-nots', the Digital Divide represents the newest addition to the enormous chasms in the stage of development and the standard of living among economies" (Sciadas, 2005).

8 Conclusion

There can be little doubt that Social Informatics and Community informatics have established themselves as new and highly popular multi-disciplinary disciplines that examine the complex relationships between modern technology and society. One area of common research is the "digital divide" with its many facets. Both disciplines have acquired a large and dedicated following typified by academics, students and researchers from around the world, and one can safely assume that they will continue to grow their inter-disciplinary support-base in the future. The academic debate as to whether Community Informatics is a sub-category of Social Informatics is also far from settled. Inter-disciplinary study and research, especially between the computing and social sciences, have radically changed the academic landscape since the late 1990s.

In 2006, the authors Berleur *et al.* (2006:53) argued that for Social informatics to continue expanding its potential as an alternative and insightful approach to studying ICT, scholars in this area must capitalise on the empirical work done to date and at the same time be prepared to move into the realm of theorising, more specifically on the nature and role of ICT (Berleur *et al.,* 2006:53). They further argued that while Social Informatics research will

continue to borrow theories, concepts and approaches from other disciplines and apply them to ICT, an improvement in existing analytical methods would assist practicing, educational and IT professionals.

No doubt the same argument can be applied to the school of Community Informatics. Like Social Informatics they too borrow heavily from the ideas, concepts and theories of other disciplines and apply them to ICT. The fact that Social Informatics research is more empirically based compared to the mainly theoretical approach of Community Informatics research are the strengths rather than weaknesses defining the two disciplines.

Exporting Social Informatics and Community Informatics theories to other fields allows them to become referenced disciplines in their own right. In this way, they communicate their findings and results, whether empirically or theoretically based, to other researchers thereby developing unique and distinct multi-disciplinary identities. In a rapidly accelerating world of ICT development and the impact that this will have on the transformation of society, Social Informatics and Community Informatics research will play an increasing role as unique tools to research and study the relationship between man, information technology and society.

Notes

1. Vserossiisky Institut Nauchnoi i Tekhnicheskoi Informatsii

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Chapter Five

Mechanisms through which information systems capabilities create benefits for e-schools: a theoretical perspective

Hesbon Nyagowa

Introduction

A variety of school systems have evolved in the new millennium to meet the demands of the complex society and work life of the 21st century. Scotland, for example, introduced the 'reculturalisation' of schools, which entailed the introduction of Information Communication Technology (ICT) for accessing resources to support classroom work and the management of the school processes (Simpson, Payne & Condie, 2005:337). Malaysia initiated smart schools whose main objectives were to train students in secondary schools, equip them with state of the art ICT skills, and transform the students into ICT savvy critical thinkers. These capabilities, it is argued, would better prepare students for the job market (EL-Halawany & Huwail, 2008). The New Partnership for Africa's Development (NEPAD) is piloting e-schools in some 96 schools in 16 African countries with the hope of rolling out e-school programmes to some 600,000 schools in the rest of Africa within a period of 10 years (NEPAD, 2005). The impetus behind the remodeling of schools to integrate ICT in the curriculum is rooted in findings in recent studies that ICT generates benefits to organisations (Gunasekaran *et al*., 2004) and similar benefits may be obtained through applying information systems (IS) in any organisation.

IS investment is geared according to their net benefits. Successful IS investments in many cases impact on the institution through one or a combination of the following: improving individual processes (efficiency), enabling process synthesis and integration across disparate physical and organisational boundaries [effectiveness] (Basu & Blanning, 2003), and facilitating innovation (Newell *et al*., 2003; Bharadwaj, 2000; Rivachandran & Lertwongsatien, 2005). An efficient process is one that maximises production from a combination of factors of production. Traditionally, an efficient process occasioned by investment in IS results in the decline of the firm's size (Brynjolfsson & Hitt, 2000), decentralisation of decision making (Zenger & Hesterly, 1997), and therefore substitution of certain functions. Effectiveness is performing a task correctly. Specific to business processes, effectiveness is strategising in interaction with other organisations with a view to outperforming the other organisations in the market. The strategising, interestingly, at times comes through the cooperation of organisations when networking and exchanging or trading

information (Teigland & Wasko, 2003). On the other hand, innovation is doing something differently by combining existing knowledge with new ideas (Edquist, 2005). For example, instead of repeatedly dissecting an animal for the teaching of its anatomy, a simulation of the process could be used to reduce the cost and time and still achieve the same level of learning (Kozma, 2005).

Different information systems tend to have different impacts on organisations. For example, while enterprise resource planning improves efficiency, knowledge management system powers innovation (Newell *et al*., 2003). In general, it is argued that when IS combines with the other resources (assets, knowledge, capabilities and processes) of an organisation, additional value, described as complementary assets (Zhu & Kraemer, 2002; Sambamurthy, Bharadwaj & Grover, 2003; Brynjolfsson & Hitt, 2000), is created, and this could not be attained if either IS or the resources were deployed separately. Complementary assets, however, are not automatic: they have to be fostered (Newell, *et al*., 2003). IS therefore gives organisations dynamic capabilities – change oriented capabilities that help firms re-configure their resource base to meet evolving customer demands and competitor strategies (Zhu & Kraemer, 2002). Expectations of complementary assets drive some chief executives to additional expenditure on IS stock. Other chief executives' main reason for voting for additional IS stock is to stay ahead or in the lead with respect to technology. Therefore chief executives are at times put on the spot to justify the huge investments in information systems, calling for reliable measurement of IS benefits.

Measuring IS benefits not only helps managers argue their case for huge expenses, but also helps organisations align the IS capabilities with the organisational core business operation. A firm's IS capability is its ability to mobilise and deploy IS-based resources in combination or co-present with other resources and capabilities (Bharadwaj, 2000). There are three types of IS capability, namely tangible resources (IS physical infrastructure components), human resources (technical and managerial IS skills), and intangible IS-enabled resources, including knowledge assets, customer orientation and synergy (Bharadwaj, 2000). Information system benefits can be measured by tracing the contribution of these IS-based assets to the overall firm performance. The benefits can be forecast to inform decisions on whether or not to deploy a new system, or can be appraised post implementation. Pre-implementation forecasts have been found to be challenging and costly. For example, some studies have proposed business process simulation (BPS) as a method of estimating future benefits of IS (Gialglis, Mylonopoulos & Doukidis, 1999), but this approach is highly expensive. The pre-implementation BPS method also doesn't paint a true picture of intra and inter-organisational interactions. Torkzadeh and Doll (1999) posit that IS benefits are multifaceted. According to Gialglis, Mylonopoulos and Doukidis (1999) a

proposal for a particular IS system is initiated with specific business goals in mind, and with a set of primary objectives being addressed through the introduction of the system. The objectives of the system constitute the benefits that have to be comparatively evaluated against projected costs to justify such a project.

IS benefits appear not to be universal across organisations that have deployed the systems. For example, whereas the benefits are easily identifiable in service-oriented organisations, it is hard to trace benefits in the manufacturing industries (Zhu & Kraemer, 2002).

Survey of literature on IS benefits

Information systems have the general ability to reduce the cost of coordination, communications, and information processing (Brynjolfsson & Hitt, 2000). Coordination can occur within or between organisations. Within a firm, the process of acquiring new capital equipment may be achieved faster through a network. The processes of approving budgets, analysing the economic value of presented bids, approving payment vouchers, and releasing payments could all be done within a couple of hours by networked people in an organisation, who wouldn't have to move files from office to office. A showcase of inter-firm coordination is exemplified in the design of the B-2 "stealth" bomber – an American war plane that was designed by four firms almost entirely using computers (Argyres, 1999). The four firms participating in the design of the B-2 stealth bomber were assigned tasks of designing different components of the plane which would be brought together at assembly and fitted together. The different organisations accessed data from each other through an integrated database. Such communication through networks emphasises the speedy resolution of problems, and reduces wastage that may arise from a non-standardised product. Work practices are combined with IS capability, strategy, and products and services (Brynjolfsson & Hitt, 2000) to lead to efficiency.

To reiterate, some of the complementary assets generated when IS capabilities combine with other capabilities of the organisation are tangible, for example cost reduction arising from the implementation of a supplier stock management system (Gunasekaran, Patel & McGaughey, 2004), and productivity improvement (at firm level) occasioned by investment in hardware and communication networks (Brynjolfsson & Hitt, 2002). Other complementary assets are intangible, for example product quality improvement (Karimi, Somers & Gupta, 2001; Brynjolfsson & Hitt, 2000), decentralisation (Abernethy, Bouwens & van Lent, 2004), and human capital (Brynjolfsson, Hitt & Yang, 2002).

Tangible benefits

Supply chain management (SCM) enables organisations to meet the needs of their customers (Gunasekaran, Patel & McGaughey, 2004). It integrates suppliers with organisations and breaks the boundaries of departments and organisations to enable seamless information sharing. In SCM, the exchange of information using supply chain technologies is structured. The technologies also change rapidly, normally for the better, and the chain partners put pressure on participating organisations to adopt new technologies (Petterson, Grimm & Corsi, 2003). SCM therefore benefits firms in more than one way: reducing the cost of held stock and operation strategies that help improve business performance. SCM enables organisations to strategise in earning the trust of customers and therefore creating and maintaining a stable market share. Gunasekaran, Patel & McGaughey (2004:345), in a survey of 21 firms, confirmed that in most of the firms the return on investment had increased to expected levels after implementing contemporary SCM.

A showcase example of the benefits of SCM is exemplified in the routines of knowledge exchange between Toyota and its network of first-tier suppliers (Dyer & Nobeoka, 2000). Dyer and Nobeoka explain that when networks create a shared identity among members, the cost of sharing knowledge among members reduces, and with the higher diversity of knowledge within the network, cooperation among members results in far superior learning opportunities. The Toyota group, as the network is commonly known, transfers both tacit and explicit knowledge through four main routines. According to Dyer and Nobeoka (2000), the association of network members conducts general and top management meetings every other month to share explicit knowledge critical to all members in the network. The second routine is the creation of learning teams through visits to excellent firms within the network or at times out of the network. This, according to Dyer and Nobeoka (2000), facilitates the transfer of tacit knowledge. Tacit knowledge is further transferred through an employee transfer system, where an employee with the required knowledge is transferred to a firm that requires that knowledge on either a temporary or permanent basis, depending on the nature of the problem the transferee is required to handle. Some tacit knowledge is easily transferable and can be achieved within a short period of less than one month. Other forms of tacit knowledge are quite embedded, making them difficult to transfer, and therefore the knowledge holder stays on site for a much longer time.

The Toyota network members also benefit from consultancy services by a central team created by Toyota to study and fix network members' problems related to cost, quality, or safety, among other issues. Dyer and Nobeoka explain that the benefits of consulting, normally achieved in the form of cost reduction and quality improvement, is normally shared by Toyota through a drop in the prices of supplies after a grace period of up to two years.

The routines of knowledge sharing within the Toyota group help group members improve in their operations, an achievement that is quite inviting. Knowledge within the network diffuses freely to all members. The only price members pay for knowledge transfer is reciprocation, and opening individual firm's operations up for inspection. This is a much cheaper commitment than the alternative option of directly paying for proprietary knowledge. The risk of operating with an outdated system in network cooperation is corrected by interaction with organisations outside the network, thus always keeping the network members at a competitive advantage (Dyer and Nobeoka, 2000).

The infusion of external knowledge does, however, result in innovation. Labour productivity improvement results from combining human skills with the capabilities of technology (Becchetti, Bedoya & Paganetto, 2004). Most productivity improvement can be associated with innovation. Innovation results from combining information gathered from the external environment of the organisation, for example from other competitors, with information in use within the organisation. Teigland and Wasko (2003) established that one way of obtaining external information is through information trading. In an investigation of the relationship between different knowledge-sourcing activities and individual performance, Teigland and Wasko (2003) established that information trading intra-firm and between firms result in improvement; intra-firm trading results in efficiency improvement while inter-firm trading results in innovation. Individual employees leak organisational proprietary knowledge to competitor firms, expecting reciprocal leakage of relevant information. This may support the development of new ideas and innovations, leading to sustainable competitive advantage (Teigland & Wasko, 2003: 281).

Intangible benefits

The integration of an information system into an organisation's processes increases productivity in the organisation. For greater productivity to be realised, processes have to be structured, and desirable skills need to be acquired. Resource allocation in computerised organisation is more efficient, resulting in savings in various factors of production. Brynjolfsson, Hitt and Yang (2002:163) established that investors place high value on firms with impressive installed information system capital. The stock market value of computerised firms is in excess of nine times the book value of installed IS capital, and this value increases with time. Brynjolfsson, Hitt and Yang therefore conclude that installed IS capital creates intangible assets or organisational capital.

Other studies have shown that a rise in the customer satisfaction index corresponds to a several fold increase in the market value of an organisation (Karimi, Somers & Gupta, 2001; Siguaw, Enz & Namasivayam, 2000). Customer satisfaction is achieved by reaching out to

customers, identifying their needs, collating their complaints and addressing these in a timely manner. For organisations to collate and analyse customers' issues with the aim of identifying suitable solutions, a high level of IS sophistication is necessary. Karimi, Somers and Gupta (2001), while surveying 213 organisations in the financial services and banking industry, established that organisations implementing IS could be categorised as either "IS laggards"; "IS enabled, operations focused"; "IS enabled, customer focused"; or "IS leaders". Of these four categories, IS enabled, customer focused organisations were found to have the requisite IS sophistication that impacts on customer service. However, the implementation of strategies demands the sophistication of IS management, which the study found was highest in the IS leaders category. These organisations compete in IS-based service differentiation, operations, inbound logistics, outbound logistics, and after-sales service (Karimi, Somers & Gupta, 2001). For these organisations to be able to transform their marketing and operations functions and use IS strategically in products and services, they critically depend on a higher level of IS planning, control, organisation and integration (Karimi, Somers & Gupta, 2001: 146).

Customer satisfaction is one of the outcomes of stakeholder management. The impact of stakeholder management on an organisation's value has received attention among researchers (Jensen, 2002; Hillman & Keim, 2001; Berman, *et al*., 1999). An organisation's stakeholders (all individuals or groups with the power to substantially affect the welfare of an organisation) can be deconstructed into employees, suppliers, stockholders and the community (Jensen, 2002). The management of stakeholders is found to result in loyalty among employees, suppliers and customers. Hillman and Keim (2001) studied the relationship between customer management performance and a firm's market-value added performance. The firm's market-value added performance was calculated by subtracting the capital value of the firm from the market stock value of the firm. Customer management performance was extracted from firm's *Kinder, Lydenburg Domini* (KLD) index. The KLD index consists of several components, including community relations, employee relations, environmental performance, product characteristics, treatment of women and minorities, military contracting, production of alcohol or tobacco, involvement in the gambling industry, involvement in nuclear energy, and investment in areas involved with human rights controversies. Of these components, stakeholder management performance was represented by employee relations, diversity issues, product issues, community relations, and environmental issues. The study established a positive and significant relationship between market-value added performance and stakeholder management performance. Thus organisations may improve shareholders' wealth by strategically managing stakeholder issues. This is one area that organisations can exploit using installed IS.

The foregoing discussion hinges on positioning the organisation. Ideally an organisation attains strategic advantage in the industry if it combines resources and processes in a unique way, inimitable by competitors. Some processes, for example human resource management policies, are thought to be easy to duplicate disqualifying them, on face value, as strategic options. However, two firms implementing identical HRM policies may differ in the process paths of combining these with the human resources capital (human skills and capabilities) or the quality of human resources capital. The variation of the processes may differ due to the time period from adoption (Wright, Dunford & Snell, 2001). This suggests that organisations with competitive advantage have to be learning organisations capable of improving the value of the combination, at least to stay ahead of competitors. It is only when the resource combination process is superior that the organisations maintain competitive advantage in the industry. Competitive advantage translates to mean higher profitability and market value than the other organisations in the same industry (Wright, Dunford & Snell, 2001:708).

Human resource practices (mentoring, incentives and performance appraisal) may also help develop and sustain social networks (internal and external relationships) in the top management team (TMT) of organisations, which in turn impacts on an organisation's performance (Collins & Clark, 2003). Collins and Clark studied the relationship between organisations' performance and TMT social networks and the contribution of HR practices to the building of TMT social networks in 73 high technology firms. The study revealed a significant relationship between certain aspects of TMT social networks and firm performance. Furthermore, the study identified links between HR-practices and the formation of the TMT. The study therefore concluded that TMT social networks improve organisational performance and HR-practices mediate organisation performance through TMT social networks (Collins & Clark, 2003). Collins and Clark's (2003) study was specific to high-technology organisations, and therefore the findings may not be generalised to low-technology organisations. The study did not investigate the effect of social networks at other levels below TMTs. However, the bottom line in social network contribution is collecting information through the networks and making use of that information in the organisation. Information collection may be done at any level. It is the level of diffusion of the information, which may be limited when collected by people at lower levels.

Limitations in extant literature
Researchers believe that the intensity of IT creates complementary assets to the organisation's processes. However, while clear cut in technology manufacturing and service organisations, value adding is not explicit in traditional manufacturing industries (Zhu & Kraemer, 2002) and e-schools The value of IS investment is difficult to measure, and where

measured, is full of faults where value creation is not measurable in monetary terms. Many researchers have confirmed that IS capabilities (Bharadwaj, 2000) and assets (Ravichandran & Lertwongsatien, 2005) both lead to improved firm performance. However, the underlying mechanisms through which these are achieved and the direction of causality are not clear (Brynejolfsson & Hitt, 2000). In other words, studies are not conclusive on whether it is improved firm performances that lead to increased investment in information systems or the converse – whether increased investment in information systems improves firm performance. Some studies actually show causality from IS investment to firm improvement, while others claim causality from firm improvement to IS investment. (Brynjolfsson & Hitt, 2000). Likewise, intangible complementarities such as quality, convenience and timeliness of IS impact on organisational improvements go unmeasured. Research suggests that human resources systems have considerable benefit potentials but there is little consensus on how to achieve that potential (Becker & Gerhart, 1996). There is a general lack of theoretical and empirical treatment of how new HRM practices affect innovation performance (Laursen & Foss, 2003).

The next section theorises the possible benefits of e-schools based on learning from traditional firms and organisations.

Theoretical benefits of the e-school system

The e-school system consists of an administration sub-system, a library sub-system, teacher sub-system and student sub-system. These sub-systems are interfaced in such a way that user groups are restricted to functions relevant to them as a form of security. The applications are browser-enabled, making it possible for users to access their modules from outside the school's local area network (LAN).

E-school systems are owned by the parent owners of the schools (communities, governments and non-governmental organisations), and therefore the operations of most e-schools are not for profit (Sedera *et al*., 2001). Consequently, the value the public places on the e-school system is not interpreted in the same way as the stock value markets put on firms. Whereas the market stock value of firms is convertible to monetary value, the rating of e-schools in public opinion is a perception that the public infers for decision only. The fundamentals for ranking e-schools include school resources (teachers and physical facilities), management, the handling of stakeholders, and above all, the academic quality of the students and their suitability for the job market. The resources of the school (human and capital) can be deployed with an efficient configuration to impact on a school's productivity. High productivity in schools translates to savings for the stakeholders and therefore increases the value of the school in the public opinion. The configuration of resource combinations

tend to depend on the management style, and its effectiveness is often a credit to the leadership of the school.

Contribution of human resources

Teachers in schools come from mixed backgrounds, but it is generally agreed that the quality of a teacher or his/her effectiveness is mainly a function of the teacher's training. If a teachers' performance improves over time, it can often be attributed to incremental training. Incremental training can be conducted in-house in order to save time, or externally (outside the school). The implementation of the e-school system calls for the retraining of teachers to help them cope with new technology and change their pedagogical skills to suit IS integration in teaching. The improved training of teachers creates a superior skills pool in e-schools. Generally, different schools have teachers with different kinds of skills depending on the expertise of the teachers and their commitment to learning. The e-school system enables the sharing of these skills and therefore encourages the homogeneity of the skills pool in the collaborating e-schools. Consequently, the quality of education can be speedily improved at regional, national and continental levels. This quality improvement may be reflected in the quality of the students.

The academic quality of students reflects on the resourcefulness of their teachers. One way of assessing students' quality is their performance in national examinations. Kenya for example ranks schools based on the performance of external examinations' mean-score index, with the higher indices being associated with better schools. A second way of assessing students' quality is the popularity of the school among employers. Students who easily fit in their employment are assumed to be alumni of well resourced schools. It should, however, be noted that grade four students in Kenya hardly get employed immediately; most proceed for tertiary education before seeking employment. Thus their performances in employment may be attributed more to the tertiary institution they graduated from than the secondary school they went through.

Contribution of stakeholder management

Schools provide a variety of reports to stakeholders (students, parents and government). The government requires specific data, such as admissions and enrollment by gender and teaching strength by subject, at certain intervals in the school year. The schools implementing the e-school system have such reports updated on a daily basis as they derive from the school attendance record that is updated daily. The capabilities of the e-school system enable parents to view the reports of their children. A parent may view the attendance and performance report of his/her child conveniently at home through the web and without taking the trouble to travel to school or wait for the child to bring the report home. This is

very useful for problem children as parents will take the earliest opportunity to discuss their cases with class teachers and seek solutions. Parents may also identify teachers who may not be performing to their expectations. Through e-school systems, parents may communicate their concerns regarding the performance of individual teachers for management to take corrective measures. This efficient communication and management of stakeholders in general improves students' performance and the public opinion of the school.

Teachers may collaborate within the network of e-schools to share their experiences in teaching, discuss new areas in the curriculum, conduct classes on behalf of their colleagues remotely (using Skype, Elluminate or Moodle), and co-author textbooks that can be adopted nationally. The sharing of experiences increases the speed of innovation amongst the e-schools and at a lower cost. Using a mentor teacher to teach on behalf of an 'apprentice teacher' in another school can be a great source of tacit knowledge transfer and reduce costs in human resources. The collaboration of teachers may be extended to textbook publishing, an undertaking which hitherto has been dominated by entrepreneurs who coordinate experts, mainly teachers, to contribute to chapters. This coordination may be taken over by networked teachers who would compile and publish the textbooks more cost effectively and still retain the monetary gains within the network. The textbooks would in all likelihood be more informative as they would have been produced by a larger than usual team with the desired expertise.

Contribution of infrastructure

Students using the e-school system are endowed with highly convenient resources. The library sub-system enables students to access electronic books from any point of Internet access. This could be within the classroom, study areas, library or even living areas. The access of e-books has none of the time limitations that traditional libraries impose. An electronic book can also be accessed by any number of users simultaneously. When a new edition of an electronic text book is released, the time lapse between ordering and accessing is very short, and the cost is fairly small. Students therefore access new editions as soon as they are released. The e-school system also has the Internet, which gives students the opportunity to obtain additional resources to supplement school resources. If a student finds it difficult to understand the explanation of a process in a textbook, the student may turn to other resources off the Internet or easily surf related e-books for an in-depth explanation on the subject.

Contribution of network externalities

The Internet connection in e-schools facilitates communication between student-teacher and student-student within the school and with other schools. This connection provides effective

communication with peers and experts outside the confines of the school's walls. The system facilitates peer coaching, remote mentoring by experts outside the school, and acquaintance with the demands of the job market. The web generally makes students very enthusiastic towards learning and encourages them to expand their knowledge beyond the curriculum.

In summary, the e-school system benefits schools by inducing productivity improvement through the efficient use of human and capital resources. The system encourages the development and application of innovative pedagogical approaches that makes learning more effective. Students' quality improvement is enhanced through the shared diversity of knowledge amongst teachers and students. Consequently, the implementation of an e-school is expected to lead to positive public approval, which earns the school support from its stakeholders.

Measurement of the net benefits of an e-school

Measuring the intangible benefits of an information system has proved elusive to the scientific community (Moody & Welsh, 1999; Grembergen & Amelinckx, 2002; Murphy & Simon, 2002; Saaty, 2008). As research indicates, the value of intangible IS benefits may be very high, and therefore exerted efforts have been made to measure them, albeit without universal agreement. In the words of Keplan and Norton (1996), "If you cannot measure an outcome, then you cannot manage it." It is therefore incumbent upon researchers to seek objective methods of measuring an information system's intangible benefits so that more informed investments may be made. Early studies described intangible benefits as residual (Jarboe, 2007). Other studies (Martinsons *et al.*, 1999; Hasan & Tibits, 2000; Grembergen & Amelinckx, 2002) have proposed the use of the balanced scorecard in monitoring the intangible benefits of IS. Grembergen and Amelinckx's e-business balanced scorecard (based on Kaplan and Norton, 1996) had four layers: customer perspective, operation perspective, future perspective and benefit contribution (Grembergen and Amelinckx, 2002); Martinson *et al.*'s (1999) had business value, user orientation, internal processes, and future readiness as its layers. In scorecarding, the achievement of objectives in the different layers is negotiated into measurable terms.

Murphy and Simon (2002) examined how a large computer manufacturer attempted to incorporate intangibles in the traditional, cost-benefit analysis of an enterprise resource planning (ERP) project. They found that the computer manufacturer applied Hares and Royle (1994) quantification technique, which follows four steps: identify benefits, make measurable, predict in physical terms, and evaluate cash-flow. The computer manufacturer (code named PCC) identified 'customer service level gain' as one major intangible benefit of ERP implementation. PCC's ERP implementation team argued that increased customer

service would increase the organisation's market share and this would reflect on sales revenue. They therefore considered sales revenue to be a measurable form of customer service. The future cash stream was found to be very close to what was predicted by the ERP implementation team (Murphy & Simon, 2002). There may, however, have been many other tangible and intangible benefits that were missed by PCC's ERP implementation team. The customer service evaluation that was considered is one aspect of balanced score card (BSC) – the customer layer.

A complement to BSC in measuring the intangible benefits of IS is the use of Tobin's q (Bharadwaj, Bharadwaj & Konsynski, 1999**).** Tobin's q is the ratio of an organisation's capital market value to the assets replacement value. The use of Tobin's q for measuring intangible value is based on the assumption that the long-run equilibrium market value of a firm must be equal to the replacement value of its assets, giving a q value close to unity (Bharadwaj, Bharadwaj & Konsynski, 1999:1010). Deviation from this relationship signifies an unmeasured source of value.) examined the association between IS investment and q values of firms listed in the US public market. They approximated capital market value by combining the value of total common shares, value of outstanding preferred stock, and debt. The replacement value of assets was represented by the book value of the total asset. The values of investment in IS in firms was estimated from data published by the Information Week and Computerworld magazines. Analysis took into consideration that there could be other sources of intangible benefits other than IS, and therefore controls were made for these. The result of the study showed that the variance in Tobin's q value when regression is done without IS investment was accounted for by including IS investment. Bharadwaj, Bharadwaj and Konsynski (1999) therefore concluded that Tobin's q is positively associated with IS investment.

In the evaluation of e-schools' net benefits, techniques that combined BSC (Kaplan & Norton, 1996) and Tobin's q derivative, which may be referred to as the e-school performance index (espi), can be deployed. As was explained earlier, e-schools are not market listed. However, the public places a value on schools based on fundamentals such as the quality of teachers, physical facilities, and students' performance. The implementation of an e-school requires improvement in the quality of teachers (attained through in-service training) and improvement in the physical facilities (installation of IS). The value the public places on an e-school is represented by the change in the number of applications (Δ_{Appl}) from students seeking admission to the school. Another known source of increase in the demand for positions in a school, is population increase, which can be calculated from the change in the number completing primary level education and controlled for. The assets of the e-school

internally improve learning performance, and this is reflected in changes in the student performance index (Δ_{spi}). The following two regression equations can then be tested:

$$\text{Espi}_t = A + \Delta_{\text{Appl}}/_{\Delta\text{spi}} \qquad (1)$$

$$\text{Espi}_t = A + \Delta_{\text{Appl}}/_{\Delta\text{spi}} + \beta_{\text{IS}} \qquad (2)$$

β_{IS} is the contribution of IS installation to the e-school's performance index.

Espi_t (1) is calculated with values in the year before the implementation of the e-school

Espi_t (2) is calculated after the implementation of e-school

We assume that changes in Espi_t, when other known factors are controlled, are due to the contribution of the installation of IS in the school.

The BSC is applied in evaluating the achievement of four objectives: customer perspectives (students' satisfaction), operations perspectives (savings in time and other resources), stakeholder objectives (government and parents), and the overall school perspective, which is captured in Espi_t above.

Conclusion

This paper has identified benefits that traditional organisations extract from the implementation of IS, and has used these to inform the potential benefits of IS to e-schools. It highlights that the potential benefits of IS to e-schools are largely intangible. Measuring the net benefits of e-schools is expected to be as elusive as measuring the intangible benefits of IS in any organisation. The paper therefore proposes a multi dimensional approach to measuring the net benefits of e-schools, i.e. the use of both BSC and Espi_t which it argues are closely linked to would be Tobin's q of e-schools were these schools listed on the market.

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Chapter Six

The perceptions of KM by LIS scholars:
a core/periphery model analysis

Omwoyo Bosire Onyancha and Dennis N. Ocholla

Introduction

'Knowledge management' (KM) is an elusive term; to date, there is no universally accepted definition of the term, yet KM is growing increasingly popular in a variety of disciplines (business administration, computer science, library and information science/studies, etc.) and institutions/organisations (universities, business enterprises, governments, etc.). Previous studies (e.g. Onyancha & Ocholla, 2006; Jacobs, 2004; Ponzi, 2002:268) have noted that the term is multidisciplinary in nature, finding the greatest contributors to or users of the theories and methods of KM to be computer science, business, management, library and information science, engineering, psychology, multidisciplinary science, energy and fuels, social sciences, operation research and management science, and planning and development. The different disciplines and sectors that contribute to the development of KM or use its theories and methods have thus greatly contributed to the many definitions and perspectives of KM. From the business point of view, Wiig (1999) defines KM as the systematic, explicit and deliberate building, renewal and application of knowledge to maximise an enterprise's knowledge-related effectiveness and returns from its knowledge assets. Rowley defines KM as a field "concerned with the exploitation and development of the knowledge assets of an organisation with a view to furthering the organisation's objectives" (Rowley, 2000:9). Likewise, Kim (2000:3) explains that knowledge management is "A discipline that promotes an integrated approach to identifying, managing and sharing all of an organisation's knowledge assets, including unarticulated expertise and experience resident in individual workers … it involves the identification and analysis of available and required knowledge, and the subsequent planning and control of actions to develop knowledge assets so as to fulfill organisational objectives."

There is no clear classification of knowledge management within the field of library and information studies. For example, in the LIS Research Areas Classification Scheme see: *http://www.alise.org/mc/page.do?sitePageId=55727* produced by the influential Association for Library and Information Science Education [ALISE], which captures ninety research sub-themes within eight broad research categories, KM is classified under "Information Organisation" instead of "Management/Administration". We have also noted the absence of

the concept 'knowledge' in the "Information Organisation" category. To many library and information scientists, KM includes but is not limited to information management. According to Read-Smith, *et al.* (2002:317), ("Knowledge management is an inter-disciplinary field that is concerned with systematic, effective management and utilisation of an organisation's knowledge resources ... it encompasses creation, storage, retrieval, and distribution of an organisation's knowledge – similar to records and information management." Read-Smith *et al.* (2002) therefore considers the processes of KM as being similar to the processes that constitute records management or information management. In fact, Al-Hawamdeh (2003:21) states that information management is a part of KM, and proceeds to define KM as the "process of identifying, organising and managing knowledge resources", in which case the resources include explicit knowledge (information), 'know-how' (learning capacity), 'know-who' (customer capacity) and tacit knowledge in the form of skills and competencies. Kim (2000) observes that managing books, journals, and other similar resources, and conducting searches in such resources for clients or arranging for the circulation of materials, is only a small part of KM. This explains, to some extent, why ALISE would classify KM under information organisation (as alluded to earlier).

A subject content analysis of the periodicals in which KM research is published, as provided by Onyancha & Ocholla (2006), reveals that they cover subjects such as library and information science, business, management science, computer science, financial management, human resource management, management information systems, and information technology. Visibly, this wide range of coverage of KM complicates efforts at arriving at a uniform definition of the concept. Any attempt to come up with a uniform definition of KM is further complicated by the different titles given to KM courses or programmes at institutions of higher learning, a situation that reflects the diverse views held by different people. For example, in a study conducted by Chaudhry & Higgins (2001) to investigate the state of KM education in selected universities in Australia, Canada, Singapore, UK and the USA, it was found that KM courses are known by different names, such as "Knowledge Management and Decision Systems"; "Information Architecture and Knowledge Management"; "Intelligence Systems and Knowledge Management"; "Management of Information Systems and Services"; "Information and Knowledge Management", and "Knowledge Management in Health Services". A long list of nomenclature purportedly referring to KM is likely to occur when an inclusive survey is conducted with a larger international sample. What is inherent in the titles sampled is the frequent occurrence of 'management' in the titles. LIS professionals and scholars also view KM as an extension of what they have always done – managing information.

The above goes to show that there are different views on the exact scope and meaning of KM (see DiMattia & Order, 1997). In this chapter we have attempted to provide a meaningful insight into how KM is understood in the context of LIS. It endeavours to answer some of the following inter-related questions: What are the processes mostly associated with KM within the context of LIS? What are the core terms (in LIS) with which KM can be defined? Which terms can be used to describe KM processes and activities within the context of LIS? Which departments or sectors or professions associated with LIS ascribe to or practice KM? Which LIS activities fall within the scope of KM? In short, what are the LIS professionals' perceptions of KM?

Methodology

The study employed informetric approaches to examine the terms that can be used to describe KM in the context of LIS. Specifically, a content analysis of KM literature, as indexed in the Library and Information Science and Technology Abstracts (LISTA), was conducted to identify the most commonly used indexing terms to describe KM; the growth rate of terms associated with KM in the context of LIS; and the core terms with which KM can be described; all in an attempt to contextualise KM within the broader field or discipline of library and information science/studies. In order to extract relevant data from the database, a search of DE "Knowledge Management" was conducted within the subject field (DE denotes subject descriptor). The search was limited to the years 1981 to 2007, split into 5 five-year and 1 two-year periods. Only two types of articles, namely magazine and journal articles, were considered. The inclusion of magazine articles was deemed important because we felt that some of them (e.g. UNESCO Bulletin) publish high quality articles on KM. After all, our major focus was on the subject terms that are associated with KM and not necessarily on research articles. Having downloaded the relevant data, different computer-aided software was used to analyse the data. Notepad was used to clean the data of irrelevant information and duplicates and to prepare the data for analysis. In order to prepare the data for **Bibexcel**, each subject in each record was entered in its own line, e.g.

INFORMATION resources management

INFORMATION science

INFORMATION technology

RESEARCH institutes

KNOWLEDGE management

Using this data, **Bibexcel** counted the number of times each subject appeared in each record for all records and returned the sum total of each subject's frequency. The subjects that recorded the highest number of appearances were deemed to be the most commonly used

terms to describe KM literature. Partly, these subject terms provided a snapshot of how LIS professionals viewed KM. In other words, they answered what LIS professionals associate KM with in their line of activities.

As the above mentioned analysis provided only the frequencies of co-occurrence of KM with other compound subject terms, there was a need to measure the strength of their relationships as well as identify the single terms with which KM is defined by LIS professionals. It was assumed that the 'associatedness' of single terms derived from the compound subject terms could further assist in identifying the core terms with which to describe KM. To achieve this, a simple core/periphery model analysis was applied to 90 selected terms (excluding *knowledge* and *information)* that recorded the highest frequency counts of occurrence in the compound subjects. According to Borgatti & Everett (1999) and Borgatti, Everett & Freeman (2002), the function simultaneously fits a core/ periphery model to the data network, and identifies which actors belong in the core and which belong in the periphery. As this analysis requires a co-occurrence matrix with which to work, we first identified one-word terms with high frequencies by subjecting the data mentioned above to further analysis using the textSTAT software. Two files (i.e. *text.txt* and *words.txt*) were created and analysed using TI software, which was also used to prepare both the raw and normalised co-occurrence matrices named COOCC.DBF and COSINE.DBF respectively. Finally, the data contained in the COSINE.DBF file was imported into UCINET for Windows (version 6) for further analysis so that the core terms that describe KM could be determined. The process produced the terms that are the core in describing KM within the context of LIS as well as those in the periphery. It was assumed that the further the terms are from the core terms, the less of a relationship they have with KM. This relationship is further demonstrated in Figures 2, 4 and 6, which were prepared using Pajek software. Developed by Vladimir Batagelj (Department of Mathematics, University of Ljubljana, Slovenia) and Andrej Mrvar (Faculty of Social Sciences, University of Ljubljana, Slovenia), the program is Windows-based and is capable of analysing and illustrating large networks containing thousands or even millions of vertices. It is freeware software (used for academic purposes), and can be downloaded from *http://vlado.fmf.uni-lj.si/pub/networks/pajek/.* The file format accepted by Pajek provides information on *vertices*, *arcs* (directed edges), and undirected *edges.* Visualisation of the relationships between and among the selected single terms was done in order to supplement the information provided in the core/ periphery models as the models did not reveal the relationships of all the terms. The graphics of the core/ periphery models could not fit into the MS Word template, thereby dictating the provision of only core single terms used to describe KM. Furthermore, clustering of the terms using sociograms assisted in identifying those terms that belong in various clusters of core or periphery terms.

Whereas the core/ periphery model provides two clusters (i.e. core and periphery), the sociograms reveal more clusters, even within the two categories of terms.

Limitations of the study

As mentioned above, this paper describes KM from the point of view of the LIS profession. In other words, we examine the perceptions of KM by LIS professionals using subject terms of the published KM literature as indexed in LISTA. The core terms with which KM is described as provided in the results section are those emanating from LIS research only. The study therefore does not provide a generalised view of KM as the term is multidisciplinary.

Results and discussion

Subject terms used to describe KM literature

An analysis of the terms that appear the most in KM literature may give an indication of LIS scholars' perceptions of KM. The underlying theoretical basis is that two or more terms have got a relationship if they co-occur in a given text. The more frequently two or more terms co-occur in a text or document, the stronger their relationship (Krsul, 2002).

Table 1 Top 100 subject terms used to describe KM literature

No.	LISTA Subject	Articles	No.	LISTA Subject	Articles
1	Information resources management	547	51	Expert systems (Computer science)	28
2	Information science	385	52	Database searching	28
3	Information technology	368	53	Knowledge acquisition (Expert systems)	27
4	Information services	179	54	Intellectual property	26
5	Information retrieval	153	55	Information organisation	25
6	Library science	125	56	Computer systems	25
7	Management information systems	124	57	Documentation	24
8	Libraries	113	58	Metadata	24
9	Management	109	59	Academic libraries	23
10	Information resources	99	60	Knowledge representation (Information theory)	22
11	Organisational learning	77	61	Knowledge, Theory of	20
12	Data mining	76	62	Education	20
13	Intellectual capital	73	63	Surveys	20
14	Information storage & retrieval systems	71	64	Employees	19
15	Knowledge workers	69	65	Information services -- Management	19
16	Associations, institutions, etc	67	66	Executives	19
17	Information professionals	66	67	Libraries – automation	19
18	Corporate culture	66	68	Database management	19

19	Business enterprises	65	69	Personnel management	19
20	Industrial management	59	70	Information scientists	19
21	Librarians	58	71	Human capital	18
22	Electronic data processing	57	72	Electronic commerce	18
23	Congresses & conventions	55	73	Document management	18
24	Digital libraries	55	74	Organisational behavior	18
25	WEB sites	54	75	Computer networks	18
26	Information theory	53	76	Web portals	17
27	Research	51	77	Computer science	17
28	Electronic information resources	48	78	World wide web	17
29	Information architecture	44	79	Information sharing	17
30	Concepts	42	80	Library employees	17
31	Decision making	41	81	Library cooperation	17
32	Computer software	39	82	Classification	17
33	Organisation	38	83	Resource management	16
34	Technological innovations	37	84	Communication	16
35	Information literacy	37	85	Library administration	16
36	Internet	35	86	Organisational structure	15
37	Business intelligence	35	87	Information society	15
38	Associations, institutions, etc.	34	88	Web site development	15
39	Technology	33	89	Electronic systems	15
40	Computer network resources	33	90	Medical care	14
41	Universities & colleges	33	91	Methodology	14
42	Strategic planning	32	92	Business planning	14
43	Learning	32	93	Business information services	14
44	Artificial intelligence	32	94	Competitive advantage	14
45	Intranets (Computer networks)	30	95	Work environment	14
46	Business	30	96	Competition	13
47	Records – management	29	97	Archives	13
48	Management science	29	98	Taxonomy	13
49	Databases	29	99	SEARCH engines	13
50	Online information services	28	100	Administrative agencies	13

Table 1 provides the top 100 compound subject terms which co-occurred 13 or more times with KM. The leading term is information resources management, which recorded a frequency count of 547, followed by information science, information technology, information services, information retrieval, library science, management information systems, libraries, management, and information resources (list only includes the top 10).

If we classify the 100 terms into various categories describing different aspects of KM, the terms that describe the **management function** would consist of information resources management, management, industrial management, records management, information services management, database management, personnel management, document management, resource management, and library administration. The list of terms also

contains **activities** or **processes** associated with KM as perceived by LIS professionals, e.g.: information retrieval, organisational learning, data mining, electronic data processing, database searching, knowledge acquisition (expert systems), information organisation, documentation, knowledge representation (information theory), libraries – automation, information sharing, library cooperation, classification, and website development.

The **resources** or **systems** or **services** that are managed include: information technology, information services, management information systems, libraries, information resources, intellectual capital, information storage & retrieval systems, business enterprises, digital libraries, websites, electronic information resources, computer software, Internet, computer network resources, intranets (computer networks), databases, online information services, expert systems, computer systems, academic libraries, human capital, computer networks, web portals, World Wide Web, electronic systems, business information services, and archives. **Knowledge managers** are variously referred to in the **Table** as: knowledge workers, information professionals, librarians, executives, employees, information scientists, and library employees. The table also provides the disciplines or fields that are contributors to or users of theories and methods of KM. These include: information science, information technology, library science, business, management science, education, and computer science.

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Core/Periphery Class Memberships:

    1:  RESOURCES TECHNOLOGY SYSTEMS SERVICES COMPUTERS RETRIEVAL ELECTRONIC DATA PROCESSING STORAGE PERFORMANCE POLICY
    2:  LIBRARIES BUSINESS THEORY NETWORKS COMMUNICATION SOFTWARE INTELLIGENCE LIBRARIANS ARCHITECTURE EXPERT LITERACY ACADEMIC DATABASES ACQUISITION

Blocked Adjacency Matrix

                           1     2     3    25     5     6     7    15     9    10    27    16      4    14     8    13    17    11    19    20    21
                         RESOU TECHN SYSTE PERFO SERVI COMPU RETRI PROCE ELECT  DATA POLIC STORA   LIBRA SOFTW BUSIN COMMU INTEL THEOR ARCHI EXPER LITER
   1      RESOURCES |           0.151       0.192 0.136 0.089 0.105 0.192 0.096 0.236       0.272 0.236       0.471 0.089
   2     TECHNOLOGY |           0.142 0.333 0.544 0.192 0.882 0.745 0.680 0.680       0.471
   3        SYSTEMS | 0.151 0.142             0.615 0.161 0.191 0.174 0.174 0.213 0.151                         0.403             0.826
  25    PERFORMANCE |       0.333       0.408       0.378 0.447 0.408 0.408
   5       SERVICES | 0.192 0.544       0.408       0.118 0.617 0.365 0.333 0.333       0.236                                           0.408
   6      COMPUTERS | 0.136 0.192 0.615       0.118       0.218 0.129 0.118 0.236                               0.289 0.436             0.745
   7      RETRIEVAL | 0.089 0.882 0.161 0.378 0.617 0.218       0.845 0.772 0.772 0.378 0.267
  15     PROCESSING | 0.105 0.745 0.191 0.447 0.365 0.129 0.845       0.913 0.913 0.447 0.316       0.408             0.154
   9     ELECTRONIC | 0.192 0.680 0.174 0.408 0.333 0.118 0.772 0.913       0.833 0.408 0.289
  10           DATA | 0.096 0.680 0.174 0.408 0.333 0.236 0.772 0.913 0.833       0.408 0.289
  27         POLICY | 0.236       0.213             0.378 0.447 0.408 0.408
  16        STORAGE |       0.471 0.151             0.267 0.316 0.289 0.289
   ------------------------------------------------------------------------------------------------------------------------------------
   4      LIBRARIES | 0.272             0.236                                                                               
  14       SOFTWARE | 0.236                               0.408                                     0.378
   8       BUSINESS |
  13  COMMUNICATION | 0.471             0.289
  17   INTELLIGENCE | 0.089       0.403       0.436             0.154                         0.378             0.267 0.488
  11         THEORY |
  19   ARCHITECTURE |                                                                                           0.267
  20         EXPERT |             0.826       0.745                                                             0.488
  21       LITERACY |                   0.408
  22       ACADEMIC |                                                                         0.577
  23      DATABASES |                         0.144             0.204                               0.500       0.189       0.354
  24    ACQUISITION |             0.533       0.289                                           0.289             0.189             0.645
  18      LIBRARIANS |                  0.408                                                                                     1.000
  26      PERSONNEL | 0.471
  12       NETWORKS | 0.471             0.289                                                             1.000
  28 REPRESENTATION |                                                                                     1.000
  29     SCIENTISTS |                                                                         0.577
  30     PERIODICALS |       0.192       0.236       0.218                         0.408       0.333
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Figure 1 Core/periphery model of terms describing KM literature, 1981 - 1990
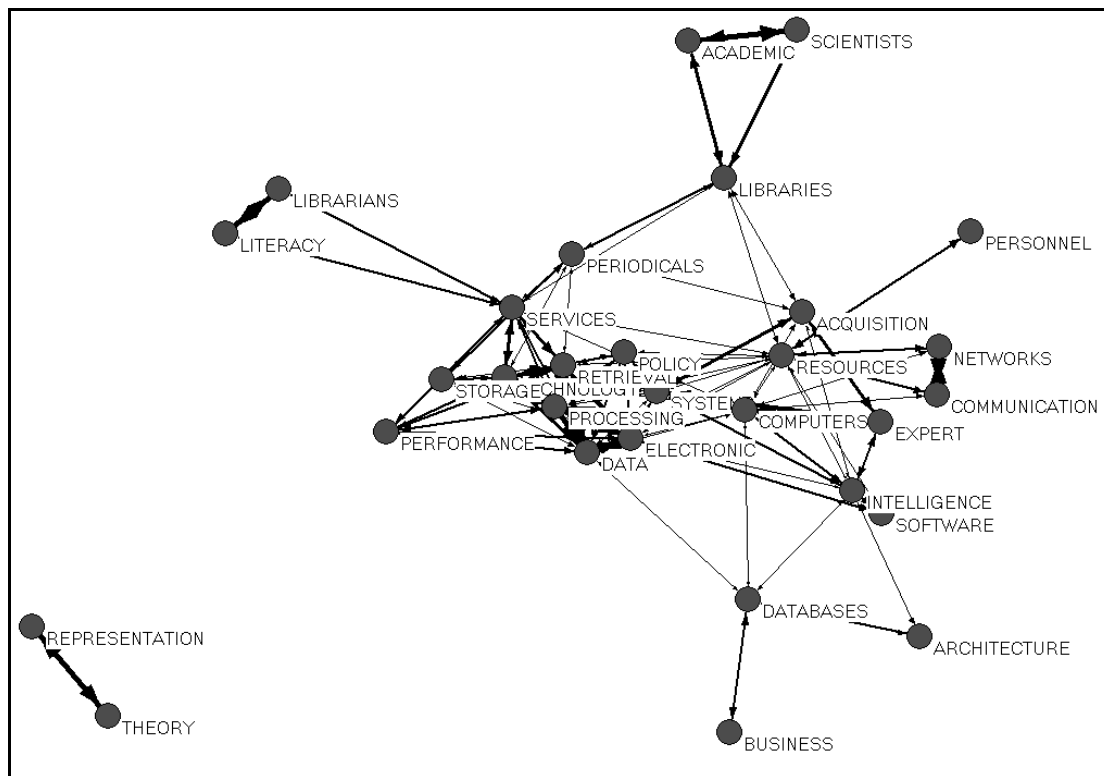
Figure 2 Visual map of core/periphery terms describing KM literature, 1981 - 1990

Core terms with which KM is described by LIS scholars

Two techniques were used to identify the core terms with which KM can be described or defined, namely the core/ periphery model and social networks, as illustrated in Figures 1 to 6, respectively. This section discusses the findings under three sub-headings so as to illustrate the emerging terms that are increasingly becoming associated with KM.

Core terms in 1981 - 1990

During this period, twelve keywords emerged as the core terms describing KM literature. These were: resources, technology, systems, performance, services, computers, retrieval, processing, electronic, data, policy, and storage. A combination of one or two of these words defined what KM was perceived to be in the said period. The highest strength of association was between the terms *retrieval* and *technology,* which recorded a normalised count of 0.882. Evidently, the areas of research focus between 1981 and 1990 were the use of technology in information retrieval and resources (including data and information) management. Essentially, therefore, KM was largely associated with the use of information technology in the retrieval of information and organisation of data. Of the 90 unique terms that were selected to conduct the core/ periphery analysis, 60 did not have any links to any other words in the period 1981 - 1990, implying that they were not used to describe KM literature. This further implies that they were not associated with the concept KM in 1981 - 1990. Only 30

terms were interlinked with one or more other terms. The poor association of most of the selected terms with KM (either directly or by proxy) is probably because they were introduced into KM literature later than 1990, or they were simply not related to the term KM before then. It was noted that one cluster of seven terms that had close associations among themselves and were therefore important in describing KM emerged in 1981 - 1990. Most of these terms comprised the core keywords illustrated in Fig. 1 above. They are: technology, retrieval, processing, data, electronic, policy and systems.

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Core/Periphery Class Memberships:

    1:  RESOURCES TECHNOLOGY SYSTEMS LIBRARIES SERVICES COMPUTERS RETRIEVAL BUSINESS ELECTRONIC DATA THEORY EDUCATION NETWORKS SOFTWARE PROCESSING STORAGE EN
    2:  RESEARCH ORGANIZATIONAL LEARNING WEB CAPITAL COMMUNICATION INTERNET DIGITAL INTELLIGENCE LIBRARIANS CORPORATE ORGANIZATION WORKERS PROFESSION SITE EM

Blocked Adjacency Matrix

                      1     2     3     4     5     6     7     8     9    10    35    20    45    14    15    24    17    42    23    36    25    22     3
                    RESOU TECHN SYSTE LIBRA SERVI COMPU RETRI BUSIN ELECT  DATA EXPER SOFTW ACADE THEOR EDUCA ENTER NETWO ANALY STORA DECIS MININ PROCE COLL
                    -------------------------------------------------------------------------------------------------------------------------------------
  1      RESOURCES |       0.076 0.167 0.049 0.067 0.137 0.076 0.126                         0.147                         0.295       0.120                   0.24
  2     TECHNOLOGY | 0.076             0.046 0.243 0.110 0.075 0.188 0.155 0.214                         0.177 0.065 0.061 0.121       0.099 0.121 0.182 0.19
  3        SYSTEMS | 0.076             0.049 0.043 0.555 0.359       0.165 0.046 0.709 0.091 0.129 0.204             0.129 0.129 0.316                   0.065
  4      LIBRARIES | 0.167 0.046 0.049       0.063 0.128 0.058 0.049             0.267 0.378       0.053       0.101       0.083       0.136             0.417
  5       SERVICES | 0.049 0.243 0.043 0.063       0.113 0.309 0.129 0.355 0.295             0.118             0.340       0.092             0.057 0.09
  6      COMPUTERS | 0.067 0.110 0.555 0.128 0.113       0.140       0.097 0.040 0.489 0.480       0.107 0.124                                     0.09
  7      RETRIEVAL | 0.137 0.075 0.359 0.058 0.309 0.140       0.040 0.526 0.382       0.109 0.154 0.098                   0.504                   0.540
  8       BUSINESS | 0.076 0.188       0.049 0.129       0.040       0.055 0.137             0.041 0.189 0.483 0.258 0.129       0.105 0.129 0.065 0.10
  9     ELECTRONIC | 0.126 0.155 0.165       0.355 0.097 0.526 0.055       0.678             0.151 0.213 0.135       0.114 0.107 0.213 0.348 0.174 0.213 0.746
 10           DATA |       0.214 0.046       0.295 0.040 0.382 0.137 0.678                         0.056       0.283       0.530 0.144 0.433 0.707 0.795
 35         EXPERT |             0.709             0.489                   0.151                   0.186
 20       SOFTWARE |       0.091 0.267 0.118 0.480 0.091       0.151                         0.112
 45       ACADEMIC | 0.147       0.129 0.378       0.154       0.213
 14         THEORY |       0.204       0.053 0.098 0.041 0.135 0.056 0.186 0.112             0.085             0.129                         0.079
 15      EDUCATION |       0.177             0.124       0.189                               0.085       0.091                                     0.74
 24    ENTERPRISES |       0.065       0.101             0.483 0.114 0.283             0.085       0.091             0.267       0.218 0.267 0.134
 17       NETWORKS | 0.295 0.061 0.129       0.083 0.340       0.258 0.107                   0.267                   0.408 0.500 0.250
 42       ANALYSIS | 0.121 0.129                   0.129 0.213 0.530             0.408 0.129                   0.408 0.500 0.250 0.204
 23        STORAGE | 0.120       0.316       0.136 0.092 0.504       0.348 0.144       0.408 0.129             0.218       0.408             0.408 0.204
 36       DECISION |       0.099                   0.105 0.174 0.433             0.267       0.500 0.408       0.250
 25         MINING |       0.121                   0.129 0.213 0.707
 22     PROCESSING |       0.182 0.065       0.417 0.057 0.540 0.065 0.746 0.795             0.079       0.134       0.250 0.204 0.204 0.250
 39       COLLEGES | 0.241 0.198                   0.092       0.105                         0.745
 46      DATABASES | 0.093       0.327 0.120 0.105 0.143 0.586       0.270 0.112       0.224 0.316                         0.258             0.158
 33         ONLINE |       0.070             0.481       0.178 0.075 0.246 0.204                                           0.289
 41   UNIVERSITIES | 0.241 0.198             0.092       0.105                         0.745                                     1.00
                    -------------------------------------------------------------------------------------------------------------------------------------
 16            WEB |       0.065       0.101 0.089       0.082 0.069                                           0.085 0.079
 12 ORGANIZATIONAL |       0.038                   0.082                         0.354
 11       RESEARCH |                   0.340                               0.354
 18        CAPITAL |       0.061             0.258                   0.079 0.401
 27   INTELLIGENCE |       0.152       0.133             0.154 0.434
 32     PROFESSION |
 21       INTERNET | 0.060 0.149             0.046 0.063 0.158             0.596                                     0.50
 34           SITE |                         0.091
 19  COMMUNICATION |                                           0.316
 28      LIBRARIANS | 0.093       0.239 0.211 0.072       0.224
 29      CORPORATE |       0.171                   0.183
 38      SEARCHING |                   0.218
```

Figure 3 Core/periphery model of terms describing KM literature, 1991 - 2000

Figure 4 Visual map of core/periphery terms describing KM literature, 1991 - 2000

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Core terms in 1991 - 2000

This period is widely seen as a time when there was a lot of emerging interest in KM (Ponzi, 2002). The number of core terms with which KM was described in 1991 - 2000 rose to 26 from the previous year's total of 11 terms, thereby indicating an increased interest from various scholars belonging to a variety of disciplines or the same discipline but with different perspectives on KM. An analysis of the association of terms reveals that the highest strengths of association (represented by the normalised frequency count) were between *data* and *processing*, *electronic* and *processing*, *education* and *universities, education* and *colleges*, *expert* and *systems, data* and *mining, electronic* and *data, computer* and *systems*, *databases* and *retrieval, data* and *analysis, storage* and *retrieval, storage* and *processing,* and *analysis* and *mining*. The linkage of two or more of these words defines the perceptions of LIS scholars about KM during the 1991 - 2000 period. Seemingly, electronic data processing (including storage and retrieval) in academic libraries dominated KM literature, meaning that it was the main activity or process defining KM in the said period of study.

It was observed that the strengths of association between these and other terms in the cluster consisting of the core terms in the previous year-period recorded lower values during this year period. This is contrary to our expectations of higher values, which would have meant stronger degrees of association between the terms. This may imply a shift in the research focus areas to include more aspects of the terms in the periphery. It may also mean that scholars were trying to gain a deeper understanding of KM and had not found common terms with which to define the 'new' concept. These assumptions could not, however, be substantiated in this study. The periphery contained terms such as the web, organisational, research, capital, intellectual, profession, Internet, site, communication, librarians, corporate, searching and records, among others. Fig 4 illustrates this pattern more clearly than Fig 3. Although some terms appeared frequently in the KM subject headings, they were not associated with any of the other terms. There were only 65 out of 90 terms that were inter-linked with at least one other term, unlike in 1981 - 1990 where only 40 terms were associated with at least one other term. There was therefore an increase in the number of terms (i.e. in the core or the periphery) that was associated with KM on the one hand and with each other on the other. This trend may have been brought about by interdisciplinary research.

Another emerging aspect is the formation of several small clusters of terms as demonstrated in Fig. 4. Two of these clusters, which produced a relatively higher number of terms each, are circled. Whereas the cluster to the left of the sociogram describes KM in relation to the use of computer systems in data representation, expert intelligence, theory and

innovation, the other cluster focuses on the storage of digital resources (including the application of e-databases) by libraries.

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Core/Periphery Class Memberships:

    1:  RESOURCES TECHNOLOGY SYSTEMS LIBRARIES SERVICES COMPUTERS RETRIEVAL BUSINESS ELECTRONIC DATA RESEARCH THEORY EDUCATION WEB NETWORKS SOFTWARE INTERNET
    2:  ORGANIZATIONAL LEARNING CAPITAL COMMUNICATION ENTERPRISES INTELLIGENCE LIBRARIANS CULTURE ORGANIZATION WORKERS PLANNING PROFESSION SITE ARCHITECTURE

Blocked Adjacency Matrix

                      1     2     3     4     5     6     7     8     9    10    11    23    35    14    15    16    17    62    41    20    21    22     5
                    RESOU TECHN SYSTE LIBRA SERVI COMPU RETRI BUSIN ELECT  DATA RESEA STORA ONLIN THEOR EDUCA  WEB  NETWO MATER SEARC SOFTW INTER PROCE DATA

   1   RESOURCES          0.374 0.340 0.244 0.262 0.255 0.278 0.184 0.386 0.179 0.167 0.182 0.148 0.096 0.108 0.200 0.202 0.080 0.161 0.144 0.152 0.093 0.16
   2   TECHNOLOGY   0.374       0.300 0.125 0.232 0.238 0.209 0.146 0.168 0.144 0.161 0.145 0.094 0.074 0.115 0.091 0.129 0.030 0.059 0.112 0.119 0.107 0.07
   3   SYSTEMS      0.340 0.300       0.170 0.143 0.313 0.389 0.128 0.209 0.149 0.094 0.464 0.063 0.194 0.092 0.120 0.087 0.057 0.061 0.141 0.081 0.079 0.14
   4   LIBRARIES    0.244 0.125 0.170       0.297 0.076 0.192 0.052 0.170 0.055 0.093 0.164 0.119 0.038 0.227 0.057 0.051 0.224 0.066 0.047 0.067 0.052 0.06
   5   SERVICES     0.262 0.232 0.143 0.297       0.142 0.242 0.116 0.179 0.112 0.110 0.083 0.332 0.044 0.108 0.077 0.062 0.040 0.063 0.106 0.101 0.114 0.09
   6   COMPUTERS    0.255 0.238 0.313 0.076 0.142       0.106 0.112 0.154 0.135 0.067 0.072 0.078 0.104 0.047 0.247 0.550 0.021 0.066 0.462 0.155 0.122 0.08
   7   RETRIEVAL    0.278 0.209 0.389 0.192 0.242 0.106       0.039 0.254 0.200 0.064 0.664 0.096 0.060 0.045 0.096 0.036 0.070 0.203 0.077 0.107 0.222 0.13
   8   BUSINESS     0.184 0.146 0.128 0.052 0.116 0.112 0.039       0.054 0.064 0.071 0.050 0.020 0.050 0.033 0.031 0.145       0.021 0.071 0.058 0.011 0.02
   9   ELECTRONIC   0.386 0.168 0.209 0.170 0.179 0.154 0.254 0.054       0.282 0.061 0.155 0.167 0.022 0.041 0.119 0.046 0.072 0.217 0.062 0.123 0.413 0.16
  10   DATA         0.179 0.144 0.149 0.055 0.112 0.135 0.200 0.064 0.282       0.067 0.101 0.150 0.049 0.051 0.022 0.025 0.022 0.247 0.093 0.050 0.592 0.28
  11   RESEARCH     0.167 0.161 0.094 0.093 0.110 0.067 0.064 0.071 0.061 0.067       0.024 0.052 0.148 0.111 0.040 0.021 0.094 0.018 0.013 0.052 0.029 0.03
  23   STORAGE      0.182 0.145 0.464 0.164 0.083 0.072 0.664 0.050 0.155 0.101 0.024       0.013 0.029 0.032 0.043       0.124 0.097 0.078 0.110 0.11
  35   ONLINE       0.148 0.094 0.063 0.119 0.332 0.078 0.096 0.020 0.167 0.150 0.052 0.013       0.021 0.026 0.083 0.043       0.179 0.042 0.108 0.118 0.19
  14   THEORY       0.096 0.074 0.194 0.038 0.044 0.104 0.060 0.050 0.022 0.049 0.148 0.029 0.021       0.006 0.088 0.051       0.044 0.039 0.018 0.026 0.02
  15   EDUCATION    0.108 0.115 0.092 0.227 0.108 0.047 0.045 0.033 0.041 0.051 0.111 0.032 0.026 0.006       0.067 0.005 0.035       0.026 0.110 0.036 0.02
  16   WEB          0.200 0.091 0.120 0.057 0.077 0.247 0.096 0.031 0.119 0.022 0.040 0.043 0.083 0.088 0.067       0.265 0.012 0.088 0.062 0.251       0.04
  17   NETWORKS     0.202 0.129 0.087 0.051 0.062 0.550 0.036 0.145 0.046 0.025 0.022 0.021       0.043 0.051 0.005 0.265       0.018 0.045 0.118 0.022 0.04
  62   MATERIALS    0.080 0.030 0.057 0.224 0.040 0.021 0.070             0.072 0.022 0.094 0.124             0.035 0.012                         0.048 0.01
  41   SEARCHING    0.161 0.059 0.061 0.066 0.063 0.066 0.203 0.021 0.217 0.247 0.018 0.097 0.179 0.044       0.088 0.018       0.067 0.256 0.088 0.45
  20   SOFTWARE     0.144 0.112 0.141 0.047 0.106 0.462 0.071 0.062 0.093 0.013 0.078 0.042 0.039 0.026       0.062 0.045       0.067       0.072 0.018 0.08
  21   INTERNET     0.152 0.119 0.081 0.067 0.101 0.155 0.107 0.058 0.123 0.050 0.052 0.078 0.108 0.018 0.110 0.251 0.118       0.256 0.072       0.040 0.08
  22   PROCESSING   0.093 0.107 0.079 0.052 0.114 0.122 0.222 0.011 0.413 0.592 0.029 0.110 0.118 0.026 0.036             0.022 0.048 0.088 0.018 0.040     0.13
  50   DATABASES    0.164 0.076 0.143 0.062 0.096 0.088 0.138 0.029 0.161 0.283 0.030 0.112 0.192 0.027 0.029 0.047 0.044 0.016 0.458 0.081 0.082 0.131
  29   CORPORATE    0.130 0.119 0.107 0.020 0.069 0.020 0.029 0.105 0.022 0.065 0.042 0.026       0.030       0.009 0.017       0.015 0.020
  25   MINING       0.159 0.106 0.130 0.045 0.040 0.074 0.063 0.051 0.051 0.713 0.017 0.050 0.067 0.030 0.041 0.035             0.257 0.131 0.034 0.135 0.29
  26   DIGITAL      0.158 0.100 0.199 0.393 0.110 0.084 0.167 0.019 0.165 0.039 0.008 0.199 0.120 0.020 0.049 0.052 0.016 0.216 0.043 0.070 0.023 0.101 0.03
  38   EXPERT       0.047 0.040 0.321       0.051 0.155 0.010 0.029 0.022 0.047 0.037             0.178             0.037 0.027       0.075                   0.01
  42   COLLEGES     0.142 0.055 0.069 0.154 0.078 0.017 0.081 0.059 0.058       0.057 0.043 0.108 0.011       0.179 0.020       0.063 0.033 0.023 0.053 0.05

  12   ORGANIZATIONAL  0.012 0.012 0.007 0.003 0.006 0.001 0.007 0.007 0.003 0.004 0.018 0.010 0.002 0.017 0.007 0.002 0.001 0.002       0.002 0.001 0.003
  30   CULTURE      0.136 0.110 0.094 0.021 0.059 0.021 0.029 0.100 0.015 0.074 0.035 0.026       0.021 0.026       0.017       0.015 0.021             0.01
  24   ENTERPRISES  0.140 0.148 0.081 0.013 0.071 0.116 0.019 0.678 0.007 0.043 0.075 0.034       0.036       0.024 0.141       0.013 0.054 0.010       0.01
  32   WORKERS      0.113 0.142 0.118 0.021 0.097 0.080 0.060 0.096 0.054 0.042       0.054       0.032 0.035 0.028 0.018       0.031 0.075 0.025 0.024 0.02
  33   PLANNING     0.144 0.086 0.154 0.031 0.020 0.036 0.025 0.262 0.052 0.036 0.023 0.023       0.018 0.044       0.022       0.010 0.020             0.03
  34   PROFESSION   0.157 0.090 0.014 0.089 0.128 0.028 0.027 0.024 0.048 0.008 0.016       0.064       0.132 0.025 0.047 0.017 0.027       0.044 0.011 0.02
  13   LEARNING     0.129 0.141 0.076 0.064 0.030 0.030 0.037 0.088 0.049 0.036 0.114 0.029 0.010 0.075 0.161 0.020 0.019 0.041 0.022 0.015 0.009 0.017 0.00
  36   SITE         0.166 0.070 0.087 0.040 0.046 0.242 0.064 0.013 0.066 0.016 0.008 0.038 0.041 0.041 0.033 0.786 0.277 0.018 0.058 0.041 0.176       0.03
  37   ARCHITECTURE 0.140 0.118 0.100 0.046 0.060 0.139 0.066 0.015 0.059 0.093 0.029 0.015 0.047 0.058 0.010 0.113 0.135       0.047 0.108 0.079 0.05
  27   INTELLIGENCE 0.083 0.081 0.100       0.087 0.053 0.033 0.357 0.043 0.065       0.044 0.032 0.070 0.010 0.010 0.010             0.017 0.059 0.027 0.013 0.04
  39   DECISION     0.060 0.066 0.141 0.011 0.051 0.039 0.024 0.116 0.016 0.108 0.019       0.076 0.067 0.028 0.010 0.019       0.065 0.011 0.026 0.025 0.10
  18   CAPITAL      0.093 0.145 0.068 0.030 0.034 0.025 0.024 0.176 0.006 0.068 0.043 0.021 0.011 0.034 0.021 0.015 0.007                   0.034
```

Figure 5 Core/periphery model of terms describing KM literature, 2001 - 2007

Core terms in 2001 - 2007

This period witnessed an increase in the number of terms (both in the core and periphery clusters) that were used to describe KM from 65 in the previous year period to 90, implying that all the selected terms used for the core/ periphery model analysis were associated with at least another term on the one hand and KM on the other. There was no term that was on its own, as shown in Fig. 6. This implies that most of the terms were introduced between 2001 and 2007 or have increasingly become more closely associated with KM. Seemingly, new methods and theories of KM were formulated during the 2001 -2007 period, a situation that also contributed to the introduction of several new subject terms with which KM literature was indexed in the LISTA database. Interdisciplinary research would have also contributed to the patterns exhibited in Figures 5 and 6, where all the terms were inter-linked with each other. Different technologies and tools (e.g. intranets, institutional repositories, internet, data mining tools, project collaboration software tools, expert systems, portals, etc.) are increasingly being applied to KM. Various different services, resources and systems are also falling under the umbrella of KM practices. A large number of disciplines have become contributors and/or utilisers of KM theories and methods. This diversity is therefore likely to complicate the search for a unified definition of KM within the context of LIS.

A comparison of the core terms in Fig. 3 and Fig. 5 reveals that whereas the number of terms has increased from 26 to 28, there are seven terms in Fig. 5 that did not feature in Fig.

3, namely: research, web, materials, searching, Internet, corporate, and digital. The terms that featured in Fig. 3 but did not comprise the core terms in Fig 5 include: academic, enterprises, analysis, decision, and universities. A relatively high number of terms have been consistent in their appearance in the cluster of core terms, e.g. resources, technology, systems, libraries, retrieval, services, computers, business, electronic, data and expert. The emergence and high ranking of the web and Internet in 2001 - 2007 heralds new approaches of KM. This may also imply the shift in the type of resources that are increasingly managed by various knowledge managers. Information has grown increasingly available via the Internet, and more so the World Wide Web, requiring new approaches and techniques in its management. The use of the Internet and the web in managing knowledge and information has therefore become common in the LIS profession.

One other aspect worth mentioning is that the strengths of association for the majority of the core terms in 2001 - 2007 were below average (i.e. 0.5). The highest strength of association (i.e. 0.713) was recorded between *data* and *mining* followed by *storage* and *retrieval* (0.664), and *computer* and *networks*. Apparently, data mining and information storage and retrieval increasingly became the core activities of KM within the LIS profession in that time frame. The core concepts that can be used to describe KM in the information age include those highlighted in Fig. 6 (as circled and outlined).
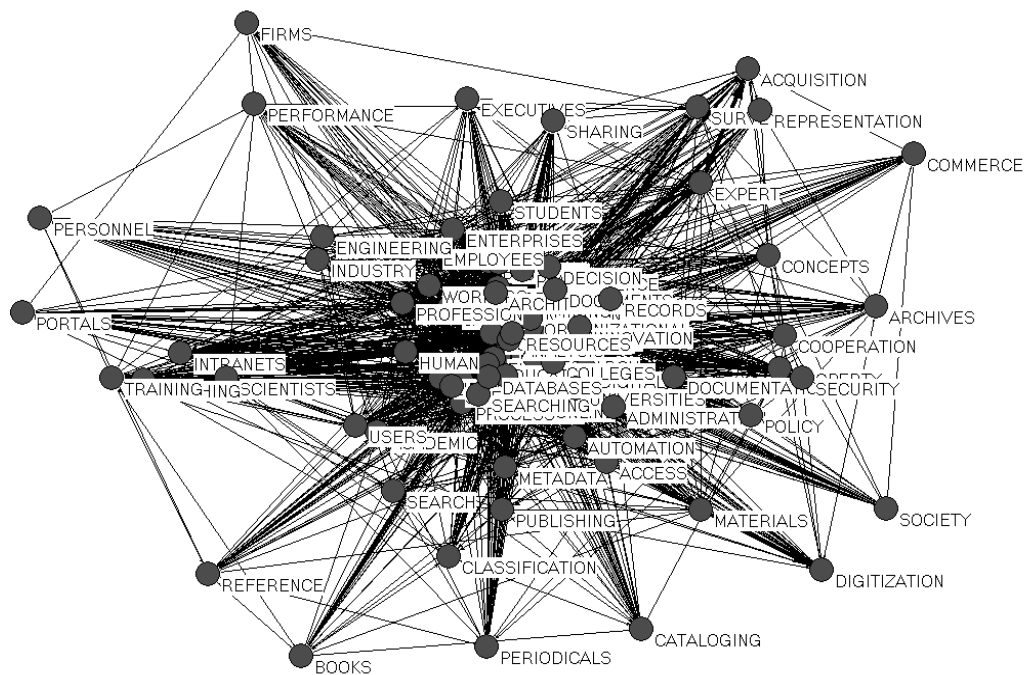
Figure 6 Visual map of core/periphery terms describing KM literature, 2001-2007

Conclusion and recommendations

The terms that frequently co-occurred with KM, in descending order of intensity, include: information resources management, information science, information technology, information services, information retrieval, library science, management information systems, organisational learning, and data mining, to name a few. These and several other terms are indicative of the LIS professionals' perception or understanding of KM. It was also observed that LIS professionals view KM's scope to encompass institutions that practice KM (libraries, information services, universities and colleges, business enterprises, archives, etc.); activities or processes (information retrieval, organisational learning, data mining, electronic data processing, database searching, knowledge acquisition, information organisation, documentation, knowledge representation, library automation, information sharing, classification, website development, etc.); different types of management and/or management functions (e.g. information resources management, industrial management, records management, information services management, database management, personnel management, document management, resource management, and library administration); and people engaged in KM (knowledge workers, information professionals, librarians, executives, information scientists, library employees, etc.) in LIS-related disciplines or subject domains (e.g. information science, information technology, library science, business, management science, education, and computer science). This essentially forms the basis on which KM can be defined in the context of LIS.

Thus, knowledge management is a discipline that involves the management and organisation of knowledge or information through services, activities and processes of knowledge-based institutions fulfilled by knowledge workers in various disciplines or subject domains such as information and library science. Furthermore, the core/ periphery model analysis of the terms that most frequently co-occurred with KM produced the following terms: resources, technology, libraries, systems, services, retrieval, computers, electronic, data, and storage. All these terms play a big role in KM practices and processes in the information age.

In conclusion, LIS scholars view KM as consisting largely of the management of information resources, services, systems and technologies using various technologies and tools through activities such as information acquisition/ creation, information retrieval and storage, data mining, classification and cataloguing, and information use in different information handling institutions or centers such as libraries, archives and museums. These activities are carried out by information professionals (e.g. librarians, archivists, knowledge workers, executives, etc.). Skyrme in Gu (2004:171) concurs, suggesting that KM is about:

• Managing information – explicit/ recorded knowledge;

- Managing processes – embedded knowledge;
- Managing people – tacit knowledge;
- Managing innovation – knowledge conversion; and
- Managing assets – intellectual capital

Anderson & Perez-Carballo in Schneider & Borlund (2004:524) state that: "A knowledge organisation within library and information science denotes classification, indexing, and cataloguing, applied to storage, access, and retrieval of documents in information retrieval systems." Indeed, although only 'classification' featured among the top 100 subject terms, 'cataloguing' co-appeared with KM 9 times while 'indexing' co-occurred 8 times. 'Abstracting' appeared only twice. We did, however, observe that KM processes were overwhelmingly information retrieval oriented, which may combine the areas of knowledge organisation listed above. In a nutshell, KM focuses on IRM; its major functions are people and document/ records management oriented; and it largely involves IR processes while the resources and systems managed are overwhelmingly IT (conduit, content, networks, etc.) oriented. We believe that a survey involving LIS professionals is necessary to ascertain whether the observations made in this conclusion about KM practices, activities and processes within library and information science/ studies are valid. The findings of this study can only be validated through such a survey. Still, can informetric methods be applied to define a concept? We think it is possible.

To improve the inter-disciplinary understanding of KM, further research employing analytic approaches as those used in this study is recommended to examine how other professions, such as computer science, business, management science, financial management, information technology and systems, etc., view KM.

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Indigenous knowledge research in Kenya and South Africa: an informetric study

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1 Introduction

Knowledge management is growing increasingly popular in all sectors of the global economy because of its confirmed importance in fostering knowledge creation, codification and transfer, and because of its ability to greatly improve the knowledge capital of an organisation. We believe that Indigenous Knowledge (IK), which forms part of knowledge management, has crucial functions and importance in the knowledge management process (creation/ production, storage, processing/ codification, transfer and utilisation) and therefore requires significant attention.

Despite emerging interest in IK, not enough is known about how IK is managed, particularly in developing countries like Kenya. For example, issues relating to IK policies and legislation (e.g. IPR), structures, research, literacy, education and training, and diffusion and use (e.g. information centers and media) that reflect on IK recognition, appreciation and protection, are not readily known (or available). Part of the problem stems from the realities of living in a developing country; most indigenous people live in rural and marginalised areas where modern forms of communication are relatively unavailable. This is compounded by high levels of ignorance and illiteracy (Mbeva, 2000:7).

Issues pertaining to the recognition, protection and appreciation of IK are therefore very crucial at national level. Awareness of this led to the South African government's involvement with the establishment of IKS policy and a dedicated IKS office. The same cannot be said for Kenya, where there is no known IKS policy or legislation. As Mbeva (2000:5) observes, the current Intellectual Property Rights (IPR) system in Kenya does not adequately recognise or protect the indigenous people and local communities' rights in terms of their knowledge and innovations. Our findings suggest that there has not been any extensive information and knowledge-based study on IK conducted in Kenya. Existing studies have mainly focused on ethnic cultures (Munyi, nd & Mutta, nd), environmental conservation (Muhando, 2005), legal aspects (Odeck, 2001), and IK and African libraries' ICT issues (Omole, nd).

1.1 What is Indigenous Knowledge?

Semali and Kincheloe (1999:3) believe that Indigenous Knowledge reflects, "The dynamic way in which the residents of an area have come to understand themselves in relationship to their environment and how they organise that folk knowledge of flora and fauna, cultural beliefs, and history to enhance their lives". Smith (1999:7) suggests that Indigenous Knowledge is a term that internationalises the experiences, concerns and struggles of some of the world's colonised peoples. The National Research Foundation is more universal in its approach, defining it as: "A complex set of knowledge and technologies existing and developed around specific conditions of populations and communities indigenous to a particular geographic area." Ocholla and Onyancha (2005:247), in turn, view IK as: "A dynamic archive of the sum total of knowledge, skills and attitudes belonging to a community over generations and expressed in the form of action, object and sign languages for sharing." They lament that "Indigenous Knowledge (IK) has been neglected, vindicated, stigmatised, illegalised and suppressed among the majority of the world communities" (Ocholla and Onyancha, 2005:248).

Characteristics and functions of IK

It is important to point out that IK is not confined to tribal groups or the original inhabitants of an area; nor is it confined to rural people. Any community possesses IK, whether rural or urban, settled or nomadic, original inhabitants or migrants (IIRR, 1996). It is based on ideas, experiences, practices and information that have been generated either locally or elsewhere, and subsequently been transformed by local people and incorporated into their way of life (Ina Hoi Riwa Foundation, 2000) and/or expressed in local languages (Langill, 1999). It is therefore difficult to transmit IK to those who do not share the languages, traditions and cultural experiences of a group or community (SARDC, nd.). Thus IK is local because it: i) Is anchored in a specific community; ii) Is established within the boundaries of broader cultural traditions but still developed by a specific community; iii) Often consists of intangible knowledge that is not easily codified and is conveyed orally; iv) Consists of experimental knowledge as opposed to theoretical knowledge; v) Is learnt through repetition; and iv) Changes continuously – created and recreated, discovered and lost - even though outsiders believe it to be static (World Bank, 1998:9). IK is embodied in various forms through which it is represented and expressed. For example, according to Kok (2005:7-8), IK is mainly expressed through beliefs, medicine, knowledge technology, education, communication, agriculture, food technology, arts and crafts.

Indigenous Knowledge is gradually gaining greater research support because of its functions and importance. Gupta (2000:6) divides its functions into six categories:

     i. Semiotic - communication through symbols, art-forms, crafts, etc.;

ii. Institutional - providing rules coded in rituals and/or other cultural and social sanctions. Some of these rituals and cultural sanctions institutionalise incentive measures for the use of traditional knowledge, just as IPRs do. These sanctions can be material, such as fines or penalties, or ethereal, such as the fear of God;

iii. Configurational. This is where the arrangement of various life processes and stages are performed according to traditional norms, leading to (more or less) predictable social outcomes;

iv. The use of utilitarian knowledge about various plants or animal products for various food, nutritional or health needs;

v. Situational - during emergencies or other contingencies, codes of conduct may be specified to maintain social order and responsibility towards other life forms, including wildlife.

vi. Religious and spiritual functions which may or may not involve material objects. Since society has to adapt to new trends from time to time, traditional systems of culture, technology and social exchange provide some scope for experimentation, deviance and variation. The same set of incentives may not help in nurturing each of these functions.

An extension of the functions of IK can be expressed through its importance. The World Bank (2004:1) highlights the importance of IK as follows:

> Indigenous knowledge provides the basis for problem-solving strategies for local communities, especially the poor; it represents an important component of global knowledge on development issues. IK is an underutilised resource in the development process. Learning from IK, by investigating first what local communities know and have, can improve understanding of local conditions; provide a productive context for activities designed to help the communities; understanding IK can increase responsiveness to clients; adapting international practices to the local setting can help improve the impact and sustainability of development assistance; sharing IK within and across communities can help enhance cross-cultural understanding and promote the cultural dimension of development and most importantly, investing in the exchange of IK and its integration into the assistance programs of the World Bank and its development partners can help to reduce poverty.

Various studies on IK (from diverse perspectives) have been carried out at both international and national levels. Examples of recent international studies have covered subjects spanning religion (Clack, 2005), curricula (Joseph, 2005), culture (Lillejord & Sørede, 2003; Mendoza, 2001), legal systems (Gupta, 2000a; Gupta, 2000b), disability (Enwereji, 2000), agriculture (Gerritsen, 2000) and policy (Vivekanandan *et al.*, 2004). International

organisations have also come on board and instigated new IKS initiatives, such as those initiated by the World Bank and UNESCO.

Similar studies can be found in Africa covering agriculture (Ashley, 2000; Weiderman, nd), curriculum development (Gitari, 2003; Wyk, 2005), ICTs (Ngulube, 2004; Cosijn *et al.*, nd; Chisenga, nd), policy (Phiri, nd), access (Magara and Ikoja, nd; Raseroka, nd), peace and development (Mascarenhas, 2004; Castiano, 2005), and knowledge management (Ocholla and Onyancha, 2004; Kaniki and Mphahlele, 2002; Meyer, nd), to name a few. Mapping and auditing IK studies continues to be a major challenge that we believe can be overcome with a proper IK recordal system. Such records can then be bibliometrically analysed.

Purpose of the study is to determine the status, trends and types of IK research in both Kenya and South Africa.

2 Methodology

An informetric analysis was applied to capture the IK research output of two countries, namely Kenya and South Africa.

In order to determine the trends and types of IK research in Kenya and South Africa, an analysis of IK records was carried out according to the distribution of IK records by data-base, document type, institution, and the trend of IK literature from 1990 to 2008.

Two types of databases were selected for this study, the first consisting of international databases – OCLC (Online Computer Library Center) MEDLINE, AGRICOLA and WorldCat – and the second, national databases in SA and Kenya. South Africa's databases were all selected from the Southern African Bibliographic Information Network (SABINET), i.e. Current and Completed Research (CCR), Union Catalogue of Theses and Dissertations (UTD), and Index to South African Periodicals (ISAP); while only the Greenstone Database was selected in Kenya's case.

Two keywords, *indigenous knowledg*e and *traditional knowledge*, were used in all the databases to retrieve relevant bibliographic information. Geographical terms (Kenya and South Africa) were added to these keywords when searching the international databases.

Generally, the steps followed to generate results were as follows:
• The relevant keywords were identified in order to download data
• Relevant variables were selected based on the objectives of the study
• The retrieved data was stored in appropriate formats using Microsoft Word and Excel spreadsheets
• Data was cleaned. Duplicates and irrelevant records were removed
• Data was analysed using Microsoft Excel software according to the set objectives
• The results were graphically presented in tables and figures.

3 Results and discussions

This section presents the findings and discussions under the following subheadings:

- Distribution of IK records by database
- Distribution of IK records by trend
- Distribution of IK records by institution
- Distribution of IK records by document type
- Distribution of IK records by subject domain.

3.1 Distribution of IK records by database

This measured the extent to which IK sources were distributed or covered in the two countries. The cited databases were analysed as per (the number of) records generated. A otal of 381 IK documents were downloaded. Greenstone produced 210 records (55%), followed by WorldCat with 79 records (21%) and OCLC with 63 records (17%). Medline and Agricola generated 23 (6%) and 6 (2%) records respectively. Greenstone Database, which yielded the most IK-related documents, deals specifically with theses and dissertations at Masters and Doctorate levels. It also deals with all Kenyan research carried out within and outside Kenya.

The South African IK output amounted to a total of 851 IK records downloaded as follows: SAE-Publications, 261 records (31%); OCLC, 164 records (19%); ISAP, 163 (19%); WorldCat, 111 (13%); CCR, 81 (10%); UCTD, 34 (4%); AGRICOLA, 25 (3%); and Medline, 7 (1%). This is reflected in Table 1 below**.**

Table 1 Coverage of IK records in databases

	Kenya (N=381)		South Africa (N=851)	
Database	Records	%	Records	%
AGRICOLA	23	6.0	25	2.9
CCR			81	9.5
Greenstone	210	55.1		
ISAP			163	19.2
Medline	6	1.6	12	1.4
OCLC	63	16.5	164	19.3
SAePublications			261	30.7
UCTD			34	4.0
WorldCat	79	20.7	111	13.0
Total	381	100	851	100

The inclusion of both international and national databases was primarily done to assess the visibility of IK research. With IK being as "neglected, vindicated, stigmatised, illegalised and suppressed among the majority of the world communities" (Ocholla and Onyancha,

2004:248) as it is, efforts are being made by some to counter this situation. Most of this can only be achieved through integration with other forms of knowledge.

Although local databases represented the highest number of records (e.g. Greenstone with 55.1% in Kenya and SAePublications with 30.7% in South Africa), international databases also yielded significant representation (WorldCat yielded 20.7% for Kenya and OCLC generated 19.3% for South Africa). However, it should be repeated that although Greenstone had the most records, it is not an IK database; it was developed to cover all research being undertaken in or by the country.

3.2 Trend of publication of IK literature

A total of 381 records were downloaded for Kenya and 851 for South Africa for the period between 1990 and 2008. The results in the graph below show the remarkable progress of South Africa, particularly in the period between 2001 and 2007. The drop in 2008 could have been caused by the processing procedures that all publications have to follow when databases are updated. On the other hand, the rise in the number of publications from 2001 could be attributed to government interventions such as the development of the National Indigenous Knowledge Systems Office (NIKSO) which advocates the promotion and protection of IK, and the efforts of the National Research Foundation (NRF) which oversees funding for IK research. The same applied to the international scene as alluded to earlier in the text.

The Kenyan trend does not appear to be progressive; there were no signs of growth, perhaps stemming from obstacles such as the lack of IK legislation and funding, lack of coordination in terms of the research being carried out, and also the lack of an IK database.
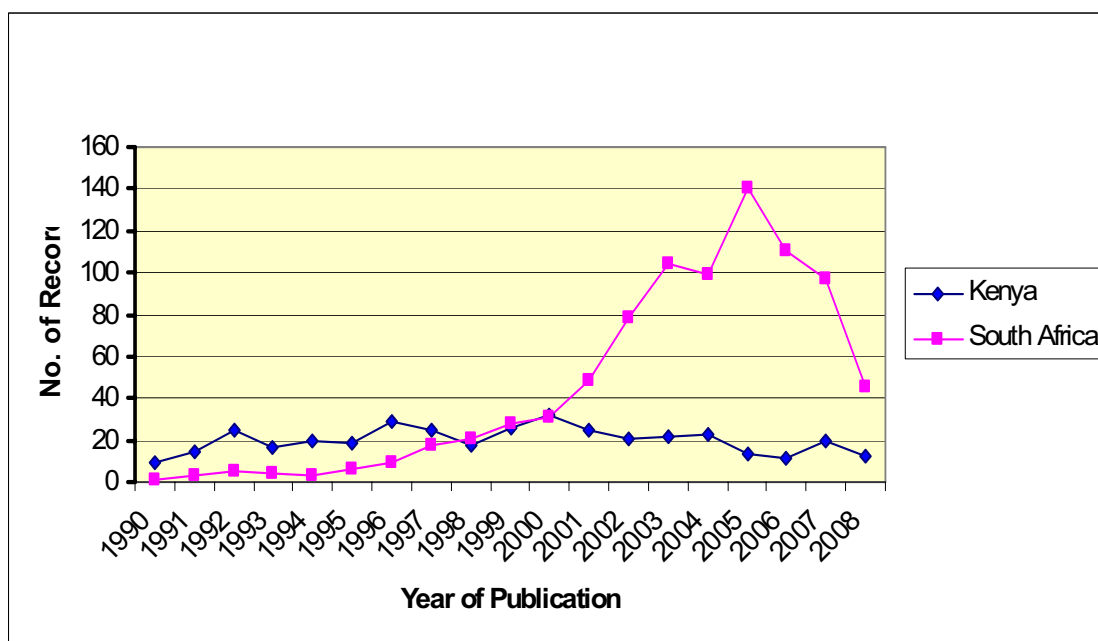
Figure 1 Trend of publication of IK literature, 1990 - 2008

3.3 Distribution of IK records by institution

Institution here refers to the source of the record, in other words the institution that produces the publication. 210 records were generated from 52 universities. 6 universities were Kenyan, namely Kenyatta University, which had the highest number of records (85), followed by the University of Nairobi (31), Moi University (5), Catholic University of East Africa (2), the Jomo Kenyatta University of Agriculture and Technology and Daystar (1 record each; 11.5%). The remaining institutions were foreign universities based in the USA, the UK, and Canada, which together generated 88.5% of the total research output. The inability of the Greenstone Database to capture research undertaken elsewhere in Africa, and particularly South Africa, makes it seem rather incomprehensive. Table 2 below illustrates which universities contributed the 210 (40.5%) records via the Greenstone Database.

Table 2 Coverage of IK records in institutions- Kenya (N=210)

INSTITUTION	No. of Records	%
Kenyatta University	85	40.5
University of Nairobi	31	14.8
University of Toronto, Canada	7	3.3
Moi University	5	2.4
McGill University, Canada	4	1.9
Saint Mary's University, Canada	4	1.9
Asbury Theological Seminary	3	1.4
Pennsylvania State University, USA	3	1.4
University of Florida, USA	3	1.4
University of California, Berkeley, USA	3	1.4
University of South Florida, USA	3	1.4
Florida State University	2	1.0
Catholic University of Eastern Africa	2	1.0
Cornell University, USA	2	1.0
Mid-America Baptist Theological Seminary, USA	2	1.0
Howard University, USA	2	1.0
Open University, UK	2	1.0
Rice University, USA	2	1.0
Southwestern Baptist Theological Seminary, USA	2	1.0
United Theological Seminary	2	1.0
University of Alberta, Canada	2	1.0
University of British Columbia, Canada	2	1.0
University of London, UK	2	1.0
University of Cincinnati, USA	2	1.0
University of Edinburgh, UK	2	1.0
University of Oregon, USA	2	1.0
University of Pittsburgh, USA	2	1.0
University of St. Michael's College, Canada	2	1.0
University of Virginia, USA	2	1.0

Andrews University, USA	1	0.5
Bowling Green State University, USA	1	0.5
Daystar University	1	0.5
East Angalia University, UK	1	0.5
Fuller Theological Seminary	1	0.5
Makerere University, Uganda	1	0.5
Northwestern University, USA	1	0.5
University of Arkansas, USA	1	0.5
Stanford University, USA	1	0.5
Trinity Evangelical Divinity School, USA	1	0.5
Tufts University, USA	1	0.5
Jomo Kenyatta University of Agriculture and Technology	1	0.5
University of New Brunswick, Canada	1	0.5
University of Pennsylvania, USA	1	0.5
Universitat fur Bodenkultur, Austria	1	0.5
University of California, Santa Cruz, USA	1	0.5
University of Chicago, USA	1	0.5
University of Strathclyde, UK	1	0.5
University of Connecticut, USA	1	0.5
University of Essex, UK	1	0.5
University of Western Ontario, Canada	1	0.5
Wageningen University, The Netherlands	1	0.5
West Virginia University, USA	1	0.5
	210	**100.0**

Table 3 shows South Africa's institutional affiliations in the CCR database which specifically deals with research. 16 universities contributed IK records to the database. North-West University (Mafikeng Campus) topped the list with 13 publications (16.0%), followed by the University of Natal and the University of South Africa (both with 9; 11.1%). The University of the Witwatersrand and Stellenbosch University tallied with 7 records each (8.6%), followed by three universities with 6 records each (7.4%), i.e.: Rhodes University, University of Natal (DBN), and the University of Pretoria. These were followed by three universities with 4 records each (4.9%), i.e. Nelson Mandela Metropolitan University, University of KwaZulu-Natal (Westville) and the University of Port Elizabeth. The University of Zululand produced 3 records (3.7%), while Rand Afrikaans University, Technikon Pretoria, and the University of the Western Cape each generated 1 record (1.2%). However, it should be pointed out that an in-depth analysis and/or index of the research output of each institution could paint quite a different picture. For example, a recent analysis of Indigenous Knowledge research output at the University of Zululand from 1981 to 2007 by Ocholla and Onyancha (2008) revealed that there is evidence of IK research publication from that institution that

constitutes 5.9% (153 of 2598) of the total number of publications captured by the research unit from 1981 - 2007.

Table 3 Coverage of IK records in institutions - South Africa (N=81)

	Institution (N=16)	No. of Records	%
1	North-West University (Mafikeng Campus)	13	16.0
2	University of Natal (PMB)	9	11.1
3	University of South Africa	9	11.1
4	University of the Witwatersrand	7	8.6
5	Stellenbosch University	7	8.6
6	Rhodes University	6	7.4
7	University of Natal (DBN)	6	7.4
8	University of Pretoria	6	7.4
9	Nelson Mandela Metropolitan University (Summerstrand Campus South)	4	4.9
10	University of KwaZulu-Natal (Westville)	4	4.9
11	University of Port Elizabeth	4	4.9
12	University of Zululand	3	3.7
13	Rand Afrikaans University	1	1.2
14	Technikon Pretoria	1	1.2
15	University of the Western Cape	1	1.2
		81	**100**

While SABINET's UCTD could be analysed in this category, it did not qualify because of lack of information pertaining to institutional affiliation. As for Kenya, the Greenstone Database qualified because it provides information on institutional affiliations that resemble the CCR due to its specific research orientation. The only difference in Greenstone's case is that it takes into account theses and dissertations that reflect research undertaken in Kenya and by institutions located outside of Kenya (Kenya Information Preservation Society, 2008).

3.4 Distribution of IK records by document type

Most of the records from Kenya consisted of theses and dissertations, amounting to 231 records out of a total of 381 (60.6%). Other document types included books (52; 13.6%), journals (51; 13.4%), government publications (8; 2.1%), videos (6; 1.6%), e-books (5; 1.3%), and conference publications (3; 0.8%). There were, however, 25 (6.6%) records that did not indicate the source. In South Africa's case, journals topped the list with 391 (45.9%) records out of 851, followed by theses and dissertations (203; 23.9% records). Further down the line were books (88; 10.3%), conference publications (33; 3.9%), videos (16; 1.9%), government publications (14; 1.6%), and international government publications (13; 1.5%).

There were also a few publications from e-books (8; 0.9%) and computer files (2; 0.2%). 83 (9.8%) records were unaccounted for.

Table 4 Coverage of IK records by document type - Kenya (N=381) and South Africa (N=851)

Document type	Kenya		South Africa	
	No. of Records=(N=381)	%	No. of Records	%
Thesis/Dissertation	231	60.6	203	23.9
Books	52	13.6	88	10.3
Journal Articles	51	13.4	391	45.9
Government Publication	8	2.1	14	1.6
Video	6	1.6	16	1.9
Conference Publication	3	0.8	33	3.9
E-Books	5	1.3	8	0.9
International Government Publication	0	0.0	13	1.5
Computer File	0	0.0	2	0.2
Anon	25	6.6	83	9.8
	381	**100.0**	**851**	**100.0**

In Kenya's case, theses/dissertations topped the list with 231 (60.6%) records, most of which were yielded by the Greenstone Database (i.e. 210). Although there were other document types, these were quite minimal, possibly because of the poor contribution or the non-participation of scholars in publication. Journal articles topped the list in South Africa, perhaps because of the government's support (for academic institutions) through funding incentives and also because of some universities' stringent requirements that both students and staff should publish. Financial support (whether full or partial) is a strong motivating factor that has led to a rise in journal publishing, especially in South African Post Education (SAPSE) accredited journals.

3.5 Distribution of IK records by subject domain

IK research is diverse and can be covered in various subjects. IK was therefore divided into six broad categories to facilitate easier identification and to discover the nature of the research undertaken in popular and neglected areas, and how the latter can be addressed in order to avert any foreseeable crises. The categories were classified as agriculture (IK in crops, plants, the ecosystem, extension, pastures, fisheries, etc.); culture (religious and related issues, ceremonies, customs, folklore, language, traditions, diet, social aspects, people, gender, etc.); education (child or adult education, i.e. primary, secondary and tertiary education, history, pre- and post-colonial aspects, philosophy, psychology, etc.); environment (everything that links to biodiversity, bio-prospecting, forestry, etc.); law (issues of Intellectual Property Rights, innovation, patents, governance, policies, legislation, etc.); and

health and medicine (alternative medicine, healing, herbal medicine, medicinal plants, and all factors that affect human and animal health).

In Kenya's case, culture-oriented records yielded the most number of records (157; 41.2%), followed by health and medicine related records (80; 21.2%), environment (46; 12.0%), agriculture (44; 11.5%), education (39; 10.2%) and law-related records (15; 3.9%). For South Africa, the leading subject was culture (264; 31.0%), followed by health and medicine (182; 21.4%), education (181; 21.3%), law (103; 12.1%), agriculture (62; 7.3%) and the environment (59; 6.9%). This is reflected in Table 5.

Table 5 Coverage of IK records by subject - Kenya (N=381) and South Africa (N=851)

	Kenya		South Africa	
Subject	**No. of Records**	**%**	**No. of Records**	**%**
Culture	157	41.2	264	31
Health & Medicine	80	21	182	21.4
Environment	46	12.1	59	6.9
Agriculture	44	11.5	62	7.3
Education	39	10.2	181	21.3
Law	15	3.9	103	12.1
	381	**100**	**851**	**100.0**

IK records with a cultural focus topped the list in both countries, presumably because the majority of the publications touch on issues that are crucial to the social wellbeing of people. Traditions also still play a very important role and affect everyday life, hence the interest in the subject. For instance, Kinama (2004:51) highlights the diverse opportunities brought about by IK, such as the problem solving strategies applied by local communities, particularly in the case of the rural poor. A case in point is land use conservation, where shifting (from area to area) was done to prevent land from overuse or repetitive cultivation throughout the season, but this is difficult to sustain now as population density increases with less land to share. Land was normally left uncultivated for vegetable or plant manure accumulation (Ayayo, 2004:40). This practice was and is still used to ensure continuous soil fertility.

4 Conclusion

IK research appears to be gaining momentum, albeit at a slow rate. The cited databases in South Africa are part of a much larger number of databases. Many institutions have a database of some kind related to medicinal plants and traditional medicines, including the CSIR, National Botanical Institute (NBI), Medical Research Council (MRC), Agricultural Research Council (ARC), as well as most universities and technikons (Universities of Technology). Often, these databases have no reference or network that links one to the other.

Kenya lacks a single cohesive IK database and therefore has to rely on the few Kenyan databases that exist, e.g. the Greenstone Database which takes into account all the research (irrespective of subject) carried out in Kenya and by Kenyans within or outside the country. In the case of South Africa, there is no dedicated IKS database, but there are quite a number of local databases under SABINET for local research (851 records). The fairly recent introduction of an IK journal, *Indilinga* (http://www.indilinga.org.za/), is a major boost.

International databases captured a significant number of publications from Kenya (171 or 45% out of 381), an indication that Kenyan research is slowly gaining visibility on the web and that Kenyan scholars prefer publishing in international journals. This can also be interpreted to mean the opposite, as it could also indicate that there may be some inadequacies with respect to technical IT skills (e.g. technophobia, ICT illiteracy) and the lack of formal, well defined processes for knowledge management, e.g. knowledge generation, capturing, and recording in Kenya. As for South Africa, the international databases captured 307 (36%) records, suggesting the confidence scholars place in local databases and also the significant visibility of IK content on the international scene. However, there was also evidence that even while IK research was being carried out, some of it was not being captured by the local databases, suggesting loopholes and inconsistencies in the recordal systems in both countries.

Reflecting on the Kenyan trend in terms of research output from 1990 to 2008, stagnation may have been caused by the introduction of private course programmes in 1998 (Kiamba, 2003:5) in all public universities, which may have reduced scholarly research output because of the financial gains teaching staff could make by doing these modules, leaving most exhausted after teaching. The private program, otherwise known as Module II, was designed to operate from 5.30 to 8.30 pm from Mondays to Fridays and full days on Saturdays; some faculties also opted to extend their teaching to include Sundays. The introduction of this module would generally have left scholars with little or no chances to publish and caused delays in the supervision of research.

As for South Africa, the rise in the number of publications from 2001 could be attributed to diverse government interventions, e.g. how SAPSE financial gains at university level water down to individual level and motivate publication (see Ocholla and Omwoyo, 2008:10). The IKS policy in place also puts a lot of emphasis on research (please refer to sections 2.4, 4.5, 5.1, 7.3, 8.6).

Research output by document type indicates that theses topped the list with 231 records out of a total of 381 (60.6%), a reflection of the poor publishing and reading culture in Kenya. The South African case is quite different, with journals topping the list with 391 records out of 851 (45.9%) – reasons have been touched on in the previous paragraph.

Culture-oriented research topped the list in both countries, with Kenya's culture-oriented records amounting to 157 (41.2%), followed by health and medicine related records (80; 21.2%). South Africa contributed 264 (31%) culture-oriented records and 182 (21.4%) health and medicine records. Indigenous knowledge, which is embedded in culture and is also part of health and medicine, proved very difficult to isolate.

Kenya has sound existing research and academic institutions that could potentially play a vital role in promoting, recognising, developing and protecting IKS within national, regional and international Diasporas. This would water down to grass roots level, ultimately leading to economic benefits. The lack of an IK database and legislation poses obstacles to the development of IK in terms of research and development. With this in mind, an IK database that acts as a single point of entry to all research carried out in Kenya is in urgent need of development. Further research should be carried out on the most effective ways and means to link various institutions in Kenya, the government, and all related stakeholders.

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Chapter Eight

The relationship between user studies, Information seeking behavior, and information architecture, with special reference to web design

Janneke Mostert

Introduction

The global embrace of the Internet, and specifically the World Wide Web, has led to a proliferation of websites that aim to attract the attention of potential clients. Generally, a well designed website aims to provide the client or user with a seamless experience, allowing him or her to effortlessly navigate the site and find information. The reality, however, is that the user often leaves a search engine or a website having either been frustrated by the amount of information available, unable to trace the information they require, or unable to successfully negotiate the user interface. Information architects, as the designers of websites and its navigational structures, have therefore long since started relying on user studies to enable them to understand what is required by the user for a successful information seeking experience.

Conceptualisation

In 1975, Richard Wurman, a trained architect with a keen interest in the way information is gathered, organised and presented to convey meaning, coined the term 'information architecture' (Simon, 2008). Lying dormant till 1996, the term was revived by two library scientists, Lou Rosenfield and Peter Morville, who used it to describe their activities while structuring large-scale websites and intranets. Although still strongly associated with websites and intranets, the term can also refer to any information structure or computer system.

Information architecture describes the structure of a system, i.e. the way in which information is grouped, the methods used to navigate the information, and the terminology used within the system. Because its primary aim is to enable users to effortlessly work their way through a system, confident that they are getting closer to what they desire, information architecture is not meant to be a visible part of the design of a website; it only becomes visible when a user cannot navigate his/her way through a system (Barker, 2005a).

Information architecture consists of the following:

- The organisation, labeling, and navigation schemes within an information system
- The structural design of an information space to facilitate task completion and intuitive access to content

- The art and science of structuring and classifying websites and intranets to help people find and manage information (Barker, 2005a)

Although perceived as a specialist position, information architects also include:
- Intranet designers and managers
- Website designers and managers
- Visual designers
- Other people designing information systems
- Programmers
- Librarians
- Technical writers (Barker, 2005a).

User and information seeking behaviour studies – an overview

Studies on information needs and information seeking are a core component of research in information studies. Information seeking is as old as the human race, but its roots as a research agenda in the field of Library and Information Science are relatively new, dating back to the early 1940's. The initial focus was on collection development and how this could improve services and systems, but the attention soon switched to the physical information system and how this could provide the required information. Commonly known as the system-oriented paradigm, this paradigm over-simplified the information seeking process by using a model where the user simply entered a query and received matching results (Bates, 2002). While describing one aspect of the search process correctly, namely that of the system, this model failed to take into account human factors such information needs, human behaviour and situations, and gaps in knowledge.
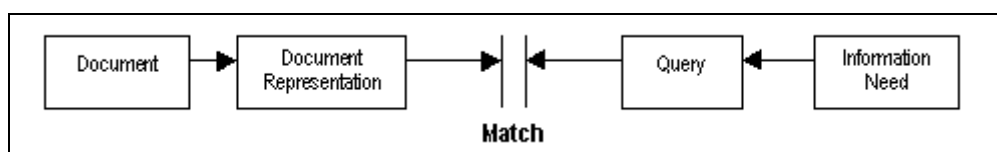
Figure 1 Source: Robertson in Kalbach, 2000

Because it mainly aimed to obtain knowledge to support organisational development and administrative decision-making, the approach was criticised for its lack of sufficient theories, concepts and research methods. It was also criticised for not considering the needs of the individual while searching for information (Eskola, 2009).

The end of the 70s and early 80s introduced a paradigm shift, with new concepts and research models focusing more on the user rather than the system. This new paradigm, also known as the cognitive view, focused on the user of information and his/her needs, concentrating more on the cognitive processes required to find information (Eskola, 2009).

Kalbach (2000) identified some noteworthy research paradigms marking this shift:

- Brenda Dervin's Sense-making model, proposed in 1972, focused on the behaviours exhibited by people in their everyday experiences. This model was developed by analysing a broad spectrum of complex human activity. Its aim was to understand user situations, gaps in knowledge, and information utilisation.
- Nicolas Belkin (1980) focused on information seekers, some of whom could be experts in a given information system, and their inability to formulate queries to access the information they require. Called the Anomalous State of Knowledge (ASK), he argued that the problem lies with the information system and not the information seeker.
- Robert Taylor (1984/85) used a value-added approach for information seeking, placing the user's problems at the core and showing how the perceived utility and value a user derives from a system influences their decisions.

The cognitive view, while addressing human information needs, neglected the holistic nature of humans (e.g. cultural and social contexts) and how this influences all information seeking behaviour (Cappurro, 1992; Eskola, 2009). The net result was an explicit call for more holistic approaches. These models of information seeking behaviour are aptly described in literature. According to Aina (2004), recent information seeking models mainly focus on how to improve information access to users. Therefore, most of these models seem to focus on the process of active information seeking, benefits derived from obtaining data during the information seeking process, and practical issues such as stages, mechanisms, processes, channels, sources and barriers involved when searching for information (Case *et al*., 2005; Mackenzie, 2002).

The digital information environment, specifically the Internet, introduced new challenges that made it necessary to revisit existing models that describe information seeking behaviour. Recent years saw a number of prominent theories and models that focus on information seeking behaviour in a digitised environment. This has not only provided an insight into user patterns, but also opened up many possibilities for interface design.

Information seeking behaviour models informing web information seeking
Although many models exist, only four models will be discussed in this chapter. Some of these models are more general and do not always approach web information seeking behaviour directly, but all of these models are relevant to those wishing to gain an insight into web utilisation.

Bates' Berrypicking model (1989)

Marcia Bates' (1989) Berrypicking model is perhaps outdated in many respects, but it can still be applied to describe a typical Internet search. This model proposes that real life searches do not follow a linear pattern, instead they evolve. Thus when a user discovers new information, he or she can change his or her ideas or directions, which has the potential to lead to new queries. By using different sources, new bits and pieces of information are picked up that force the user to constantly modify their search (hence the reference to berrypicking) [Bates, 1989]. The final outcome may therefore not match the original query because of alternate queries that emerged from the information discovered during the search process.
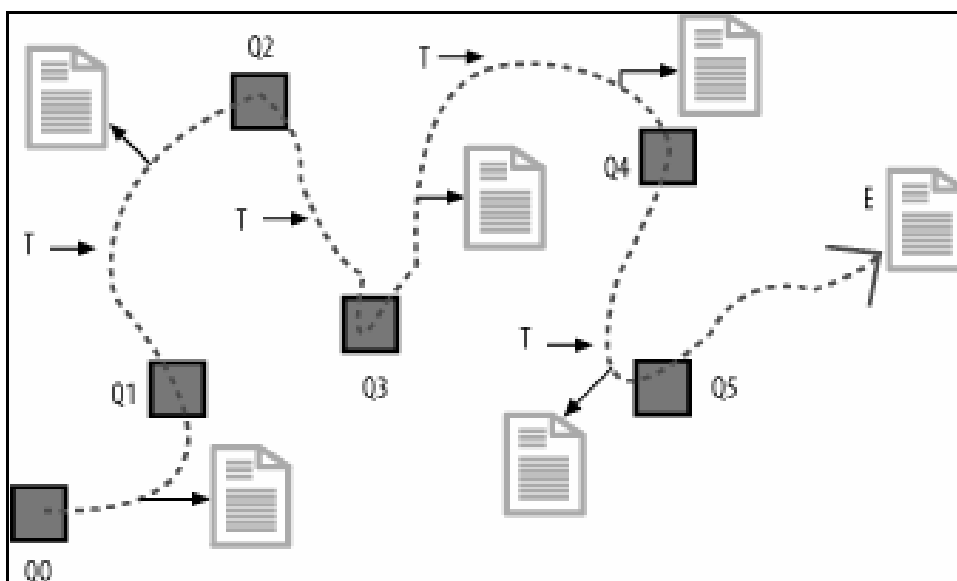
Figure 2 Information searching process (Poteet, 2006)

Bates identified six main strategies in a 'real life' searching process, namely:

- **Footnote chasing:** looking at the footnotes of a paper for more sources
- **Citation searching:** looking for other papers that cite from the same source
- **Journal run:** methodically searching through each journal for the intended topic
- **Area scanning:** physically searching items or documents in the vicinity of the original document of interest
- **Subject searches:** scanning subject indices for relevant material
- **Author searching:** finding additional works by the author on the same topic (Lester, 2004; Abbott, 2008)

Bates additionally states that these methods are not used singularly but in conjunction with one another (Abbott, 2008).

Ellis' model (1989)

In 1989, Ellis developed a behavioural model that radically influenced information seeking research because it outlined patterns across situations and contexts. He identified eight 'features' that could be followed, but not necessarily in sequential order. These features include:

- **Starting**: the means employed to start the search for information
- **Chaining**: following footnotes and citations in known material or 'forward' chaining from known items through citation indexes
- **Browsing**: semi-directed or semi-structured searching
- **Differentiating**: using known differences in information sources to filter the information
- **Monitoring**: staying up-to-date or current awareness searching
- **Extracting**: selectively identifying relevant material in an information source
- **Verifying:** checking the accuracy of information
- **Ending:** tying up loose ends through a final search (Järvelin & Wilson, 2003)

Because this is not described as a uni-directional process for information seeking, each behavior's importance and involvement is seen as variable and situational. The features are also usually of an iterative nature (Kalbach, 2000).

Choo, Detlor and Turnbull (2000)

In 2000, Choo, Detlor and Turnbull (2000) developed a two-dimensional model that describes information seeking on the web. Combining Ellis's features of information seeking, Wilson's (1996) four modes of information seeking (i.e. passive attention, passive search, active search and ongoing search), and literature on environmental scanning (Choo and Auster in Cockburn and McKenzie, 2002), Choo *et al*. proposed a flexible model that describes systematic changes in the mode of information seeking as an individual moves through the information seeking process (Cockburn and McKenzie, 2002). In their model, Choo *et al*. (2000) referred to Wilson's modes as undirected viewing, conditioned viewing, informal search and formal search. With directed viewing, the user is exposed to information with no need in mind. This is mainly an exploration exercise that can involve a wide range of information sources that may or may not be of relevance. According to Turnbull (n.d), information searching and acquisition is based on previous experience and acquisition.

Conditioned viewing entails viewing information on selected topics. This is still not an active search, but mainly a browsing action where the information seeker notices the relevance of the sources and how they relate to the topic of interest (Turnbull, nd).

Informal searching refers to an active search for information to broaden and deepen knowledge on a specific topic, while formal searching is a planned, structured and deliberate action to obtain the required information on a topic or issue (Ikoja-Odongo & Mostert, 2005).

Combining these modes with Ellis's behavioural model created the following behavioural model to characterise web information seeking.

Behavioral modes and moves of information seeking on the web

	Starting	Chaining	Browsing	Differentiating	Monitoring	Extracting
Undirected Viewing	Identifying, selecting, starting pages and sites	Following links on initial pages				
Conditioned Viewing			Browsing entry pages, headings, site maps	Bookmarking, printing, copying; Going directly to known site	Revisiting 'favorite' or bookmarked sites for new information	
Informal Search				Bookmarking, printing, copying; Going directly to known site	Revisiting 'favorite' or bookmarked sites for new information	Using (local) search engines to extract information
Formal Search					Revisiting 'favorite' or bookmarked sites for new information	Using search engines to extract information

Figure 3 Source: Mostert, 2004

Bates (2002) also proposed four modes or activities of information seeking that are closely related to Choo *et al.*'s version, i.e. directed and undirected viewing and active or passive information seeking, to indicate how active the user is when acquiring information.

Awareness ('being aware') refers to all we know and learn though passive undirected behaviour (Bates, 2002).

Browsing takes place when a user does not experience a specific need or interest but actively exposes himself or herself to possible novel information. This curiosity poses many problems to a typical web user. While it can lead to many good sites and content, it can also often entrap users in unreliable information or too much information. Striking a balance between too much and too little 'curious behaviour' is therefore advisable. The act of browsing through websites can be referred to as sampling and selecting, which includes

behaviour such as 'berrypicking', mingling, dating, nibbling, sightseeing, channel surfing, and web surfing (Bates, 2002). Users that employ this tactic sample a number of possibilities, selecting the best from the available options.

	Active	Passive
Directed	Searching (a)	Monitoring (b)
Undirected	Browsing (c)	Being Aware (d)
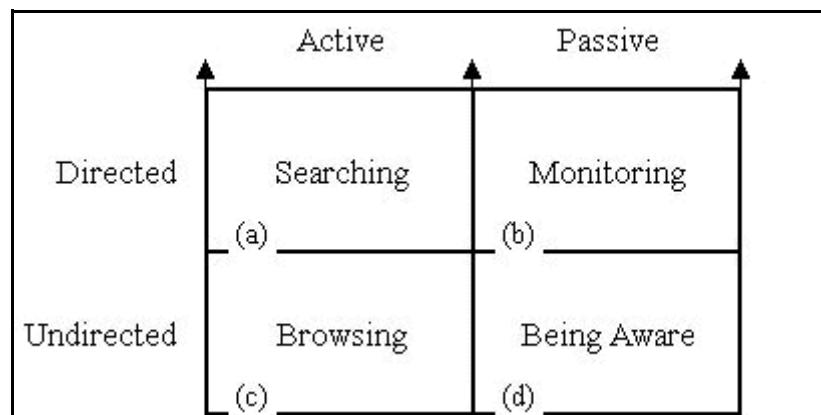
Figure 4 Source: Bates, 2002

Monitoring refers to a need for information that a user is aware of but not actively pursuing. The information is noted if it is found accidentally. In order to cut down on active searching time, a user would often arrange his/her information seeking environment in such a way as to provide information from useful sources when needed, e.g. by bookmarking such sites (Bates, 2002).

Searching is a planned, structured and deliberate action that is used to obtain information on a specific topic or issue. According to Bates (2002), this kind of searching is selective and focuses on the least amount of information. By nature, humans prefer to get the information they need while putting in the least amount of effort. They are therefore prepared to settle for less accurate or reliable information if it is more readily available or easier to use (Bates, 2002). The need to actively engage in a search for information is rarely necessary when most of the information required on a daily basis is either already available in the individual's environment, or can easily be gained from people or events in one's surroundings. This active engagement is also discouraged by the current overload of recorded information, which (in turn) requires sophisticated and complicated access machines that require more effort, knowledge and skills from the individual without having any guarantee that the input will lead to a desired outcome. Only when an urgent need for information is experienced will the user make an effort to get the skills they need to search effectively (Bates, 2002).

Card and Pirolli's (1993) Information Foraging theory
In order to describe observed human information seeking behaviour, specifically on the web, theorists often rely heavily on metaphors derived from nature. The Information Foraging

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theory, developed in 1993 by Stuart Card and Peter Pirolli, likens the information seeking behaviour of humans to wild animals, in that animals make decisions on where, when and how to eat based on highly optimised formulae. Poor optimisation would lead to starvation and less offspring (Nielsen, 2003). While humans are not under direct evolutionary threat, their nature also doesn't necessitate exertion save for when the need arises. In terms of web searching, this means that a human wants to get the maximum benefit they can get out of minimum effort (Nielsen, 2003).

Derived form the Information Foraging theory, the concept 'information scent' was proposed by Spool in 1994 to explain how users interact with information systems. Information scent refers to how well links and navigation options match a visitor's information needs, and how well they predict the content on the destination page (Kalbach, nd). This concept once again uses the analogy of animals hunting for food. Based on what they perceive as a hunt by following a spoor, users assess whether their search path provides them with clues that link or relate to the desired outcome. A predator that is convinced that that there is prey at the end of the trail is less likely to wander away from the path. In other words, as long as the user senses that he or she is getting 'warmer', they will keep hunting (by clicking). The scent therefore needs to progressively (and rapidly) get stronger, otherwise the user will give up. If the user cannot find what he or she is looking for, they will most likely conclude that the site does not offer the information at all (Nielsen, 2003).

The Patch Leaving model (also derived from the Foraging model) proposes that after a user has 'hunted' for a while, the question is whether to stay or leave for another patch (website). If a user finds it difficult to leave because the 'venison' (information) is what they require, they will stay, otherwise they will hunt further. Information Foraging predicts that the easier it becomes to find a good patch, the quicker users will leave a patch, meaning less time spent on one site. Ever since Google started sorting search results by emphasising quality, it has become easier to leave a patch and find another good one. Greater access to broadband also results in 'information snacking', where a user only goes online briefly to get specific answers, leading to more frequent but shorter visits (Kalbach, 2000).

Trends in web information seeking

Recent user studies (Nicholas, *et al.*, 2004; Cockburn and Mckenzie, 2000; Nielsen, 1997; Nicholas, 2008) have revealed a number of interesting behaviours commonly observed in users, for example:

- Users tend to favour one or two websites or pages which they visit more often than any other pages or sites. To access these pages, most users use a shortcut scheme, suggesting that they probably bookmark these pages.

- Rapid interactive browsing. Several pages are visited in a very short period of time, implying that most pages are displayed on the browser for a very short time. In most cases, it was found that the gap between each browsing action was 1 second, with 10 seconds in between being a very rare occurrence. It is possible that users use some pages as routes to other pages which they know will provide the required answers. The rapid movement is facilitated by the users' knowledge of the location and display of the links on a page.

- Bookmarked collections tend to grow and items are very seldom deleted. This suggests that users find it difficult to manage the size and organisation of these collections.

- Missing, incorrect and inconsistent HTML title tags lead to frustration among users who want to identify pages they wish to return to. Since browsers use the tags to label items on the 'back' pull down menu or to show the bookmark and history lists, these titles are then not easily traceable.

- Users tend to bounce around when on a site (between 1 - 3 pages of the many available) and very seldom penetrate any site in depth. Most tend to visit a number of sites for the information they require and seldom return to sites they have visited (40% never visit again).

- Users tend to 'feed' for information horizontally, and whether they search a site or not depends heavily on 'digital visibility' which in turn creates all the conditions for 'bouncing'.

- Very short periods are spent on in depth reading; readers do not tend to view articles for more than 2 minutes. Users don't read webpages word by word, but instead scan the page and pick out individual words and sentences. Users also spend more time reading short articles than long ones.

- Users often power browse through titles, contents, abstracts, etc., at huge speeds.

- Half the time spent by users is on navigating.

Practical implications for information architecture

Many interface designers still design based on the premise that users search in a linear form - a user accesses an application, searches or browses in a simple manner, finds their information and then leaves. However, Bates' Berrypicking model shows that the searching process can either result in directly finding the information, or alternatively result in a lengthy navigation process. Users can therefore navigate along one path and backtrack to find another path when searching for information. If a user feels frustrated with the process or is unsuccessful in obtaining the required information, the user will leave the site. Therefore when designing a website, both the navigation and search features need to be prominently displayed to demonstrate how easily the information can be found.

Navigation options must clearly indicate the path to be followed and show that other paths will not have the information required by the user. A navigation path that might be perceived as having a strong 'scent' while being devoid of anything usable should be cross-referenced to the desired location, otherwise users might believe that the site does not have what they want and leave altogether.

In constructing navigation options, care should be taken to use familiar words with high search engine visibility to provide the user with a strong scent. Unfamiliar words or slogans do not normally match the words in the user's mind and the words seen on the site and should thus be avoided (Nielsen, 2003).

To support rapid page navigation, websites should be designed to shorten the navigation paths to popular pages. The high revisitation rates of familiar webpages require efficient interfaces that can support any inefficiencies that would result in the loss of massive productivity rates among users. Although browser interfaces offer many options that support revisitation, e.g. history lists, bookmarks and the 'back' button, it would possibly be more beneficial if all the revisitation interfaces were integrated into a single interface component, thereby eliminating the need for the user to learn multiple interfaces.

Bookmark collection systems should be sufficiently scalable to manage large collections. Bookmark collections' systems should include tools to assist users with managing their collections, particularly with identifying invalid bookmarks. Systems should also support shortcut mechanisms that facilitate efficient navigation to a small set of frequently visited pages.

When confronted with a list of options, users will choose the one that provides the clearest indication that it will lead them to the information they require. Information scent is all about optimised navigation through 'trigger words' – words that will trigger a user to click on a given link. Scanning for trigger words is a consistent pattern across user types and tasks (Kalbach, nd). Each click that a user makes should help him or her eliminate choices, hone in on the correct information, and support the user's growing confidence that he or she will find the desired outcome. Frustration increases when a click does not provide the necessary confirmation, and often leads to a user abandoning a site. Therefore the site should provide constant feedback on the current location or point of the search and how it relates to the user's task to keep frustration levels down.

Creating the right labels to enable users to find what they want is critical but problematic because each individual user uses various terms to describe things they look for. Extensive user profiling is therefore necessary.

During a search, the user prefers to access 'big' sites, but failing that will be satisfied with 'smaller' sites. Because a website wants to be accessed, it is important for the content to

be made as attractive as possible. In the analogy of the animal hunting for food, the content must look like a nutritious meal and it must signal that it is easy prey. Both these aspects need to be optimally utilised on any website because users will leave a good content site if the content is difficult to find and vice versa (if the information is easy to find but the content is poor).

To support information snacking, websites need to be designed in a way that:

- Supports short visits (like a snack)
- Encourages user return by constantly posting reminders to the user about the site
- Emphasises search engine visibility to increase frequent visits (Nielsen, 2003).

Pages must be designed to load quickly and clearly present their links to the users. Advanced webpage features such as Macromedia Flash Player and Java Applets should be reserved for pages that the designer expects users to peruse for longer periods.

To increase readability, a site must employ text that can be quickly scanned using highlighted keywords, meaningful sub-headings, bulleted lists, one idea per paragraph, and/or half the word count.

Conclusion

To create an 'invisible design', the information architect has to eliminate all of the frustrations a user could potentially experience in their search for information. Future designs must strive to create intelligent and intuitive systems that engage the user in meaningful negotiations with information on their own terms. In the end, the success or failure of a given solution lies not in new technologies, but in understanding human needs and behaviour. Access to websites is no longer the net outcome; design now needs to go beyond providing basic access to providing access in a quick and easy way. It is therefore imperative to profile behaviour in order to identify best practices and be able to see what works and what doesn't.

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Chapter Nine

Issues and challenges on the use of scholarly electronic journals by the academic community: a literature review

Margret Mgobozi

1 Introduction

A scholarly journal may be defined as a periodical devoted to disseminating current research and commentary on developments within a specific discipline, sub-discipline, or field of study, usually published quarterly or bi-monthly and bound into continuously paginated volumes (Reitz, 2001). The Dictionary Unit of South Africa (2002:623) defines the journal as a newspaper or magazine that deals with a particular subject. It further defines a 'scholar' as a specialist in a particular field of study, a distinguished academic, and/or a person who is highly educated. Together, the two terms therefore mean that a scholarly journal is an academic journal dedicated to a specialised field of study. Scholarly journals are therefore periodicals whose goal is scholarly communication, providing the means by which scholars and researchers share their findings with one another and with the public. Research articles, in turn, are peer-reviewed by scholars and are often published by a scholarly association.

The aim of this chapter is to explore and review literature related to the use of scholarly electronic journals by the academic community. The scope of the chapter covers the origin of the scholarly electronic journal, characteristics of electronic journals, methods used for accessing electronic journals, uses of electronic journals, studies on the use of electronic journals by the academic community, and an investigation into scholarly communication.

2 The origin of the scholarly electronic journal

2.1 The traditional printed journal

Historically, Wells (1999) notes that communication between scholars relied heavily on personal contact and meetings that were arranged by early learned societies, such as the Royal Society. Because these societies were highly popular, only so many people could attend the meetings; the proceedings that were usually circulated as proof of the last meeting became a way to disseminate papers for the benefit of the members who were not (or could not be) present at the meetings. Scholarly journals were therefore developed in this way (Wells, 1999).

Walker (1998) informs us that the Royal Society of London published the first issue of the first scientific journal in 1665. The first published journal was the *Journal des Scavans*

followed by *The Philosophical Transactions of the Royal Society* (Harter & Kim, 1996; Oppenheim, Greenhalgh & Rowland, 2000:36; Wells, 1999). According to these authors, the journal's purpose was to disseminate the results of members' research, and in so doing, allow scientists to reach a wider audience. Walker (1998) writes that journals consequently became a way of disseminating new discoveries, and were soon accepted as permanent records of research and archived by libraries. The peer-review of all or most articles was instituted in order to screen and improve publications. Previous research was woven into the fabric of the new by way of citation to earlier articles (Walker, 1998).

It is recognised that journal numbers have grown steadily over the years, most of them supported and sponsored by the societies that promote certain scientific disciplines. Publication costs were initially recovered from the money paid by members in the form of journal subscriptions. While some of the journals were published by non-profit institutions, such as universities and governments (Walker, 1998), most journals were published by scientific societies.

Commercial publishers were at first not involved in the process as there was "little potential for profit", as Walker (1998) puts it. The scholarly community, comprising mainly of academics and postgraduate students, submitted research papers for publication, which in turn helped them acquire jobs, grants, tenure and promotion (Walker, 1998; Ocholla, 1999:121; Oppenheim, Greenhalgh & Rowland, 2000:362).

Global competition caused an increase in the number of scholarly research publications, thus attracting commercial publishers who, in turn, offered their professional publishing skills. New journals were started, and this drove the commercial publishing industry to merge and facilitate communication between researchers, academics and librarians. The scholarly publisher was therefore dependant on the researchers for authorship, while libraries, mostly academic libraries, were dependant on the researchers for income (Oppenheim, Greenhalgh & Rowland, 2000:362). The rising costs of published journals and budget cuts in academic libraries eventually led to a serial crisis. According to Oppenheim, Greenhalgh and Rowland (2000:362), journal subscription rates rose by 12% in 1998, which was even faster than the rate of inflation. This led to a drastic cancellation of subscriptions by academic libraries and raised conflict in the function of the journal as a means of promoting scholarly communication. Harter (1998:507) opines that rising costs and long publication delays were ultimately what led to the criticism of the scholarly printed journal.

2.2 The electronic journal

The dramatic explosion of the Internet, particularly the World Wide Web, provided a solution to the problems experienced by printed journals, mainly because of the advent of alternative

forms of conventional printed journals known as electronic journals (Harter, 1998). The World Wide Web therefore became a new medium for publishing scholarly journals. As a result, the number of electronic journals started proliferating in various academic fields (Koehler, 2000). McLuckie (1998) observes that innovations in information technology have encouraged the move towards electronic journals because technology facilitates the effective and efficient creation, storage, transfer and delivery of electronic information. According to Chan (1999), the idea of an electronic scholarly journal was first conceived by Sondak and Schwarz in 1973. They envisioned the distribution of computer-readable files of journals to libraries, and the distribution of computer-output microfiche to individual subscribers. Joint projects between publishers and libraries resulted in the emergence of various distribution systems of electronic data, from CD-ROM to local data loading – where publishers provide image and text data directly to libraries (Chan, 1999). Electronic journals formally kick-started in the 1990s, although they had been in the pipeline since 1976 (Harter & Kim, 1996; Bearman, Prior and Pudlowski, 1999). Harter and Kim (1996) state that the *Online Journal of Current Clinical Trials* (*OJCCT*) was the first peer-reviewed, full-text, electronic journal, and even had graphics.

2.2.1 Characteristics of electronic journals

Electronic journals are serial publications that are available in digital format. These journals may be distributed electronically in various ways, such as through CD-ROMS or the Internet. Those available on the Internet can be accessed via the World Wide Web and/or through email. Some journals are in ASCII text while others are in HTML format. Still others use formats such as Adobe's PDF. There are journals that are purely electronic, while others also appear in print form. Users have free access to some electronic journals while needing to subscribe to others (Klemperer, 1999). Although these journals are electronic in form, they can and do index or review paper-based publications (Mogge, 1999:20). Electronic journals that often scan images of print versions tend to be available as PDF files.

2.2.2 Types of electronic journals

Electronic journals may be divided into three types, i.e. online, CD-ROM and web-based electronic journals.

2.2.2.1 Online electronic journals

Sweeny (1997) refers to online electronic journals as "pay as you go" journals. DIALOG is perhaps the best example of how powerful searching tools are used to retrieve documents from printed journals. These journals are printed on paper and thereafter scanned, stored and distributed electronically. An entire issue may be distributed electronically to a membership list, or only the table of contents and abstracts may be provided with specific information on

how to obtain the full electronic text or article. According to Rao (1998), these journals are also referred to as digitised journals.

2.2.2.2 CD-ROMS

CD-ROMS tend to be electronic versions of existing printed journals. Powerful search tools are used with CD-ROMS.

2.2.2.3 Web-based electronic journals

Rao (1998) has referred to these as electronic journals that are digital in form. These journals are produced, processed, edited, stored, reviewed and distributed to subscribers electronically, without any print versions.

2.2.3 Advantages and disadvantages of electronic journals

2.2.3.1 Advantages

Electronic journals offer many solutions to problems that are facing information management centers today. The most important features are the following:

- *Space-saving*

    Space saving is one of the most cited advantages of electronic journals in literature (Bandyopadhay, 1999; Cook, 1992:33; Sweeny, 1997). Electronic storage is more efficient than providing shelf-space for a number of volumes.

- *Speed of communication*

    It is obvious that electronic journals also improve the speed of communication by providing updates on recently published material and allowing for the swift transmission of research results and scholarly communication (Sweeny, 1997; Rao, 1998; Mountifield & Van Brakel, 1994). Chan (1999) concurs that the electronic transmission of journals saves valuable time, especially in terms of the review process, thus enabling efficient network communication between authors, editors and referees.

- *Provision of powerful searching tools*

    Words and terms in the records on the database can be searched and combined with Boolean operators (AND, NOT, OR) to find specific articles. Specific periods or years can also be used to broaden or narrow the search (Fisher, 1995). Several databases can be searched simultaneously, thus allowing a large collection of material to be retrieved instantly.

- *Accessibility*

    Electronic journals provide immediate access to sought after information (Fisher, 1995; Sweeny, 1997; Bandyopadhay, 1999). Rao (1998) reinforces

this, saying that electronic journals facilitate precise access to the archive of knowledge. Finding articles or journals can take minutes or even seconds, which is very different to the long waiting periods experienced with printed journals (Chan, 1999).

- *Value-added features*

    Facilities such as integrated text, hypertext links, etc., are also offered by electronic journals. Holovak & Settler (1997) explain how navigational aids, such as an internal hyperlink between a mention in text and the corresponding figure, table, or equation, or from bibliographic citations in text to the reference list at the end of the article, are examples of value-added features. According to Chan (1999), further advantages are that the printing and mailing processes are eliminated, while authoring and publishing systems are integrated easily into computer readable text. Valuable time is saved through electronic transmission, especially in the review process.

- *Cost-effectiveness*

    Electronic journals are cost effective as far as the printing of paper and mailing to subscribers is concerned (Rao, 1998). A number of academic and public institutions are faced with budget cuts that have forced them to cancel subscriptions on a number of journals. Electronic journals therefore offer solutions in this respect, as there are some that are either free or inexpensive and affordable to end-users (Moret 1997; Mountifield and Van Brakel, 1994:30). Chan (1999) states that there is a potential saving of twenty-four to thirty-six percent from the elimination of printing and postage costs.

- Up-to-date information

    Information published in electronic journals tends to be up-to-date, seeing as there are no printing and distribution delays. Already in the 90s, Rao (1998) observed that published electronic articles could be available within forty-eight hours after being approved by the preview team (that is a reality today).

    According to Mountifield and Van Brakel (1994:31), electronic journals may be distinguished from printed journals because they appear in a non-static form and are therefore irregular. Articles can be submitted, refereed, amended and updated at the same time, and published as soon as they are ready. There is an "active dissemination mechanism", as Chan (1999) defines it, such that whenever new articles are accepted into the database, users are alerted at their desktops. This has become a standard practice with most established scholarly journals in the world.

2.2.3 Disadvantages

Evidently, there are still problems related to the use of electronic journals.

- *Technological barriers*

The storage and display of electronic journals rely on technology and equipment that is rather expensive and not affordable to users with low incomes (Chan, 1999). Computer literacy is also a problem. Some users struggle with electronic mail, file transfers, the handling of network and mainframe software or downloading operations (Mountifield and van Brakel, 1994:31).

Although information delivered electronically may be cheap, the cost of computer hardware is high (Sweeny, 1997). Files that are transferred electronically are also sometimes disrupted by network problems. As electronic journals become more technologically advanced, the speed and bandwidth of networks also affect delivery.

- *Socio-cultural barriers*

Electronic interfaces can take a long time to master, thus frustrating end-users. Reading from a computer can also not compare to reading printed material – the process tends to be slower and less comfortable.

- *Economic barriers*

The equipment used for displaying, storing or printing electronic journals is expensive. Users may not be in a position to download and print each and every article they need as this may lead to high economic and ecological costs. As already noted, some electronic journals are not free and charge subscription fees (Chan, 1999). Mackay (1999) cautions that in order to receive access to electronic journals at no additional charge, academic institutions need to subscribe to the journals' print versions. Thus, in order for academic institutions to gain access to every electronic journal published, they must inconveniently subscribe to a number of aggregator services as well as multiple publishers. This approach is still in force with minor amendments.

- *Ownership versus access*

With print journals, the academic institutions own whatever journal they have paid for and subscribed to. This is not the case with electronic journals because they are not received, but accessed (Mackay, 1999).

2.2.4 Methods used to access electronic journals

Electronic journals may be an answer to the current problem of "infolation" or information overload, where scholars find it difficult to keep up with developments in their various disciplines. Accessing information from places of work is an added advantage of electronic journals. Electronic journals are also said to provide continuous and instant access to relevant material (Eason, Carter and Harker, 1997).

Van der Walt and Van Brakel (1995:57-63) list the following as methods that may be used to access electronic journals:

- Personal electronic communication, where electronic mail is used to transfer messages between users. Electronic journals may also be distributed in this format. Electronic list managers are also useful in distributing content pages and individual articles to subscribers.
- Internet facilities to transfer information and files between different sites or PCs. The file transfer protocol is used for the physical retrieval of archived issues of electronic journals.
- Direct access to specific titles, including databases, of solely electronic journals.
- Online directories of electronic journals, such as the Directory of Electronic Journals, newsletters, and academic discussion lists, provide a description of each electronic journal, its subscription procedures and costs.

The above methods, as provided by van der Walt and van Brakel (1995), are used mostly for network-based electronic journals. However, Machovec (1997) reiterates that electronic journals are also offered to the public by the publishers and aggregators. Publisher-based electronic journal projects include: project Muse (*http://muse.jhu.edu/*), High Wire Press (*http://highwire.stanford.edu*), Elsevier Press (*http://www.elsevier.com*), Blackwell Science (*http://www.blackwell-science.com*), Springer-Verlag (*http://www.springer.co.uk*), and Academic Press IDEAL (http://www.idealibrary .com) [Machovec, 1997].

Machovec (1997) adds that a number of electronic journals from a variety of publishers are combined and provided through common gateways such as: OCLC Electronic Collections Online, Blackwells Electronic Journal navigator, Institute for Scientific Information, the JSTOR, Ovid Technologies Inc., EBSCO, Information Access Company, DIALOG, Emerald, and University Microfilms International.

Access to most electronic journals is provided to the subscribing institutions through license agreements. Bona-fide members of these institutions may therefore also receive licenses, but the onus lies with the institution to ensure that only members have access (Edwards, 1997).

2.2.5 Uses of electronic journals

Motivations for making the most of electronic journals are founded on the main role players, i.e. authors, publishers, librarians and journal users (Hitchcock, Carr and Hall, 1998). The motivations are as follows:

- Publishers - adding value to journals;
- Librarians - improved information retrieval; and
- Users - faster, more direct access to information, and the ability to act on information.

Electronic journals are therefore in a position to play an important role in the provision of information. For example, seeing as journals are used for the sharing of up-to-date research results, the efficiency of this service could be vastly improved by using electronic journals (Eason, Carter and Harker, 1997).

The aspect of scholarly communication that is most enhanced by the use of electronic journals is teaching, as confirmed in a study by Milne (1999). Academics whose primary focus was teaching were more likely to use electronic journals than full-time researchers. The latter were less inclined to accept electronic journals in publications or scholarly activity.

2.2.6 Studies on the use of electronic journals by the academic community

Bibliometric research techniques based mainly on citation analyses as the primary method of investigation have been considerably criticised. However, Harter (1998) suggests that citations do reflect an influence of some kind on the author of the citing article. Harter (1998) therefore conducted a study that aimed to gather raw data on the actual impact of electronic journals on scholarly communication. The study's main objective was to assess the extent to which scholars and researchers are influenced by, and base their own work on, research published in electronic journals. One of Harter's findings was that journals with fewer articles tend to influence less researchers and authors and therefore contribute less to the advancement of knowledge (Harter, 1998).

Harter's (1998) study also revealed that scholarly, peer-reviewed electronic journals had no impact on formal scholarly communication in their respective fields. The conclusion he drew in the study was that authors and readers need to view electronic journals as legitimate publication vehicles before they can assume a significant role in the scholarly communication process.

Scholarly communities in various disciplines differ in their use of electronic journals. In a study by Milne (1999), scholars from three disciplines, i.e. science, social sciences and the humanities, displayed distinct differences in their use of electronic services. The study's findings also hinted at an increased pattern of use of electronic journals and services by the academics from the three disciplines.

Ashcroft and Langdon (1999:105) investigated the benefits of and barriers to the purchase of electronic journals in university library collections in the United Kingdom and North America. The survey method was used to obtain librarians' perceptions of these benefits and constraints. The conclusions the authors drew from this study were that librarians were aware of the benefits of electronic journals, and that these journals had become an integral part of higher education library collections. The authors noted that major concerns were concentrated around permanent archives and site licenses. They also noted the suggestion made by the respondents that future surveys should include end-user statistics.

Cargille, *et al*. (1999) produced a paper on electronic journals and users. Three librarians gave their views on changes in the delivery of library services that came about as a result of the introduction of electronic journals, thus the paper is divided into three sessions. The first one, Cargille explains, was by Degener, who wrote about the impact of electronic journals on the medical library setting. Degener noted that many researchers in the medical library community were relying more on electronic journals. He felt that electronic journals were more convenient to use because they are accessible twenty-four hours a day, seven days a week. The authors further noted that added features provide additional opportunities to work more efficiently and effectively; printed copies are cleaner than photocopies; and access to electronic journals has affected the reading habits of some researchers.

Liew, Foo and Chennupati (2000:302) conducted a study on the use, perception and future expectations of electronic journals by graduate end-users from Nanyang Technological University and the National University of Singapore. The main objectives of the study were to determine the level of use of journals (both print and electronic), the users' preferred medium, and their expectations and concerns for the future. The study sought to determine the level of familiarity with the current offering of electronic journals, and to examine to what extent additional interactions, features and functionality were deemed useful and desirable by end-users (Liew, Foo and Chennupati, 2000:303). It is reported that over 70% of the participants had used electronic journals, although it was obvious that respondents had more experience with print journals. However, 73% preferred the electronic medium (Liew, Foo and Chennupati, 2000:304). The authors concluded that the interest in the use of electronic journals by end-users was growing.

A study by Rao (2001:169) explored why it is necessary to adopt electronic journals in scholarly communication. Rao (2001:172) found that they have the added advantages of easy access, greater speed and ease of communication, and less associated costs. Rao (2001:174) further found that publishing in electronic journals has slowly gained acceptance, especially following the inclusion of the referee system and peer-review by major publishers. Academic institutions were also accepting electronic publications by their faculty members for tenure and promotion purposes (Rao, 2001:174). Johnson (2001:166) also found that students were increasingly expecting all the information they were searching for to be provided in electronic format.

Gyeszly (2001:5) conducted a study meant to indicate what library administrators would choose between electronic and print journals. The study's incentive was the escalating price of the growing number of electronic journals, even while subscriptions were still being paid for both electronic and print journals. Among the objectives of the study, as indicated by Gyeszly, were the following:

- To identify the sources of the full-text online journals;
- To compile a list of all the electronically available titles in the political science and economic disciplines;
- To collect the end-user data of all electronic journals costing more than $500 per year;
- To determine the annual subscription prices of the core journals of political science and economics disciplines during the academic years of 1998 - 2000; and
- To analyse and compare the percentage price increases from 1998 to 2000.

The end-user data of the electronic journals in the study was based on the number of hits cumulated by users' requests via the websites of the Texas A & M University Libraries (Gyeszly, 2001:6). According to the author, the available user statistics of the electronic journals were not convincing enough for the library administration and collection development officers to cancel any print subscriptions. The library was therefore compelled to pay for both electronic and print journals as some publishers do not allow the termination of print journals, even if the utilisation of electronic journals is greater. Gyeszly concluded that the faculty staff and students were satisfied with the use of electronic journals, and that there appeared to be an increase in the use of electronic journals over printed journals.

Nelson (2001:205) conducted a study to evaluate the extent to which the potential of electronic journals was being realised within the United Kingdom's academic community. The conclusions drawn from the study were that:

- Most scholarly journals will ultimately be available in electronic format;
- The potential of electronic publishing to transform scholarly communication lies in the following: the ability of individuals to publish their own work on the World Wide Web, making it freely available to the scholarly community; the level of success of learned societies in publishing high-quality peer-reviewed journals which are either free, or at least cheaper than equivalent journals from commercial publishers; the speed of publication; and the ability of the electronic medium to transform electronic journals' content by including links to other material, such as multimedia presentations, access to databases, and interactive functionalities;
- The scholarly impact of electronic journals in the United Kingdom was still low; and
- The use of electronic journals was also still low.

Mgobozi (2002:7) conducted a study on the use of electronic journals for the dissemination of scholarly information at the Universities of Natal and Zululand. An attempt was made to determine the level of electronic journal utilisation and the perceived impact that these journals have on the community. Mgobozi (2002:87) observed that the level of use and cognisance of electronic journals was significantly lower than that of printed journals. Hence, it followed that the scholarly community leaned more towards the use of print media. The author was able to measure the perceived impact that the electronic journals had on the

scholarly community, although the real impact could not be ascertained. A strong perceived impact was found to exist within the scholarly community (Mgobozi, 2002:96).

A survey on the use of electronic databases and electronic journals accessed through the web by the academic staff of the Israeli Universities was conducted by Bar-Ilan, Peritz and Wolman (2003:346). The major results were that the use of electronic journals and databases was already widespread among the respondents (more than 50% found electronic services indispensable), and electronic services were increasingly being adopted by the academic community. An increase in the use of electronic journals was also demonstrated in a study by Smith (2003:162), where the author explored the role electronic journals play in a faculty's weekly scholarly reading habits. The academic community was found to rely more on electronic journals than on print media, and this, as Smith (2003:162) notes, is a significant milestone on the timeline of electronic journal utilisation. The assimilation of the electronic journal is further confirmed by Wulff's (2004:315) study, where the author examined the patterns of use of electronic journals supplied by an academic health sciences library. The aim was to find out whether the patterns of use of electronic journals differed significantly from the patterns of use of corresponding print titles, and to relate the applicability of print collection development practices onto an electronic environment. The conclusion drawn from this study was that collection development practices based on quality and user needs can be applied with confidence to the electronic environment (Wulff, 2004:315).

Nicholas and Huntington (2006:50) found that users were taking full advantage of the electronic journals that were offered to them. More people were found to be accessing electronic journals than was previously the case with printed media. The authors further found that searching occurred more widely as linking became easier and abstracts were popularised (Nicholas and Huntington, 2006:48).

Borrego and Urbano (2007:243) made the observation that data on the use of electronic products can be used to carry out comparative studies on topics such as the difference in electronic products in different institutions, the consumption of scientific information in different areas of knowledge, and how electronic publications are used in comparison to their printed forerunners. The purpose of their research was to analyse the behaviour of the users of electronic journals using the data of consumption per IP address. They found that there was a greater dispersion of the consumption of electronic information than of information on paper (Borrego and Urbano, 2007:243). The study also found that the number of abstracts viewed is a good predictor of the number of regular users of a journal.

In developing countries, poor infrastructure is the main reason for the low or non-use of electronic journals. Ajegbomogun (2007:27) focused on impediments to harnessing scholarly

electronic journals on the Internet in developing countries through a case study of a Nigerian university. The research objectives of the study were as follows:

- To identify the categories of Internet users and their use of the Internet.
- To determine the availability and usefulness of scholarly electronic journals and research output on the Internet.
- To determine users' point of access to scholarly electronic journal resources on the Internet.
- To identify the problems faced by users in their information seeking patterns on the Internet.
- To offer suggestions on how to harness electronic journals on the Internet.

Ajegbomogun's (2007:31) findings were that:

- Electronic resources available on the Internet were underutilised by the users, although the little access that they had increased their research and teaching output.
- The level of Internet use was low when compared to similar institutions in developed countries.
- Respondents gave lack of time and lack of access to personal computers as the main reasons preventing them from achieving their maximum potential in research output.
- Respondents were able to access the Internet using cyber café facilities, but these were not good enough because there are only a limited number of computers and the charges for using them are enormous; a lot of potential users are discouraged.
- Inadequate infrastructure, particularly telecommunication facilities, continues to put off the technological advancement of most library users in developing countries.

The author therefore recommended that the highest priority must be placed on university libraries in Nigeria so that they may remain centres of excellence, play their role as knowledge disseminators, and fully unearth their potential in order to compete with the best in the world (Ajegbomogun, 2007:31).

Zainab, Huzaimah and Ang (2007:558) found that electronic journals were used by respondents to search for new information, read full-text articles and abstracts, and browse the table of contents. Most respondents read the abstracts first to determine relevance before downloading the articles. It was also found that most respondents believed that electronic journals will co-exist with print journals; 25.5% believed that they would replace the print journals, and a further 25.5% stated that they would supplement them (Zainab, Huzaimah and Ang, 2007:558).

There has been growing interest in the use of electronic journals by the academic community, as reflected in a study by Moghaddam, Galyani and Talawar (2008:15). The purpose of their study was to investigate the use of scholarly electronic journals at the Indian Institute of Science. The aim of the study was to identify user's opinions on different features

of electronic journals, their awareness of the electronic journals' services, their use of different publishers, the purpose of their use and their most preferred formats. The results of the study reflected a growing interest in electronic journals among users at the Indian Institute of Science. Convenience and accessibility were the most important considerations cited by the users in opting for electronic journals, which were (mostly) used to address research needs, for education, and to locate current information (Moghaddam, Galyani and Talawar, 2008:22). Scientists were found to be more advanced in their use of electronic journals when compared to other faculty disciplines, whilst PDF was found to be the most preferred format of electronic journals (Moghaddam, Galyani and Talawar, 2008:22). The results also suggest that twenty-four hour access to electronic resources increases the acceptance and use of electronic scholarly journals (Moghaddam, Galyani and Talawar, 2008).

3. Scholarly communication

Shaughnessy in Milne (1999) has defined scholarly communication as "the social phenomena whereby intellectual and creative activity is [sic] passed from one scholar to another". Milne (1999) emphasises that formal and informal communication are what make scholarly communication possible. According to Milne (1999), formal communication entails the writing of articles for inclusion in journals, whereas informal communication includes conference visits, discussion groups and general networking to find out what is going on in a particular discipline. An important role in the system of scholarly communication is played by academic libraries, academic staff and postgraduate students, publishers of academic journals and books, and learned societies. Increasingly, the Internet is heavily relied on in speeding up and easing scholarly communication within the academic community.

The scholarly community is known to encourage informal or formal communication between/among academic colleagues. Informal communication can range from personal communication through conversation, newsletters and discussion groups, to full-scale national and international conferences. Research reports may therefore be distributed in this format (Eason, Carter and Harker, 1997). In some cases, Eason, Carter and Harker observe that informal and formal methods are used together. Thus, the authors note that academics who are busy and do not have time to engage in formal searches may use the informal network to identify what is worth finding and studying in journals and books. Ocholla (1999:12) elaborates on scholarly communication amongst academics and observes that academics are identified according to their scientific activities and communication in addition to their academic activities. He notes that in addition to conducting academic

research, academics prepare and report research results, publish and teach. These activities therefore all form part of formal and informal scholarly communication. Postgraduate students and library staff, who either help or are subjects in research, also participate in these activities.

Kuhlen and Zhang (1997) state that scholarly literature is an essential aspect of the scholarly communication process and argue that it is the formal foundation and basis of scientific communication. According to Eason, Carter and Harker (1997), formal communication proffers several services, i.e.:

- It is a public and permanent record of the achievements of the discipline.
- It is a peer-reviewed, quality assured record that meets the performance criteria of the discipline. It may also be a record that obeys the specialist conventions and language of the discipline, hence facilitating swift communication with fellow scholars.
- It is a testament to the current state of knowledge in the discipline.
- It provides a place for authors to register their achievements, following which they can be assessed by colleagues for career progression and/or status recognition in the field. It also serves as a means of attracting new recruits (Eason, Carter and Harker, 1997).

Varian (1997) notes that the academic reward system is structured to encourage the production and dissemination of good ideas that are widely read and acknowledged. Thus, according to Varian (1997), it is part of the researcher's job to produce scholarly publications.

The three main roles of scholarly communication, as identified by Getz (1997), are teaching, the dissemination of knowledge to the community, and developing new knowledge. There is an integration of roles among the key players of scholarly communication, i.e.: the scholars conduct research and write articles for publication; the publishers and learned societies accumulate, copy-edit, produce, and distribute articles; and the academic libraries buy, store and disseminate scholarly journals (Wells, 1999).

Vassallo (1999:232) introduces the process of organisational integration, brought about through the development, adoption, and implementation of the concept of the knowledge continuum. He says that the knowledge continuum assesses the various elements that contribute to scholarly communication and provides a continuum of support services, where the identification, absorption, utilisation and manipulation of existing knowledge merges with the organisation, formation, and dissemination of new knowledge. This process includes research input and output, which are important in the scholarly communication process. According to Vassallo (1999:234), the knowledge continuum is best served by an organisational structure that extends its contribution and role in the scholarly research process to produce and disseminate results that benefit scholarly communication.

Studies show that academic or scholarly journals play an important role in the dissemination of scholarly information (Eason, Carter and Harker, 1997; Wells, 1999; Harter, 1998:507; Milne, 1999; Oppenheim, Greenhalgh and Rowland, 2000:361). This role is clearly articulated by Harter (1998:507), who reiterates that the scholarly journal has served as the primary medium of scholarly communication for more than three centuries, and has remained basically unchanged in form and function since its inception. This role, however, differs from discipline to discipline. Some disciplines use journals primarily for information dissemination, while others prefer books for this purpose (Ocholla, 1999:136). Harter (1998:507) further reiterates that despite the popularity of printed journals, they have also been criticised because of problems relating to the peer-review process, high costs, and the lack of selectivity.

3.1 Scholarly communication and electronic journals

It is generally believed that electronic journals will transform the scholarly communication system (Harter, 1998:507). However, Harter warns that electronic journals can only succeed in this transformation if they are integrated into the process of scholarly communication. Academic scholars need to read electronic journals and write the articles that get published in them because without [academic scholars'] active contribution in terms of readership and authorship, electronic journals cannot prosper. Harter (1998:508) suggests that scholars must be influenced or affected by the findings reported in electronic journals enough to build or modify their own research and scholarship. Oppenheim, Greenhalgh and Rowland (2000:365) add that scholarly inquiry in the new medium of electronic journals is expected to proceed more quickly, interactively and globally than the original printed medium. There is, however, a lot of information that may be classed under academic and non scholarly journals. Therefore, as Oppenheim, Greenhalgh and Rowland (2000:365) argue, it is important to be able to distinguish between the two, and to address the role of publication and the values held by the scholarly community.

4 Challenges

The use of electronic journals by the academic community poses a number of challenges, some of which are as follows:

- Provision of ICT facilities in libraries

    The provision of ICT facilities in libraries may enhance the use of electronic journals by users, especially students. Some libraries still lack ICT facilities, such as electronic classrooms with sufficient high-end electronic equipment.

- User education

Users need to be trained and educated in the use and importance of electronic journals. This process calls for collaboration between the academic and library staff. Getting the library staff to educate the academic staff on the use of such services could do this. The academic staff in turn would be able to pass the information on to students, possibly by recommending the use of such services and/or encouraging consultations with the library staff. Short courses on the value, availability and use of electronic journals should also be offered.

- Electronic publishing

  The scholarly community should be encouraged to publish in electronic journals. This would improve their use and understanding of electronic journals.

- Methods of access

  Students and staff should have easy access to the electronic journals offered by their library.

- Inadequate support of infrastructure

  Inadequate support of infrastructure, particularly telecommunications infrastructure, continues to disrupt the technological progress of most library users in developing countries.

- Non-availability of personal computers

  The lack of personal computers prevents some members of the academic community from achieving their maximum potential in research output.

6 Conclusion

The scholarly activities of the academic community have gradually been transformed by the introduction and use of electronic journals. However, and according to Harter (1998:508), electronic journals can only impact on scholarly communication if they are integrated into the research process. This process, as Harter (1998:508) suggests, can be enhanced if the findings reported in electronic journals help scholars develop their own research.

The reviewed studies also reveal that the level and understanding of electronic journal use by the scholarly communities of various disciplines may differ. Ocholla (1999:136) found that some disciplines preferred journals for information dissemination while others preferred books. This possibly also applies to the electronic versus print journal debate. It is evident in the literature that there are various disciplines that are already fully engaged in the use of electronic journals, while others (maybe purposefully) lag behind.

An analysis of the literature in terms of the use of electronic journals shows that libraries, academic libraries in particular, have a considerable role to play in the provision of

scholarly information. Studies also support the notion that the lack of adequate resources affects the use of electronic journals; high-end technologies, which are necessary for access to these journals, may not be affordable to poor libraries and low income users (Chan, 1999; Mgobozi, 2002:105; Ajegbomogun, 2007:31).

Despite this, the use of electronic journals by the academic community is gradually increasing; earlier studies (Harter, 1998; Nelson, 2001:205; Mgobozi, 2002:103) cited a low prevalence rate, while later studies (Smith, 2003:162; Nicholas and Huntington, 2006:50; Borrego and Urbano, 2007:243; Zainab, Huzaimah and Ang, 2007:558; Moghaddam, Galyani and Talawar, 2008:15) all noted an increase in the use of electronic journals.

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Complexities of e-learning in an ODL environment: the experience of students at the University of South Africa (UNISA)

BT Mbatha, L Naidoo and B Ngwenya

1. Introduction

In this chapter, we investigated the challenges experienced by Communication Science students with respect to electronic learning (e-learning) at the University of South Africa (UNISA) in order to improve the university's services to students, facilitate a seamless learning experience, and bridge the transactional distance in its Open Distance Learning (ODL) programme. E-learning refers to the use of Information and Communication Technologies (ICTs) and various interactive tools in higher education curricula. Specifically, it refers to learning done using a computer, usually connected to a network, giving a learner the opportunity to learn at any time, anywhere in the world (WorldWideLearn, 2009). E-learning is not completely unlike traditional, class-based education, and with its unique additional features, can be as rich and valuable as the classroom experience.

The question is therefore what would prevent students from effectively using e-learning in their studies – what are the challenges faced by students in e-learning? And how do students acquire the skills they need for e-learning? Respondents were required to write about their use of e-learning resources at UNISA. The respondents were also required to provide recommendations on how to enhance the use of e-learning at the university. This paper was based on the assumption that e-learning facilitates and opens avenues for effective teaching and learning because of the potential it has for collapsing the transactional distance between students and the institution by allowing easy access to course material, regardless of time and location. The paper is significant because of the contribution it can make towards improving throughput at UNISA's Department of Communication Science, which would filter through to the rest of the UNISA community.

The University of South Africa (UNISA) was founded in 1973 as a university college that offered courses to learners through correspondence. The university then migrated through various developmental stages of distance education and in January 2004, was reconfigured as a comprehensive Open Distance Learning (ODL) university after amalgamation with two similar educational bodies. The 'new' UNISA effectively became the fifth largest ODL education institution in the world, and services approximately 300 000 learners (Sonnekus, Louw and Wilson, 2006).

Sonnekus, Louw and Wilson (2006) observe that students at UNISA are from both rural and urban areas. This geographical difference impacts on the service delivery of the university, which also has a mandate to enrol "a large and diverse student body". Not only is the infrastructure in these areas vastly different, but so is the level of exposure to and availability of modern technology, which impacts on the level of technical support that can be provided through a learner-support system. UNISA adopted e-learning in order to collapse the transactional distance between the university and its students. UNISA's ODL policy promotes open access to courses, flexibility in learning provision, flexibility in methods and criteria of assessing the learning process and achievements, and lifelong learning as propagated by the Commonwealth of Learning. ODL implies a shift from content to learner, which dictates that the needs of learners be addressed in a holistic manner. The term 'open distance learning' reflects the fact that all or most of the teaching is done by someone removed in time and space from the learner, and that the mission aims to include greater dimensions of openness and flexibility, whether in terms of access, curriculum or other elements of structure (UNESCO, 2002:8). Other than interaction, students should also enjoy a richly rewarding and penetrative learning experience. Meaningful engagement and dialogue through e-learning can help achieve this in UNISA's ODL context. Furthermore, as initiators of this engagement process, UNISA needs to consider circumstances in its surrounding environment and the specific factors that exist in its environment in order to ensure maximum reach, effectiveness and consequently the success of e-learning.

2 Theoretical framework

2.1 Transactional Distance theory

The chapter is informed by Michael Moore's Transactional Distance theory, which considers dialogue, transactional distance, and telecommunication systems. Moore (1997) suggests that distance education is much more than the geographical separation of learners and teachers. Rather, it is a concept describing the universe of teacher-learner relationships that exists when learners and instructors are separated by space and/or time. This universe of relationships can be ordered in a typology that is shaped around the most elementary constructs of the field, namely the structure of instructional programmes, the interaction between learners and teachers, and the nature and degree of self-directness of the learner (Moore, 1997).

Moore (1997) emphasises the concept of dialogue and explains that dialogue is developed by teachers and learners while they are interacting. The concepts of dialogue and interaction are very similar, and indeed are sometimes used synonymously, yet an important distinction applies here. The term 'dialogue' is used to describe an interaction or series of

interactions that have positive qualities that other interactions might not have. A dialogue is purposeful, constructive and valued by each party. Each party in a dialogue is viewed as a respectful and active participant; each is a contributor and builds on the contributions of the other party or parties. An 'interaction' can be negative or neutral, but the term 'dialogue' is reserved for positive interactions, with value placed on the synergistic nature of the relationship of the parties involved. In this context, the direction of the dialogue in the educational relationship is towards the improved understanding of the UNISA student in order to cater for specific needs during the learning process.

Moore's (1997) concept of transactional distance is determined by the amount of structure that may be provided to the student. Education lies along a continuum of transactions from less distant (greater interaction and less structure) to more distant (less interaction and more structure). The transactional distance theory is important because of its relevance in bridging the transactional gap in an ODL arena, which is the primary objective of e-learning. In order for students to take part in e-learning, they require access to the resources and skills that would enable them to engage effectively in dialogue with the lecturer.

3 Methodology

A survey questionnaire was administered to all COMSA executives and 50% of UNISA Radio's student employees who were selected using simple random sampling. The paper focused on COMSA executives and UNISA Radio employees because of their active involvement in the Muckleneuk and Sunnyside campuses, the hub of the university's activities. The data collection instrument requested the following: the personal details of the respondents; students' level of access to e-learning facilities; students' readiness to take part in e-learning; methods used to get skills for e-learning; benefits and challenges of using e-learning at UNISA; and recommendations to improve the use of e-learning at the university. The data collected was analysed using thematic categorisation and tabulation, and the findings were presented descriptively.

4. Findings

4.1 Demographic profile of the respondents

The respondents were BA Communication Science students from UNISA. The respondents were mostly male (75%) and under the age of 29 (94.2%).

4.2 Methods used to acquire skills to use e-learning resources

The study sought to establish the ways in which respondents acquired the skills they required to use e-learning resources. Respondents were therefore provided with a list of possible methods to choose from and select what applied to their situations. Table 1 below summarises the responses.

Table 1 Methods used to acquire skills to use e-learning resources (N=110)

Variables	Responses	Percentage
Self taught	40	36.4
Guidance from other students	23	20.9
Trial and error	17	15.5
Courses offered by the University	13	11.8
External courses	09	8.2
Guidance from Computer Lab Assistants	06	5.4
High school	02	1.8
Guidance from Lecturers	0	0
Total	**110**	**100**

Table 1 shows that most of the respondents (40; 36.4%) were self taught; 23 (20.9%) received guidance from other students, 17 (15.5%) indicated that they learnt through trial and error, and 13 (11.8%) learnt from courses offered by UNISA. Nine of the respondents (8.2%), revealed that they acquired their skills from external courses, 6 (5.4%) received guidance from computer lab assistants, and only 2 (1.8%) said that they'd learnt about e-learning while in high school. None of the respondents appeared to have received guidance from lecturers on e-learning.

Sloman (2001) and Ray and Day (1998) explain that this is a problem because when students are not encouraged to use ICTs by their tutors and computer skills training occurs outside of the curriculum, they (students) are much less likely to make use of electronic resources for academic purposes. In order to use e-learning resources at UNISA, students need to acquire and practice the skills necessary to exploit them.

E-learning provides lecturers with an opportunity to offer constant educational support because students are able to instantly communicate with fellow students and lecturers. Lecturers can also engage students in academic debates, and in doing so, promote intellectual stimulation and the synthesis of information that is covered in a lecture or in course content. While this study acknowledges that students at UNISA have access to e-learning resources, the lecturers' guidance or support is critical in transforming the use of these resources into information and relevant knowledge.

4.3 Students' perceptions towards e-learning at UNISA

Respondents were asked to answer an open-ended question about the use of e-learning resources at UNISA. The aim of this question was to capture various opinions and attitudes that relate to e-learning resources at UNISA. The respondents' general feelings were as follows:

- E-learning is a good facility because students can communicate with each other using *my*UNISA. They can also submit their assignments (using *my*UNISA). It makes their lives easier and faster
- E-learning resources at UNISA help students retrieve their assignments and examination results
- While there is a huge problem with e-learning resources because many students do not have access to them, students hope this problem will change with time
- E-learning resources are very helpful, especially when students can use them.
- Different opinions can also be shared through e-learning initiatives.
- Some felt that it is limited to those who have Internet access and those who are computer literate.
- It is very effective in their studies.
- It is very challenging because it is a new method of learning to many students who are used to traditional modes of learning.
- It is a good way of teaching because it closes the gap between students and the university.

Sloman (2001) asserts that the emergence of e-learning has created a new platform for teaching; the impact of this technology will create opportunities that will enhance and transform the learning experience for both student and teacher. The use of e-learning has grown considerably in recent years and triggered a great deal of interest in this age of rapid technological progress, transforming the very nature of higher education. The White Paper (Republic of South Africa, 2004) stresses that introducing ICTs into education is an important part of the South African government's strategy to improve the quality of learning and teaching throughout the education and training sector. Bates (1999) agrees that the use of technology for teaching at a university can serve the public more cost-effectively and shape students more for an ICT-based society.

4.4 Challenges experienced by students in e-learning at UNISA

The study also investigated the primary factors preventing students from engaging in e-learning at UNISA. The general aim of this question was to capture varying opinions, attitudes and impediments relating to the use of e-learning resources by UNISA students. The respondents noted the following:

- Poor communication between lecturers and students.
- Not knowing how to use *my*UNISA and the Internet.
- Slow feedback provided by lecturers.
- Problems accessing *my*UNISA. One student cited that they had an email account but experienced technical errors on the site.
- UNISA has enrolled a large number of students but does not have sufficient resources to cater for all the students. Consequently, when students want to access computer labs, they find that they are always occupied. This results in long waiting periods.
- Sometimes *my*UNISA is very slow and it takes a long time to process or retrieve information.
- Students cannot access *my*UNISA at home and cannot afford to use Internet cafes.
- Some students cannot use the Internet independently and must have someone to assist them. UNISA is not always helpful in this respect.
- E-learning resources result in some students losing confidence in their abilities because of the level of complexity of these resources. The guidelines on how to use *my*UNISA are extremely confusing and not user friendly.

This confirms earlier findings by Sloman (2001) and Ray & Day (1998), who observed that lack of computer skills in tertiary institutions is the main barrier to students' use of ICTs. Moore's (1997) reference to student-lecturer interaction also plays an important role here, which is that element in his theory that is about motivation, feedback and dialogue between the teacher and student. Student-content interaction refers to how students obtain intellectual information from course material, while student to student interaction is the exchange of information, ideas and dialogue that occurs between students about the course. A crucial component here, and one that is often taken for granted by the lecturer, is the interaction between the student and the technology that aids the dialogue. Students who do not have the skills required to use a communication medium tend to be discouraged and may therefore decide to withdraw from the e-learning process. Thus students must be trained in order to successfully interact with the mediating technology.

4.5 Recommendations to improve the use of e-learning resources at UNISA

The respondents were required to discuss and indicate contextual conditions that need to be adapted in order to enhance the use of e-learning resources at UNISA. The respondents generally felt that:

- Lecturers should see students at least twice a week in order to increase interaction, discuss content, and guide and encourage students on how to use e-learning effectively.
- All computer labs at UNISA should have a working Internet connection because some of the students only use *my*UNISA to send their work and access UNISA content.

- UNISA must promote e-learning resources and make sure that students have Internet access in order for them to effectively use these useful tools and services.
- UNISA needs to build a technology centre with e-learning resources in each region to improve students' access to e-learning.
- UNISA should provide faster computers and increase Internet bandwidth.
- More computer labs with faster computers and a faster Internet connection are necessary to ensure that students do not wait for long hours to get things done.

5 Discussion

Although the study is only an initial effort to gauge the challenges experienced by students in the e-learning context, it is clear that access is limited and acts as an impediment to the e-learning process. Infrastructure and resources refer here to computer labs, physical hardware, software, and computer services provided by UNISA or accessed in private by the student. A significant number of students stated that e-learning is very helpful, particularly to people that have the requisite skills. Limitations are often caused by poor Internet access and computer illiteracy. E-learning severely challenges students who are used to conventional ways of learning and students who do not have access to computers and Internet access. As a result, e-learning is a double edged sword. While it reinforces and enhances ideas of ODL where distance is bridged in the learning process, it also stunts students who have access problems and/or computer competency challenges. Thus e-learning inherently poses the threat of the digital divide and societal inequality.

Another glaring problem was that lecturers are now taking a peripheral role in teaching and are foregrounding e-learning as something that students can use independently without assistance and guidance from the lecturer. The signs emerge in Table 1, where there is a large gap between the expectations of lecturers and the reality of students. Most students were self taught (36%), and a significant number (15%) acquired their skills through trial and error, with guidance from lecturers amounting to a striking 0%. This is augmented by evidence in Section 4.4 where students were asked to reflect on the challenges they face with e-learning. The responses revealed a yearning for lecturers' guidance – e-learning seems isolated without lecturer interaction. The suggestion is that the lecturer should take on the critical role of encouraging students to use e-learning as a tool in the learning process. One of the respondents articulated it thus: "It is difficult for me to study; we need guidance from the lecturers and the problem is that when we call they are not helpful."

Students appear to appreciate the role played by e-learning and the flexible learning environment it creates. Some were forming study groups to submit assignments and access study material online despite the fact that few made use of it for research purposes. Respondents emphasised that it is a faster way of accessing courseware and results.

However, their view of e-learning is limited because they restrict their understanding of e-learning to the formal avenues offered by the university, such as *my*UNISA. This rigid view consequently prevents them from using other functions that e-learning can offer, such as research using databases and academic debate on discussion forums. E-learning has a lot of potential in UNISA's ODL context, with attributes such as flexible learning, overcoming geographical and transactional distance, and peer education, and this is despite the debate of conventional learning versus virtual learning that it espouses. The Transactional Distance theory advocated by Michael Moore (1997) provides direction with respect to dialogue in an educational setting, which is confirmed by the results in this paper.

6 Conclusion

Although ICTs have changed the teaching and learning environment at the University of South Africa by creating new opportunities for learning, the paper found that the university has an unfair expectation of students in terms of their ability to access computers and their independence in the e-learning environment. That said, e-learning facilitates and opens many avenues for effective teaching. Part of this stems from its ability to collapse the transactional distance between students and the institution, and between students and courses or modules irrespective of time and location. This is highlighted by the Transactional Distance theory, which argues that distance is not determined by geography, but by the relationship between dialogue and structure. In UNISA's ODL context, less structure is offered, meaning that increased dialogue is required, and this may be facilitated through e-learning.

E-learning is an interactive and engaging educational resource that is capable of fostering an enriching learning experience for all of UNISA's local, national and international students. However, e-learning as a novel way of teaching is highly problematic because many students do not have access to computers. This is a problem when they enrol at an ODL institution that can offer only limited infrastructure. Students with limited or no computer skills only worsen the situation. The study also revealed that there is a lack of support from the lecturers because they believe that the technology will deal with the student's queries.

All these handicaps limit student participation in e-learning and in the process create inequalities between students who are competent computer users and those who are not. Generally, the responses fell into two groups: students with little or poor computer skills complained about the distance learning aspect of the lectures, but those with competitive skills found e-learning to be rewarding. Most students expressed the need for the 'human factor' or face to face interaction which virtual tools do not provide. Although most of the respondents had access to e-learning, they indicated that their interactions were not

meaningful. For example, lecturers were not actively involved in discussion forums and academic debate was not fostered. Effective two-way communication should be encouraged to enhance dialogue with all stakeholders in the learning process. The results of this study would suggest that there is poor meaningful interaction at present. Lack of dialogue has resulted in students' apathy towards e-learning at UNISA, which drains into the entire ODL programme. These inefficiencies boil down to lack of guidance, lack of appropriate infrastructure, and the passive involvement of lecturers in the e-learning process.

7 Recommendations for further study

Although the study makes inroads in understanding e-learning trends at UNISA, it is entirely focused on the student experience. It is therefore necessary to expand the study and focus on academic and ICT staff as well as students chosen from the entire Communication Science discipline. The results of this study could have been affected by the dominant complaint-ridden nature of students. On the other hand, a study involving all the stakeholders in the e-learning process would provide a collective solution that would enhance the success of e-learning at UNISA. Nevertheless, in response to some of the complaints raised in this study, it will be necessary for the university to provide more infrastructure and services to enhance access to students who come from less privileged communities.

Tutors should also be appointed to train students in computer skills and thus enhance the face to face element in UNISA's ODL context. It is also important for the university to introduce a compulsory 6 month computer module for all undergraduate students across all colleges. This would cater for the needs of the students and prepare the UNISA graduate for the job industry. Students may also be credited for completing the course with a private provider recognised by UNISA.

Finally, the lack of support from the institution brings us to the conclusion that academics should undergo rigorous training as e-learning instructors to augment the success of the university. This would institute the balance that is required between the virtual tool and the human element in the learning process. Due consideration should be given to the fact that technical expertise on its own is not of value unless lecturers envision effective ways to harness it. Lecturers will always play an important role in the effective delivery of e-learning initiatives because it is the lecturer and not the technology that facilitates the student's learning experience. This is especially important if overcoming transactional time and distance in UNISA's ODL environment is to be achieved.

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Chapter Eleven

Information literacy education in universities.
Some Southern African perspectives

George Theodore Chipeta, Daisy Jacobs and Janneke Mostert

1 Introduction

Tertiary institutions are centers of learning and knowledge generation. In other words, students, academic staff, administrative staff, researchers and librarians work with information. It is imperative for students to therefore be able to independently search, identify, locate, retrieve and use information. Barton (n.d:1-2) observes that information literate students should access, evaluate and use information from a variety of sources, communicate effectively, and reflect on the process as well as the product. Therefore, a deliberate program for the teaching and learning of information literacy (IL) should be incorporated in all universities' curricula. According to the American Library Association (ALA, 2007:1), IL is: "A set of abilities which enable individuals to recognise when information is needed, and possessing the ability to locate, evaluate, and utilise the needed information.". We have observed that most undergraduate students do not posses the skills necessary to conduct their research and search for information. They rely heavily on their lecture notes and library staff in their search for information, despite presumably having been taught and equipped with IL skills during their first year at the university. What and where is the problem? Why are students not performing as expected with respect to IL? It is the intention of this study to reveal, among other findings, how valuable the course is.

The study surveyed two institutions of higher learning in the KwaZulu–Natal province (South Africa), namely the University of Zululand (Unizul), located 15 km outside Empangeni, and the Durban University of Technology (DUT) in Durban, and one in Malawi – the Mzuzu University (Mzuni) in Mzuzu. The Unizul and DUT were selected because they represent various groupings in the country. The Unizul is a comprehensive rural-based university and is regarded as a historically disadvantaged institution, while the DUT is urban-based and is considered to be a historically advantaged institution. Mzuni represents both urban and rural settings. The study excluded the other institutions in South Africa and Malawi because distance, cost and time prevented their inclusion.

The purpose of the study was to investigate the teaching and learning of IL in institutions of higher learning in KwaZulu-Natal (SA) and Malawi. Specifically, the study intended to achieve the following objectives:

- To determine the offer and teaching of IL;
- To ascertain the learning of information literacy;
- To establish who is responsible for the teaching of information literacy or library orientation programmes;
- To determine students' perception of their ability to independently identify, locate, retrieve and use information sources;
- To establish the problems faced in the teaching and learning of information or library orientation programmes; and
- To make recommendations to the curriculum developers and concerned departments at the universities regarding the effective teaching and learning of information literacy.

2 Literature review

The review discusses the following: i) The concept of information literacy; ii) Information skills; iii) Benchmarking of IL; iv) Information literacy models; v) The Seven Pillars of Information Literacy model; vi) Integration of IL into the curriculum; vii) Teaching and learning of information literacy; viii) Topics covered in the module or course of information literacy or in library orientation programmes; and ix) The challenges in the teaching and learning of IL.

2. 1 The concept of information literacy

Shapiro and Hughes (in Malliari and Nitsos, 2008:n.p) believe that in today's society, the effective and efficient utilisation and handling of the massive volumes of print and electronic material and the various audio-visual features presupposes the existence of trained and competent users. Shapiro and Hughes (in Malliari and Nitsos, 2008:n.p) note that by definition, a competent user is one who has developed a set of skills that go beyond the basics of how to use a computer and how to access sources of information, to skills that help him or her decode the nature of information and assess its scientific, social, cultural and philosophical value.

Thus, the American Library Association (ALA, 2007:1) defines information literacy as: "A set of abilities which enable individuals to recognise when information is needed, and possessing the ability to locate, evaluate, and utilise the needed information." Living in the information era, these abilities have become imperative in virtually all life situations, and especially in the learning or educational environment.

According to the Chartered Institute of Library and Information Professionals (CILIP) (2006:n.p), IL is a part of knowledge or learning that is about acquiring a set of skills or competencies. An information literate individual cares about the quality of the answer to

what he/she is investigating and is prepared to work to guarantee that quality. Information literacy is especially relevant in primary and secondary schools, institutions of higher learning, and in business and leisure (CILIP, 2006:n.p). The general lack of access to information sources experienced on the African continent, both for educational and leisure purposes, often results in information illiterate students who are not prepared for the rigors of information retrieval at tertiary level. For this reason, a deliberate programme designed to teach IL should be incorporated in all universities' curricula to help students interrogate and utilise information.

2.2 Information skills – what are they?

Lock (2003:n.p) suggests two ways of approaching or categorising information skills in institutions of higher learning. The first relates to the skills that students will need to put to use during their (study) tenure, and includes the students' ability to use a library and its resources in order to advance their studies; the ability to perform literature searches to whatever depth and complexity required for a particular curriculum or discipline area; and the ability to demonstrate this to the satisfaction of tutors and assessors by means of citations and references when using information. This approach supports the development of a competent student, one who is able to function effectively as part of the academic community.

The second category, according to Lock (2003:n.p), is about the level or degree to which students are prepared to partake in whatever activity they may choose upon leaving higher education. This requires an awareness and understanding of the way in which information is produced and some practical ideas on how information is acquired, managed, disseminated and exploited, particularly with knowledge on how professional groups use information in the workplace, in business, and in the world of culture and the arts. It also includes the critical appraisal of the content and validity of information (Lock, 2003:n.p). In order to know whether a student has mastered IL, some standards have to be made with which to measure the student. This is also known as benchmarking.

2.3 Benchmarking information literacy in institutions of higher learning.

According to De Jager and Nassimbeni (2002:3), benchmarking is a strategic assessment tool that is commonly practiced in the business sector environment and essentially consists of comparing best practices with one's own practice in order to ensure continuous improvement. The purpose of benchmarking, as noted by Meade (in De Jager and Nassimbeni, 2002:3), is to improve the current situation in order to attain excellence, and an important product of such an initiative is: "The discovery of innovative approaches […] as

enhancement of current practices is rarely sufficient to ensure future excellence." Information literacy has been stressed as imperative in institutions of higher learning, especially with the publication of "Information Literacy Competency Standards for Higher Education" by the Association of College and Research Libraries" (ACRL) in 1999. These are considered to be the most acceptable standards by which to measure information competencies in higher education institutions worldwide. The Council of Australian University Librarians (CAUL, 2001:4) is also an example of an organisation that provides information literacy standards as a framework for embedding information literacy in the design and teaching of educational programs and for assessing the information literate individual.

These standards are equally useful to students because they provide a framework for their interaction with information in the academic environment. They also help the students develop their awareness of the need for a meta-cognitive approach to learning, making them conscious of the explicit actions required when recognising their needs and gathering, analysing and using information (CAUL, 2001:4). The Seven Pillars of Information Literacy model describes outcomes and provides examples on how to assess students' progress towards information literacy. The outcomes serve as guidelines for academics and librarians in developing local methods for measuring students' learning.

There are different ways of assessing the outcomes, and these ways include both higher order and lower order thinking skills. These assessment outcomes are based on Bloom's taxonomy of educational objectives, which, according to Haberle (in De Jager and Nassimbeni, 2002:3), require students to first master the cognitive skills of the lower levels of each knowledge domain before they can master the higher levels. Azmi (n.d:149) notes that because information literacy augments students' competencies with respect to evaluating, managing and using information, it is now considered by several regional and discipline-based accreditation associations to be a very important competency of university students. These benchmarks or standards are explained as part of information literacy models, of which several are in use today.

2.4 Information literacy models

There are several information literacy models that have been propagated by different authors, theorists and academics. Examples of such models are outlined below.

2.3.1 The Seven Pillars of Information Literacy (SCONUL, 1999)

The Seven Pillars of Information Literacy model was developed by the SCONUL advisory committee on information literacy in 1999. The model has seven competence levels that include the ability to recognise a need for information; the ability to distinguish the way in

which the information gap may be addressed; the ability to construct strategies for locating information; the ability to locate and access information; the ability to compare and evaluate information obtained from different sources; the ability to organise, apply and communicate information to others in ways appropriate to the situation; and the ability to synthesise and build upon existing information, contributing to the creation of new knowledge (SCONUL, 1999:6).

2.3.2 The Big6 Skills (Eisenberg and Bob Berkowitz, 1990)

According to MacDonald and Darrow (2003:1), the Big6 Skills Model is one of the most well known models in the field and is often taught to students as a guide for their research. It is a process model that outlines how people of all ages solve an information problem. It has six stages that students follow in their information problem-solving process, namely task definition, information seeking strategies, location and access, use of information synthesis, and evaluation (Eisenberg and Berkowitz, 1990: n.p).

2.3.3 Information Search Process (Kuhlthau, 1993)

Another well-known model is the Information Search Process by Kuhlthau (1993). This model demonstrates how users approach the research process and how users' confidence increases at each stage. The model has seven stages, which include initiation, selection, pre-focus exploration, formulation, collection, presentation and assessment (Kuhlthau, 1993:1-3).

2.3.4 Pathways to Knowledge (Pappas and Tepe, 2002)

The Information Inquiry Model by Pappas and Tepe delineates pathways to knowledge and is meant to encourage students to continuously explore and reassess information as they go about their information seeking or retrieval processes. The model consists of six steps, namely appreciation and enjoyment, pre-search, search, interpretation, communication and evaluation.

The above mentioned information literacy models are used in conjunction with other well known information seeking processes, namely Ellis' Model of Information Seeking Behaviour, Dervin's Sense Making Theory, and Belkin's Anomalous State of Knowledge (ASK) theory, in order to look at IL teaching and learning. The Seven Pillars of Information Literacy (as proposed by the SCONUL Committee on Information Literacy in 1999) has been selected in this paper as the focus or core model because it is closer to what students experience in reality in their daily information processes. It shall therefore be used to frame the discussion, and its relevance to the other models will also be demonstrated.

2.3.5 The Seven Pillars of Information Literacy

The Seven Pillars of Information Literacy Model is presented in the diagram below. Other information literacy models' discussions are based on this model. Each skill is discussed and compared with some of the stages in other models. Examples of the kinds of specific activities or competences that illustrate how each skill is applied are also provided**.**
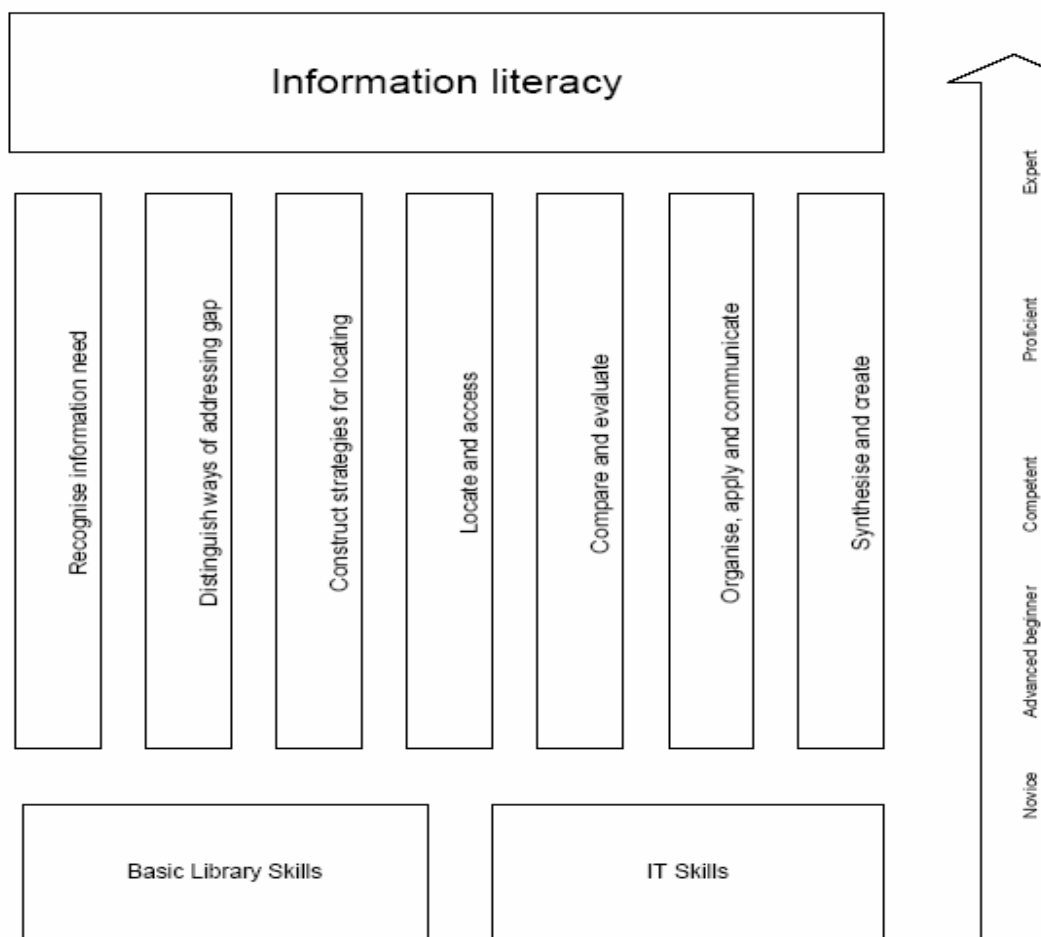
Figure 1 Information Skills model (Sourced from SCONUL position paper, 2003)

2.3.5.1 The ability to recognise a need for information

At this (first) stage, the user, in this case a student, is like a blank slate, with no clear understanding of his or her information needs. Mostert (2004:124) describes 'need' as the perception that something is lacking. It can also be seen as something that a human being requires in order to function effectively. According to Belkin **(**in Kituyi-Kwake, 2007:82), an information need is present when a gap, uncertainty or deficiency in a person's cognitive state is recognised**.** Belkin **(**in Kituyi-Kwake, 2007:82) notes that this deficiency prevents a person from making sense of the surrounding world, and to this end it is described as an "anomalous state of knowledge*"* (ASK), in other words a gap in one's ability to make sense of a situation.

MacDonald and Darrow (2003:2) compare this stage to 'task definition' in the Big6 Skills, and 'initiation and selection' in Kuhlthau's Information Seeking Process. In task definition in the Big6 Skills model, a student determines exactly what the problem is and determines the specific information needs related to the problem. In other words, the stage asks what information is needed in order to solve the problem at hand. This is similar to 'task initiation and selection' in Kuhlthau's Information Seeking Process model in which an individual first becomes aware of the lack of the knowledge necessary to accomplish an assignment, which is followed by feelings of uncertainty and apprehension. At this stage, the task is to recognise the need for information. Thoughts are vague, and there is ambiguous centering on the general problem.

According to Kuhlthau (1993), a person is driven to search for information in order to address a problem as perceived by him/her. A student may therefore discuss the problem at hand with others, including peers and experts, and/or browse different sources to identify a research topic or other information need. This in turn leads the student to explore general information resources to increase their familiarity with the topic by brainstorming, discussing the problem with others, thinking about possible topics, and by tolerating uncertainty. The student then selects the topic for research. Thoughts at this stage centre on weighing topics that would best suit his/her research interests and project requirements based on the information and time available; the topic with the greatest potential for success ultimately gets selected.

When selection is delayed or postponed, feelings of anxiety and confusion are likely to intensify until a choice is made. Feelings of uncertainty give way to a brief sense of elation upon selection. Actions may involve searching for information by consulting with informal mediators and making preliminary searches of the library and other sources. As already mentioned, strategies would include discussing possible topics with peers or experts and using different sources to overview possible topics. In Strippling and Pitts' Research Process model (1988: n.p), also known as REACTS, choosing a broad topic and getting an overview of the topic is known as recalling, which entails fact-finding and reporting on the information.

This is followed by narrowing the topic and developing a statement of purpose, which means posing questions (e.g. whether the chosen topic will meet the users' research interests) and finding answers to such questions. It also entails exploring various forms of literature and reading, viewing and listening.

In their model, Pappas and Tepe (2002:1-2) refer to this stage as 'appreciation and enjoyment'. Appreciation and enjoyment are about 'raising' the information need. The authors argue that appreciation fosters curiosity and imagination, which in turn lead to

discovery in an information seeking activity. As students go through the information seeking stages by viewing, listening, reading and sensing, their appreciation also develops and matures.

The pre-focus exploration stage in Kuhlthau's Information Search Process model also fits in this first stage of the Seven Pillars model. The student investigates information in order to find a focus point or area. He or she would therefore learn more about the general topic and identify several possible focus areas while still being unable to express the exact information that is needed. The student would therefore feel confused, doubtful, uncertain and sometimes threatened, and consequently take action by reading to gain more information and by taking notes and making bibliographic citations. Strategies that an information seeker or student would employ include summarising the notes, listing possible foci of the topic, and combining several themes to form one focus. The student then proceeds to the next stage, which is finding ways in which the information gap can be addressed.

2.3.5.2 The ability to distinguish ways in which the information 'gap' may be addressed

The second step of the information process in the Seven Pillars of Information Literacy model entails being knowledgeable about both print and non-print information resources, selecting the information sources that would go towards accomplishing the research task, and understanding issues that affect access to information sources (Sconul, 1999:7).

Baker (2005:1-2) compares this stage to: 'focus formulation' in Kuhlthau's Information Search Process model; 'formulating questions to guide research and plan for research production' in Pitts and Strippling's Research Process model; and the 'pre-search stage' in the Pathways to Knowledge model of Pappas and Tepe. Kuhlthau (1993:1-2) notes that the exploration or investigation stage in her model is the most difficult stage for users and the most misunderstood by intermediaries. Feelings of confusion, uncertainty and doubt frequently increase during this stage. The task is to investigate information relating to the general topic in order to extend one's personal understanding. Thoughts are on becoming sufficiently informed about the topic to form a focus or a personal point of view. An inability to state exactly what information is needed makes communication awkward between the user or student and the system. Actions include locating information relevant to the general topic, reading, and relating new information to what is already known. Formulation means focusing more on a specific topic within a topic. Feelings of uncertainty diminish and confidence begins to grow. The task is to develop a focus area based on the information encountered during exploration. Thoughts become clearer as a more focused and articulated concept of the topic is formed. Baker (2005:5) explains that the 'formulating questions to guide research and plan for the research production' stage of the Research Process model involves examining and organising (analysing) information, and asking whether the questions lay a

good foundation for the research task and whether the research plan is feasible. The student then organises the information to fit the research task at hand.

In their model, Pappas and Tepe (2002:2) explain that the pre-search stage enables the users to make a connection between their topic and the knowledge that they already have in order to explore the relationships between subtopics. This requires students to brainstorm and ask what they know about their topic and what they want to know.

2.3.5.3 The ability to construct strategies for locating information.

The third step in the Seven Pillars of Information Literacy model implies articulating information needs to match the available information sources, developing a systematic method appropriate for the information needs, and understanding the principles of the construction and generation of databases. Baker (2005:1-2) compares this stage to 'information seeking strategies' in the Big6 Skills model and 'search' in the Pathways to Knowledge model. In order for a student to extract ideas or the right amount of information during the 'information seeking strategy', the student would need to consult a range of literature, such as journal articles, Internet sources and books on the subject. This would mean selecting a wide range of information sources and prioritising the best of all the possibilities. This is also accomplished through information seeking and requires the student to assess the value of various types of print and electronic sources, such as CD-ROMS, databases, browsing the Online Public Access Catalogue (OPAC), and so on.

The sources found would give the student an idea on how to narrow his/her broad area of interest. Ellis (in Choo, Detlor and Turnball, 2003:n.p) and Wilson (1999:6) call this 'chaining and browsing'. Chaining can either be forward or backward. Backward chaining occurs when pointers or references from an initial source are followed; scientists and researchers follow this routine in their information seeking processes. Forward chaining, on the other hand, identifies and follows up on other sources that refer to an initial source or document and is less commonly used. This is where the individual simplifies browsing by looking through the table of contents, lists of titles, subject headings, names of organisations or persons, abstracts and summaries, and so on. Browsing takes place when related information has been grouped together according to subject affinity, when the user views displays at an exhibition, when he/she scans a book on a shelf, etc (Ellis in Choo, Detlor and Turnball, 2003:n.p). Having accomplished this activity, the student moves on to the next activity.

2.3.5.4 The ability to locate and access information.

The fourth stage of the Seven Pillars of Information Literacy model requires the student or information user to be able to develop an appropriate searching technique, such as the use of

Boolean operators, communication and information technologies, appropriate indexing and abstracting services, citations, indexes and databases, and current awareness methods to keep up to date. To this end, the models that fit here include the Big6 Skills' 'location and access', 'information location' in Kuhlthau's Information Search Process, 'find, analyse and evaluate resources' in the Pitts and Strippling's Research Process model and 'search' in the Pathways to Knowledge model.

Eisenberg and Berkowitz (1990:n.p) refer to this stage as 'locating and accessing information'. This is concerned with the student selecting the most appropriate investigative methods by developing a research plan and identifying keywords, synonyms and related terms for the required information. The student thereafter constructs a search strategy using appropriate commands for the information access tool selected, such as the use of Boolean operators ("AND", "OR" and "NOT"), truncation, and proximity operators for databases/ search engines, and/or the use of OPAC, indexes and abstracts. The student goes on to retrieve information in a variety of formats using various information access tools, classification schemes and other systems, such as call number systems or indexes, to locate information resources within a library.

Kuhlthau (1993:2-3), on the other hand, refers to this as 'collection'. This is when interaction between the user and the system functions most effectively and efficiently. At this point, the task involves gathering relevant information on the focus topic. The student would have a clearer sense of direction and can specify the need for particular information. Thoughts are on searching for information to support the focus area, defining and/or extending the focus area through information, gathering pertinent information, and organising information in notes. At this point, feelings of confidence may grow considerably as uncertainty subsides and interest in the project intensifies. Actions focus on using the library and other resources to collect significant information, and taking detailed notes with bibliographic references. Strategies that are used include using keywords to search for significant information; comprehensively searching various types of materials, such as references, periodicals and non-fiction; using indexes; and requesting assistance from the librarian. This stage is equivalent to 'find, analyse and evaluate resources' in the Research Process model in which a student asks themselves whether the sources found are usable and adequate.

In the search stage of the Pathways to Knowledge model, Pappas and Tepe (2002:3) explain that users identify appropriate information providers such as libraries, records and archive centres, museums and so on; select information resources and tools such as indexes, people, the Internet, the media and reference resources; and then plan and implement a search strategy to find information relevant to their research question or information need.

This they can accomplish by scanning, interviewing and confirming information sources and recording information to determine the relevance of the information, and by exploring and browsing widely. Ellis (in Choo, Detlor and Turnball: 2003: n.p) refers to this as 'extracting', which is an activity of systematically working through a particular source or sources in order to identify materials of interest. This is achieved by directly consulting the source(s) or by indirectly looking through bibliographies, indexes or online databases.

2.3.5.5 The ability to compare and evaluate information obtained from different sources
The fifth stage of the Seven Pillars of Information Literacy model signifies that students should be aware of bias and authority issues, in other words the peer review process of scholarly publishing and appropriate extraction of information matching the information need. This is compared to 'evaluation' in the Big6 Skills model, 'search closure' in Kuhlthau's Information Search Process, 'evaluating evidence/taking notes and compiling a bibliography' in the Research Process model, and 'interpretation' in the Pathways to Knowledge model.

Eisenberg and Berkowitz (1990:n.p) explain that the student assesses the quantity, quality and relevance of the search results to determine whether alternative information access tools or investigative methods should be utilised, identifies the gaps in the information retrieved, and determines if the search strategy should be revised. The student repeats the search using the revised strategy when necessary, summarises the main ideas extracted from the information gathered, and examines and compares information from various sources to evaluate the information's reliability, validity, accuracy, authority, timeliness and point of view. The student should be able to recognise the cultural, physical, or other contexts within which the information was created and should understand the impact of context when interpreting information. In 'search closure', Kuhlthau (1993:3) asserts that the task is to wrap up the search for information. A student's thoughts are immersed in identifying whether this would increase redundancy and exhaust all resources.

At this stage, the student could feel a sense of relief, satisfaction, or disappointment. The student rechecks sources for information that might have gone unnoticed from the outset and confirms information and bibliographic citations relevant to the focus area and research questions. Strategies would include returning to the library to sum up the search and keeping the necessary books while writing to recheck information. Baker (2005:5) explains that 'evaluating evidence or taking notes and compiling a bibliography' in the Research Process model involves judging information on the basis of authority, significance, bias and other factors.

Ellis' model of information seeking behaviour refers to this as 'differentiating' (Ellis in Choo, Detlor and Turnball, 2003:n.p). This means that the student filters and selects from the

sources scanned by noticing differences between the nature and quality of the information offered. Priority of sources and types of sources can be made according to three main criteria, namely substantive topic, approach or perspective, and level, quality, or type of treatment. The differentiating process is likely to depend on the individual's prior experiences with the sources, word of mouth recommendations from personal contacts, or reviews in published sources.

2.3.5.6 The ability to organise, apply and communicate information to others in ways appropriate to the situation

This stage calls for students or researchers to cite bibliographic references in their academic works, construct a personal bibliographic system, apply information to the problem at hand, communicate information effectively using the appropriate medium, and to understand issues pertaining to copyright and plagiarism (SCONUL, 1999:6). This is similar to 'information use' in the Big6 Skills model and 'communication' in the Pathways to Knowledge model. According to Pappas and Tepe (2002:3), the communication stage allows students to organise, apply, and present new knowledge that is applicable to their research questions or information needs. In applying information, students choose an appropriate communication format and respect intellectual property. In sharing knowledge, they compose, design, edit, revise and use the most effective medium (e.g. video, report, animation, etc.) and convey the information.

In communicating information to others, the student should understand cultural, ethical, legal, and socio-economic issues surrounding information, and identify and articulate issues that relate to privacy. In addition, the student needs to note security in both the print and electronic environments, identify and articulate issues in relation to free versus fee-based access to information, identify and discuss issues in relation to censorship and freedom of speech, and demonstrate an understanding of intellectual property, copyright and the fair use of copyrighted materials. To avoid issues of plagiarism, the student should acknowledge the use of information sources by selecting an appropriate citation style in project reports and theses.

2.3.5.7 The ability to synthesise and build upon existing information, contributing to the creation of new knowledge

'Synthesis' in the Big6 Skills model by Eisenberg and Berkowitz, 'presentation' in the Information Search Process by Kuhlthau, and 'establish conclusions/organise information in outline and create and present final product' in the Research Process Model by Pitts and Stripling compare favourably to the seventh stage of the Seven Pillars model.

According to Eisenberg and Berkowitz (1990:n.p), synthesising information means that the student brings information together and relates what he/she learnt to what he/she already

knows. The student chooses a communication medium and format that best supports the purposes of the product and the intended audience. This entails writing a draft that links various segments of information into a coherent whole and revising the draft a number of times to improve understanding before submitting it. In Kuhlthau's (1993:n.p) model, this stage falls under presentation. The task is to complete the search and to accomplish the assignment. A sense of relief is common, with satisfaction if the search has gone well and disappointment if it has not. Thoughts centre on culminating the search with a personalised understanding of selected aspects of the topic under study. Finally, the student has to combine concepts into potentially useful primary statements with supporting evidence and integrate the prior and new information, including words and ideas, in a manner that supports the purposes of the project.

In establishing conclusions and organising information in an outline, Pitts and Stripling (Stripling and Pitts, 1988:n.p) explain that the student or researcher draws conclusions by developing a personal perspective based on the obtained information. The outline should logically arrange conclusions and evidence. In creating and presenting the final product, Pitts and Stripling (Stripling and Pitts, 1988:n.p) are of the view that this should reflect on whether the paper is satisfactory.

The above competencies can be inculcated in students by teaching them in formal classes in their respective subjects. If the module or course of information literacy is to be taught in formal classes and marked, it has to be embedded into the curriculum of the teaching department.

The teaching of information literacy in institutions of higher learning with special reference to South African universities: case studies

Schaffner, Stebbins, and Wyman (in Allen, 2000:n.p) suggest that in order to improve active undergraduate education, resource-based learning should be the standard model of learning on university campuses. It also incorporates undergraduate research, service learning, inquiry learning, problem-based learning, and evidence-based learning. Additionally, it fosters the achievement of information literacy competencies and results in tangible outcomes or accomplishments, e.g. in the case of a solution to a community problem. Daskiw and Forsyth (2003:3) present an example of resource-based learning at La Trobe University in Canada, where information literacy as a subject for the Bachelor of Nursing degree was published and presented online in WebCT modules and delivered as a set of lectures. Formal lectures were improved with standard tutorials and workshops.

There are several information literacy initiatives in South Africa. One such initiative, the most prominent in fact, is the Information Literacy (INFOLIT) project, established in 1995. According to Underwood (2002:5), the primary objectives of INFOLIT (as of 1995) are to

promote the concept, value and importance of information literacy, and to launch a series of pilot projects and explore and establish a means of spreading information literacy education in the Western Cape region. The tangible outcomes of the INFOLIT project have been the recognition of the importance of IL at the University of Stellenbosch, University of Cape Town, Peninsula Technikon, Cape Technikon, and the University of the Western Cape. The INFOLIT project also culminated in sponsoring the development of a web-based IL course. The site is meant to help users find, evaluate, use and communicate information. It is available at all the tertiary institutions in the Western Cape Province (Underwood, 2002:7). Underwood (2002:8) reports that the INFOLIT project also led to the establishment of a Centre for Information Literacy at the University of Cape Town. The members of staff at the centre are responsible for working with the academic staff of all the university's faculties in order to develop strategies for the integration of IL within the faculties' curricula. A series of discipline-based workshops on web-searching were developed using a template. The workshops were delivered on request to academic and library staff and students at each of the five institutions in the Cape region (Underwood, 2002:8).

According to De Jager, Nassimbeni and Underwood (2007:143), most institutions of higher learning offer library orientation or training that includes the use of the OPAC, electronic databases, citations and referencing. These authors also note that there is growing evidence of a greater number of IL modules being embedded in various curricula. While most of the courses are still generic stand-alone courses, others are credit bearing. Most institutions have a librarian whose primary responsibility is IL education, very often supported by subject librarians who offer training in their specific fields or disciplines. Some of the training is delivered in classrooms or computer laboratories, while other forms of training are offered virtually through platforms such as Web-CT. A training librarian made the point, however, that at her institution they were unable to offer an online course because many of their students come "from rural areas, farms and townships where there are no libraries and computers" (De Jager, Nassimbeni and Underwood (2007:143).

The former Rand Afrikaans University launched a multimodal approach to teaching and learning in 2003. The multimodal approach was aimed at optimisation, learning and assessment, and has been defined as the use of different media or modes of delivery of teaching. The different media and technologies used in this integrated, multimodal learning environment include lectures, support from tutors, paper-based learning guides, interactive CDs, textbooks, videos, videoconferencing, and the web (electronic classes based on Web-CT software offered to students via the Edulink virtual learning environment portal) [Molepo and Van Vuuren, 2005:144].

According to Kibirige (2005:131), the learning and teaching processes at Monash University, South Africa, involve, in some instances, customised classes for groups of students for search assistance related to a specific assignment. Such a session covers the Voyager catalogues as well as reference works, search strategies and online databases relevant to an essay topic. Through liaisons between the library and the Center for Learning and Teaching, some lecturers attend information literacy workshops taught to subject groups on an *ad hoc* basis. Other initiatives include curriculum integrated sessions, where there is one formally scheduled session on the academic timetable--a two-hour class on "Doing research on the Internet" as part of a first year course in contemporary studies. Students complete an assignment for credit towards their semester mark, and develop the skills that are necessary for effective Internet research by completing specific exercises. This model could be extended to other course units (Kibirige, 2005:131).

Chipeta, Mostert and Jacobs (2009:52), in their study on the "Teaching and learning of information literacy in some selected institutions of higher learning in the KwaZulu-Natal province, South Africa and Malawi", established that IL is offered and taught as a module or course by the Departments of Library and Information Science at the University of Zululand (Unizul) and Mzuzu University (Mzuni), where it is embedded in the departments' curricula. While it is not formally offered by the Durban University of Technology (DUT), it forms part of the library orientation programme. Both Unizul and Mzuni also offer it as part of the library orientation programme, but it is not compulsory to attend. This method corresponds with one at the Chinese University of Hong Kong, China; according to Li, Leung and Tam (2007: 534), the reference librarians at the University Library System (ULS) conduct the user education or information literacy instruction through face to face classroom instruction.

In their study, Chipeta, Mostert and Jacobs (2009:117) ascertained that common topics in the two institutions include sources of information, searching and retrieval tools, the use of I-Link OPAC, the use of the Internet and electronic sources such as databases, evaluating and manipulating information in a usable form, arrangement of information resources in the library, communicating information, and citing and referencing academic works. Modes of delivery mainly consisted of lectures, group discussions and practicals in the computer laboratory, and both theory and practical modes in the library.

Several problems in the teaching and learning of information literacy are pinpointed here and were discussed in Chipeta, Mostert and Jacobs' (2009) paper. These include technological issues, diverse groups, language and cultural barriers, and lack of time and resources such as computers.

Insufficient computer resources and slow Internet connections make the efficient teaching of information literacy very difficult. The problem of slow connectivity affects the

time frame in which a topic could be taught and its completion (Daskiw and Forsyth, 2003:7). To compound the problem, some students do not have any computing skills.

Chipeta, Mostert and Jacobs (2009:53) observed that some topics, such as the use of the OPAC, databases and search engines, require the use of computers and the Internet. Therefore students need to be computer literate. The study established that the inability to operate computers sufficiently slowed down teaching during practical sessions and was particularly frustrating to the library staff since they only had one hour to teach students all that they needed to know about the library and how to search for information. This often resulted in sessions being virtually fruitless as tasks could not be completed or practiced. Erratic network connections due to viruses and power disruptions at both the University of Zululand and Mzuzu University were other common problems. Chipeta, Mostert and Jacobs (2009:125) noted that 2008's load shedding was a crisis in South Africa that was beyond the affected universities' control; it generally remains a national and regional crisis that afflicts most of the countries in the Southern African region. Power blackouts tend to disrupt the teaching and learning of IL because classes are based on the use of electronic equipment, e.g. computers, overhead projectors and the Internet. Once power goes out, the computers' network server is disrupted and classes have to be dismissed.

Another problem, as highlighted by Winfred and Manning (in Selematsela, 2005:30), is that the student population in South Africa is very diverse and teachers are responsible for classrooms that represent students of different racial and ethnic groups, religions, languages, backgrounds, ages and learning styles and computer skills. As such, students enter the university with extreme polarity in their skills levels, thereby making it difficult for academic and library staff to pitch information literacy sessions at the same level (Moore and Abson in Selematsela, 2005:30). Winfield and Manning (in Selematsela, 2005:30) note that diversity in the case of students can be classified according to intergroup or individual differences. Intergroup differences are more pronounced in socio-economic levels; racial, ethnic and language groups; and physical ability. Within the intergroup differences and within each learner group, there are individual differences in learning rates, attitudes and motivational rates, which have a bearing on the achievement outcomes that academic and library staff must accommodate.

Yet another problem identified by Selematsela (2005:31) is that most learners that study in South African universities come from Southern African Developing Countries (SADC) and beyond and also include locals whose mother tongue is not English. Most of these learners use English as a second language. This has some implications on their learning. Conteh (in Selematsela, 2005:31) asserts that the inclusion of learners from diverse language and cultural backgrounds in the same information literacy instruction session becomes

problematic in the teaching of information literacy and increases the risk of misunderstanding. Students from disadvantaged backgrounds have unique obstacles that they have to overcome in order to be able to independently use library and information resources. Issues such as communication, learning styles and students' previous experiences should be taken into account by the lecturers and instructors. In addition to language barriers, there are also cultural barriers, which include students' reluctance to ask for help and their shyness of and respect for authority.

Chipeta, Mostert and Jacobs (2009:53), in their study at UniZul and the DUT in KwaZulu-Natal in South Africa and Mzuni in Malawi, found that time plays a very important role in the teaching of IL. The shorter the time selected for teaching, the more likely it is that the teaching would be ineffective. If, on the other hand, the teaching period is longer, there is a higher likelihood that students would grasp the topics under discussion. All the staff members interviewed cited lack of time as a common problem. For the library orientation programmes, only one-hour slots per student group were allocated, and even departmental staff that had a whole term to teach IL cited these time slots as inadequate, especially in terms of practical work.

The teaching of IL also requires a setting where there are computers for students' practicals. This contributes to a smooth teaching and learning environment. A shortage of equipment and/or venues means limited access to computers and therefore fewer practicals. Chipeta, Mostert and Jacobs (2009:53) found this to be a perennial problem at Unizul, DUT and Mzuni, especially in their libraries which require the equipment onsite for practical orientation. The staff teaching the course experienced the same problem, having to make use of computer laboratories that were mostly double-booked with other courses (Unizul) or always used by computer science students, not leaving much room for any other classes (Mzuni). The authors observed that students often simply did not pitch up for classes because they knew about these problems.

These studies have been able to unearth the dearth of studies on information literacy in Africa. Most information on IL is euro-centric; there is little happening in African countries, except for South Africa in which there have been a number of initiatives.

We have demonstrated that information literacy is being taken seriously as a module or course in some institutions of higher learning in KwaZulu-Natal, South Africa and Malawi, although a lot more needs to be done in terms of facilities and equipment that are vital in inculcating IL skills in students. If IL instructors are to teach effectively, they have to be given the necessary support in terms of tools, otherwise they may end up with students who do not know how to independently search, identify, locate and use information. All in all,

institutions of higher learning should incorporate IL courses in their curricula and it should be made mandatory to teach students such a course.

3 Methodology

Qualitative and quantitative approaches were both used in this study in the form of a survey consisting of questionnaires and observations for data collection from the students, and interviews in the case of academic and library staff. A quota sampling technique was used on 408 students, of whom 287 responded. A sampling ratio of 1.3% was used across all three institutions to come up with the sample. The population in this study was first categorised according to faculty, level of study (whether undergraduate or postgraduate) and gender before being selected haphazardly. Permission had to be sought and granted from the institutions under investigation. For the survey, self-administered questionnaires, containing both open and closed ended questions, to cater for both qualitative and quantitative responses, were handed out. Observations on the students' ability to search, locate and retrieve information were also done during the same period as the questionnaires were distributed. The study used purposive sampling, which is also a judgemental form of sampling. The study targeted and interviewed three lecturers in the respective Departments of Library and Information Science (LIS) responsible for teaching information literacy, and three library staff from the selected institutions. Lecturers in the Departments of LIS were targeted because most IL offerings and teachings are housed in these departments. Library staff were selected because libraries conduct orientation programmes in which some components of IL are taught. Hence, their inclusion was viewed as important. Data was analysed using the Statistical Package for Social Sciences (SPSS). The results were represented qualitatively and quantitatively using tables, graphs and percentages.

4 Results and discussions

This section presents the results and discussions of the major findings collated from three sets of data, namely questionnaires, observations of students' information-related behaviour, and interviews with academic and library staff from the three institutions. Issues that are considered to be of major importance are outlined below.

4.1 Status of teaching information literacy

The offering of the course of IL in the universities under study was considered to be of great significance in this paper, because it lays the foundation for the teaching and inculcation of IL skills in the students. From the research, it emerged that information literacy is offered and taught as a module or course by the Departments of Library and Information Science at

the University of Zululand and Mzuzu University, where it is embedded in the departments' curricula. While it is not formally offered by the Durban University of Technology, it forms part of the library orientation programme. At both Unizul and Mzuzu, it also forms part of the library orientation programme, which is not compulsory to attend. The methods of designing the formal courses differ in the two institutions that offer it. Whereas the best practice for the design and review of the curriculum is through the involvement of various stakeholders, such as librarians, administrators, lecturers and curriculum designers, this is not always the case. In the case of Mzuzu, no external input is sought. From the interviews with staff members, it was clear that the teaching of the formal courses is the responsibility of the lecturers in the respective departments of Library and Information Science, while the informal library orientation programmes were the responsibility of a senior library staff member. Although strong emphasis was placed on theoretical modes of teaching only, it would seem that there was a practical component, specifically at Unizul, as 9 (50%) of the 18 students who attended formal classes indicated that they received instruction by way of both practicals and theory. The informal library orientation programmes took the form of a theoretical introduction to the library, a walkabout in the library to familiarise students with the whereabouts of the information sources, and a one hour practical, hands-on introduction to the OPAC. Attendance of the orientation programmes was not compulsory and skills learned were not tested or credited to the student. It was worrying to note that very few (31; 11%) of the student respondents indicated that they are aware of the formal course in information literacy. Quite possibly, this is because the module or course is only embedded in the curricula of the Departments of Library and Information Science and Communication and Agriculture Science at the University of Zululand, and the Department of Library and Information Science at Mzuzu University. As students are mostly concerned with what is prescribed to them in the curriculum, they will mostly remain unaware of the IL course's existence. From the above, it should then stand to reason that the attendance figures of the IL courses would be low, which was in fact the case as only 18 (28%) of the respondents from the three institutions indicated that they attended the formal courses in information literacy.

4.2 Students' perceptions of their ability to identify and locate sources in the library independently by using the OPAC and indexing and abstracting journals

From the results presented in Table 1 below, it was observed that all the students who indicated that they had received formal training felt confident that they could identify and locate information sources with ease using a variety of information retrieval tools. This finding was confirmed by our observations of the searching skills of the students, where it was found that students who had some formal training very easily traced the required documents and located them on the shelves. However, those with no formal training spent

many hours searching and were often frustrated at not finding what they wanted. This was a common trend at both Unizul and Mzuni. The observed students at DUT, however, had no problems locating and retrieving documents.

Students without formal training, but who probably attended the library orientation programme at both Unizul and Mzuni, did not feel too confident in their ability to either identify or locate information sources (a 'no-response' to this question was seen as an indication of an inability to use the specified tool), while those at DUT, where only library orientation was offered, displayed a lot of confidence in their information seeking abilities (see Table 1). This then raises the question of the quality of the library orientation programmes at the institutions. During the interviews with the librarians at Unizul and Mzuni, they indicated that they taught topics such as library rules and policies (Unizul), information retrieval skills (Unizul and Mzuni), how to use the OPAC and other retrieval tools (Unizul and Mzuni), online databases (Unizul), classification and arrangement of information sources in the library (Mzuni), and the citation and referencing of academic works (Mzuni). At DUT, however, the orientation programme consisted of eight units and included topics such as the nature and need for information, the Dewey Cecimal Classification, I-Link-OPAC, printed sources of information, e-resources, how to locate information using different retrieval tools, evaluation of information resources, and plagiarism and referencing. It would therefore seem that the DUT library programme offered more in-depth knowledge to students with respect to information and its retrieval.

4.3 Students' perceptions of their ability to identify, locate, retrieve and use information sources

The respondents were asked to indicate how they perceived their abilities to locate, retrieve, and use various information sources commonly used by students for educational purposes. As was the case with the previous section (4.2), the same trend was detected among the students from the respective institutions, where the students from DUT were much more familiar with searching for, finding, and using a variety of sources (see Table 1).

4.4 Challenges faced in the teaching and learning of information literacy or the library orientation programme

During the interviews with the Library and Information Science Departmental staff at Unizul and Mzuni, as well as DUT, the librarians responsible for the library orientation programmes at all three institutions cited the challenges outlined below.

Table 1 Students' perception of their ability to independently identify and locate services in the Library by using the OPAC, indexing and abstracting journals. (N=287)

Unizul

With formal information literacy training (N=14)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	14	0	14	0	0	14	0	14
Ind	10	4	10	4	4	10	4	10
AJ	7	7	6	8	7	7	8	6

Without formal information literacy training/ with library training/other modules or courses (N=75)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	8	67	8	67	27	48	27	48
Ind	4	71	4	71	42	33	42	33
AJ	3	72	3	72	50	25	50	25

DUT

With formal IL training (N=2)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	2	0	2	0	0	2	0	2
Ind	0	2	0	2	0	2	0	2
AJ	0	2	0	2	0	2	0	2

Without formal IL training / with library training/other modules or courses (N=187)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	131	56	131	56	20	167	20	167
Ind	100	87	100	87	0	187	0	187
AJ	40	147	40	147	0	187	0	187

Mzuni

With formal information literacy training (N=2)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	2	0	2	0	0	2	0	2
Ind	2	0	2	0	0	2	0	2
AJ	2	0	2	0	0	2	0	2

W

Without formal information literacy training/ with library training/other modules or courses (N=16)

Tool	Ident	Non Res	Loc	Non Res	Can Not Ident	Non Res	Can Not Loc	Non Res
	F	F	F	F	F	F	F	F
OP	6	10	6	10	0	16	0	16
Ind	5	11	5	11	11	5	11	5
AJ	3	14	3	14	13	3	13	3

4.4.1 Time

Time plays a very important role in the teaching of IL. The shorter the period of teaching, the less effective it is likely to be, meaning that important information skills would not be adequately grasped by the students. If, on the other hand, the teaching period is longer, there is a higher likelihood that students would grasp the topics under discussion. All the staff members interviewed cited this as a common problem. In the case of library orientation programmes, only one-hour slots per student group were allocated, and this was seen as totally inadequate. Even for the departmental staff who had a whole term to teach information literacy, this was still insufficient, especially in terms of practical work.

4.4.2 Computer literacy

Some topics, such as the use of the OPAC, databases, search engines, and searching and retrieval in the module or course of IL, involve the use of computers and the Internet. Therefore students need to be computer literate. The lack of computer literacy was a problem mentioned by all the staff members interviewed. The inability to operate computers sufficiently slowed down the teaching during practical sessions, and this was particularly frustrating to the library staff since they only had one hour to teach students all that they needed to know about the library and information seeking. This then often resulted in sessions being virtually fruitless as tasks could not be completed or practised.

4.4.3 Lack of computers

The teaching of IL also requires a setting where there are computers for students' practicals. This contributes to a smooth teaching and learning environment. A shortage of equipment and venues means limited access to computers and a subsequent shortage of adequate practicals. This was found to be a perennial problem at all the universities, especially in the libraries which needed the equipment on-site for practical orientation. The staff teaching the course experienced the same problem, having to make use of computer laboratories, which were often double-booked (Unizul) or always used by Computer Science students, not leaving much room for any other classes (Mzuni). This often led to situations where students just did not pitch up for classes, as they knew about these problems.

4.4.4 Lack of collaboration between academic and library staff

Where the academic staff did not see the need for any form of collaboration, especially in terms of curriculum development, all the library staff interviewed lamented the lack of collaboration, especially in terms of making students available to attend library orientation programmes. One of the library staff members also complained that students are sometimes sent to the library for an orientation class without prior arrangement with the librarians,

leading to a situation where the librarian is ill-prepared or not in a position to handle them at that point in time.

5 Conclusion

Although information literacy does form part of the formal offerings at both Unizul and Mzuni, it is not a course that is widely opted for by students. Possible reasons for this could be poor marketing to other departments by the respective Departments of Library and Information Science (LIS), since the majority of the students who do take the course come from the LIS Departments. Other reasons could be that the university academic staff in general do not realise the value of such a course, in all likelihood because they do not know what it entails, or because they do not view it as an important aspect of the academic empowerment of students. Another explanation could be that lecturers in each module provide information on aspects of information literacy, such as citation writing, and see this as enough background for writing. The librarians at all three libraries also indicated that some of the lecturers send students to the library to attend a library orientation programme specifically for that class. This is seen as enough for students to search and find information on their own. Taking into account the existing disparities in the access to information sources in the majority of the communities from which students originate, it can be assumed that most students have not been widely exposed to the use of information sources. Based on this, and as indicated in the literature review, the ideal situation is to have information literacy embedded in the curricula across the tertiary institutions' academic programmes. As long as information literacy is not a compulsory module, most students will struggle to engage in the information seeking, utilisation and dissemination process effectively. In the absence of formal information literacy teaching, the library orientation programme needs to fill the gap.

From the interviews with the librarians, it was clear that the time allocated to each student group is insufficient, especially with the amount of information and skills that need to be disseminated. This is topped off by the students' lack of previous exposure to formal information sources, as well as their lack of computer literacy. All these factors necessitate the negotiation of time allocation between the library and the academic institution. The issue of the allocation of credits for attendance should also be receiving attention, since it was shown that this is one of the major spurs behind the attendance of library orientation programmes. The fact that the DUT students perceived their information location, utilisation and retrieval abilities to be relatively good compared to the other two universities is an indication that their library orientation programme is worth emulating at other tertiary institutions. However, further research should be done on this matter, as the positive results could also stem from the fact that this institution is located in an urban area where previous

exposure to information sources is more likely. With the current trend in academia to use technology extensively to try and locate information, it is imperative for information literacy to be made part of each academic programme, since each source, from bibliographic or full text database to electronic newspapers, online journals, CD-ROMs, etc., presents its own challenges in terms of locating the source, navigating around it, and eventually extracting the necessary information.

6 Recommendations

In order for information literacy to be successfully taught, necessary resources, such as the venues in which to teach and access to sufficient computers, are essential. Theoretical teaching alone is not enough, as it does not equip students with the necessary skills to use libraries or information sources with confidence. Enough staff members also need to be allocated, particularly for the library orientation programmes, as these are sometimes the only exposure students get to any form of IL education. Groups should be small enough to be interacted with so that all problems, whether computer illiteracy or inexperience with searching for information, can be solved as they come up. In bigger groups, those with problems are not easily identified and often leave such a lecture as ignorant as they entered it. This was clearly illustrated by the responses in Tables 1 & 2, where a large majority of students who potentially should have attended library orientation programmes, still could not utilise the library facilities and information sources. Wider consultation and collaboration with various stakeholders, such as the librarians and staff from other universities who offer similar courses, should be encouraged, especially in terms of curriculum development and areas of concern such as time and staff shortages. This would result in learning from others and establishing best practices. Mzuni has already embarked on such a process, and we recommend that other universities should follow suit. The DUT should seriously consider introducing a formal information literacy course to build on the work that is already being done by the librarians. In the interest of the academic empowerment of students, it is recommended that both LIS academic staff and librarians market their information literacy or library orientation classes aggressively to the rest of the university staff and lobby for it to be made a compulsory and credit bearing course. In this way, all students would be prepared for the rigors of academic discourse and research work, which ultimately is the aim of any academic institution.

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Chapter Twelve

Which way for LIS education and training in South Africa? Some considerations from contact and distance learning

Mabel K Minishi-Majanja

1 Introduction

The changing patterns of social-economic interaction in society often mean that professions need to re-examine their principles and re-align themselves with current trends and perspectives. Of the latter, the two most influential to Library and Information Science (LIS) education have been the democratisation of information and the emancipation of the user (de Bruyn, 2007). Democratisation of information refers to how access to information has long ceased to be the preserve of only a few--the elite--because political forces and Information and Communication Technologies (ICTs) have effectively tackled the barriers to information. I hasten to add that this does not by any means imply that everyone all over the world has equal access, but merely assert that there are more opportunities to access information than there were 20 years ago. The emancipation of the user is a direct offshoot of both technology and globalisation. New technologies not only increasingly provide information to the user whenever and wherever they are, but also employ more sensory, user-friendly formats than text, such as sound, video and images. Globalisation permits information users to behave like international citizens looking for and being provided with information across borders, even though the issue of relevance has not been completely resolved.

These changes have had a profound and obvious impact on the provision of library and information services, and hence LIS professionals. The type and quality of LIS education graduates should both reflect and be a reflection of the types of services provided in libraries and other information centres. Undoubtedly, trends in the development of ICTs in the world today are centrally significant.

A further contributor to the course of LIS education has been the reforms or changes in higher education. In many countries, governments have recognised the need to reorganise higher education in order to match changing times and needs, thus affecting LIS education (Hallam & Calvert, 2009; Moniarou-Papaconstantinou & Tsatsaroni, 2008). Library and Information Science education and training in Africa, which bears the weight of providing qualified staff to the library and information professions, is currently challenged to ensure that graduates have competencies that align the profession with current trends and

perspectives. Many LIS educators acknowledge that it is their responsibility to steer the profession towards new directions in response to the globally and locally changing information environment while simultaneously maintaining relevance.

LIS educators worldwide are preoccupied with the question of relevance. In a recent IFLA publication that scans the entire IFLA world (Abdullahi, 2009), the 'songs' about the relevance of LIS education differ because of different social political environments and cultures, but the 'dance' is the same, basically asking: which way for LIS education? The central theme is that of professional identity, especially in a world that now describes itself as the knowledge or information society. De Bruyn (2007:114) warns that technological development coupled with democratisation in access to information are in fact major factors that threaten to erode the profession, inadvertently suggesting that the LIS profession is 'sleeping with the enemy'. The sub-themes of relevance in LIS education include:

- Levels and names of qualifications
- Curriculum approaches and focus (theory vs. practice; academic knowledge vs. technical skills)
- Teaching or learning methods and resources
- Quality.

2 Levels and names of qualifications

In general, LIS schools in South Africa offer three levels of undergraduate programmes and four levels of postgraduate programmes (Minishi-Majanja & Ocholla, 2004). Undergraduate qualifications include certificates, diplomas and bachelor degrees, while postgraduate levels include the postgraduate diploma, Honours degree, Masters degree, and Doctoral degree (PhD). Kyriaki-Manessi (2008) observes that it is more productive to teach LIS at postgraduate level because postgraduate students are bound to already have academic foundations and hence a better sense of the interdisciplinary nature of the profession. The trend in East Asian countries is towards graduate level education (Miwa, 2006); the same applies to Australia (Hallam & Cravert, 2009:293). But in most African countries, the need seems to be for lower qualifications, mainly because most LIS graduates are in low-paying positions and cannot afford the fee of postgraduate education. Turning the situation around is a developmental matter that requires appropriate legislation and public interest.

Notably, the names and nature of LIS education programmes in South Africa have not been uniform because each and every higher education institution (HEI) determines its own, albeit with approval from the South African Qualifications Authority (SAQA). Glancing over the borders of any country, it is possible to confirm Rosenberg's (2000) observation that the lack of uniformity or consistency in names of courses vis-à-vis standards of content and lengths of study, while being a historical accident that is often perpetuated by national or in-

stitutional structures and practices, militates against the desire to participate in globalisation. Achieving some uniformity can be useful for equivalence and the recognition of qualifications across institutions and countries as this would not only breakdown trans-border educational barriers, but also address Tammaro's (2005) concern that "more librarians are seeking employment and further education outside their own countries, yet there are no clear guidelines for determining the equivalency of degrees and certificates".

In South Africa, LIS education departments now have to operate within the new South African Higher Education Qualifications Framework (HEQF) [see Figure 1] which was signed into law in October 2007. This should bring about some uniformity within the country, but while seeking to streamline and standardise offerings across the many HEIs in SA, the HEQF has also succeeded in disorientating the understanding and relationship between LIS educators, students and employers. Gone are the old familiar qualification names such as the National Certificate, National Higher Certificate, National Diploma and Bachelor of Technology. The new names include Higher Certificate, Advanced Certificate, Advanced Diploma and Postgraduate Diploma. The new names are not direct replacements, nor are the qualifications thereof simply equivalents of the old. The new framework comes complete with specifications of National Qualification Framework (NQF) levels that reflect quality. For example, both the National Diploma and the Diploma, as they were previously known, were relegated and replaced with a new diploma that consists of 360 credits, with an allowance for only 60 credit transfers from a previous qualification. The NQF exit levels 5, 6, 7, 8, 9 and 10 are representative of the weighting and level of complexity of the content. Names of qualifications now need to have two or three basic components, i.e. the qualification type, the designator and the qualifier. Figure 1 above shows the various qualification types. A designator has to indicate the broad area of a study's discipline or profession and has to be used in naming the bachelor, Masters and Doctoral degrees only, using the link word "of", e.g. *Bachelor of Information Science.* A qualifier indicates the field of specialisation using the link word "in", e.g. *Higher Certificate in Archives and Records Management* or *Bachelor of Arts in Library Science.* A further area of specialisation may be indicated by another qualifier, for example *Masters in Information Science in Archival Science*. However, the framework further specifies that "in order to use a qualifier, at least 50% of the minimum total credits for the qualification and at least 50% of the minimum credits at the qualification exit level must be in the field of specialisation denoted by the qualifier" (Government Gazette, 2007:11).

10

Doctoral

Figure 1 South African Higher Education Qualifications Framework.

Within this new framework, comprehensive universities such as Zululand and UNISA have the luxury of being able to offer qualifications at all levels and of all types. Non-comprehensive universities, on the other hand, can be selective both in terms of the levels and niche focus areas. Thus comprehensive universities run the risk of spreading themselves thin, while non-comprehensive universities run the risk of abandoning some important core LIS areas of practice. Because SA is a society in which equality, affirmative action and economic value are highly prized, it is imperative for educators to carefully balance the specifications of the HEQF, scholarship, employers' needs and students' needs. It is worrying that the vocational/ technical route requires a total minimum of 720 credits compared to the academic/ professional route which requires a total of 480 credits to achieve the NQF level of 8. The credit accumulation and transfer (CAT) rule allows students' previous achievements to be recognised and contribute to further learning. However, students may not transfer more than 50% of the credits either of a completed qualification or the qualification being pursued.

The implication of these changes is that LIS educators have the challenge of ensuring that their offerings and content are comparable without necessarily duplicating each other's

programmes. Ostensibly, students should be able to move to a new HEI and carry the credits of an unfinished qualification from a previous university. Correspondingly, the employers have to redefine their career progression ladders including both the old and the new (HEQF) qualification descriptions. The old names have to stay because there are still individuals in the workplace who have the old qualifications. Meanwhile, as in the case of Greece, attitudes may prove the hardest to change (Kyriaki-Manessi, 2008).

3 Curriculum approaches and focus

There is no uniform approach to what is taught, let alone how it is taught (Ngulube, 2006). This has proved cumbersome considering the dearth of legislation or professional standards and the diverse institutional cultures and differentiated expertise. While collaboration could be beneficial, the increasing competition for students has often silently militated against it. Collegiality and professionalism have enabled South African LIS educators to share their developments, for instance in conference papers or symposium presentations, but there is often sadly no forum for systematic or collaborative benchmarking.

Since politics may not be the main focus of LIS educators, one avenue open to them is the use of a learning outcomes or competencies approach, which can provide a form of communication between the stakeholders involved in the practice and lifelong learning of library and information professionals and those involved with the academic programs of education and training of library and information professionals. The IFLA Education and Training section suggests three approaches, namely programme orientation, educational process orientation and learning outcomes orientation (Tammaro, 2005). Programme orientation focuses on the provision of both a broad general education and core LIS elements. Most university-based qualifications in South Africa have tried to do this, emphasising that an element of 'graduateness' must be instilled in every student. The educational process orientation is much more difficult to implement uniformly because of varying levels of resources such as lecturers, ICTs, library resources, etc. Learning outcomes orientation focuses on what students should learn and are able to learn.

3.1 Core competencies

How do we conceive what students need to learn and how do we put it in the curriculum? Raju (2003) observes that the core of LIS education is elusive because of the constant evolution of the profession. The 10 "core elements"[1] listed by IFLA (2000:2) are only the tip of the iceberg, not only because they are general enough not to be prescriptive, but also because by the same token, they are subject to interpretation (e.g. in areas of emphasis) and are often subject to the knowledge and expertise of the curriculum designers. IFLA suggests

that LIS education departments "should refer to educational policy statements issued by government or professional associations that identify important knowledge and skill components. [Examples of such statements include those issued by the Institute of Information Science (UK), the Chartered Institute of Library & Information Professionals - CILIP (formerly the Library Association – UK), the Special Libraries Association (US), the Medical Library Association (US), the Association of Library Service to Children (US), the Australian Library and Information Association (ALIA).]" Unfortunately, South Africa does not have clearly identified areas or guidelines as neither LIASA nor the government have made such provisions. Raju's (2003:235) survey in South Africa produced a list of 25 possible subjects for the South African market.

Meanwhile the diversity of fields that are considered to be core competencies continues to grow, which when pitched against the need for market-ready graduates, makes the task of preparing a curriculum difficult. For instance, the emergence of ICT as well as Knowledge Management (KM) disciplines, each jostling for core status, have greatly added to the relevant competencies of LIS graduates. Yet these disciplines are themselves interdisciplinary or adjoin other disciplines and are growing. While these new areas cannot be ignored, De Bruyn (2007) contends that the need to accommodate these new areas has resulted in a misconstrued situation which, coupled with the request for adequately skilled graduates, has adverse long term consequences for the profession. Considering the guidelines of HEQF, plus the reality that time for studying towards a qualification has a specific duration, 25 basic modules would prove difficult to fit in one programme. Employers who demand a workplace ready graduate are bound to be disappointed in the short run. This also means that specialisation by students during their first qualification is unlikely to be take place. Stoker (2000) observes that there is no clear-cut solution to this problem and recommends that educators respond to the employment market by, for instance, offering some of these specialisations as electives.

3.2 Continuous education

There is great need for continuous LIS education in South Africa because basic professional training is not enough to last five years, let alone a lifetime, in a fast-changing, hi-tech

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1. **IFLA Core Elements.** Core elements include: (1) The Information Environment, Information Policy and Ethics, The History of the Field; (2) Information Generation, Communication and Use; (3) Assessing Information Needs and Designing Responsive Services; (4) The Information Transfer Process; (5) Organisation, Retrieval, Preservation and Conservation of Information; (6) Research, Analysis and Interpretation of Information; (7) Applications of Information and Communication Technologies to Library and Information Products and Services; (8) Information Resource Management and Knowledge Management; (9) Management of Information Agencies; and (10) Quantitative and Qualitative Evaluation of Outcomes of Information and Library Use.

profession and world. Ocholla (2003) and Stoker (2000) rightly observe that no one skill will equip an individual at all stages of their career because knowledge and technical skills now have limited time spans or relevance. AACR2 changes to RDA, and Web 2.0 evolves into Web 3.0, requiring professionals to continually refresh their skills. Moreover, career development sometimes tends to force individuals to change focus, for example a career change from a reference librarian to a systems librarian. Additionally, employers and employees are no longer finding it affordable to allow full time study leave. Thus there is an obvious need for continuous education programmes that specifically focus on desirable competencies. For this to be effective, it is necessary for educators and practitioners to collaborate, especially at the level of identifying training needs, and also by including and facilitating the training. In Australia, the association ALIA has formalised continuous education by launching a Professional Development (PD) program (Hallam & Cravert, 2009), while in some European countries, LIS schools provide systematic continuous education; in other countries, it is larger organisations, such as professional associations, that provide it (Kajberg, Horvat & Oguz, 2009). In planning continuous education programmes, educators, employers and practitioners need to remember that the content of continuous education may not always need to add up to complete programmes or enhanced qualifications. Desirable and beneficial as higher qualifications may be, in some cases the acquisition of relevant knowledge or skills may be achieved in a simple module that is related to a new development, either in the profession or specific work environment. The development of continuous education programmes of diverse type, form and duration is imperative, including pegging them to specified NQF levels for recognition.

4 Teaching and learning methods

The integration of new technologies in teaching and learning is said to be a significant factor in the promotion of academic innovation and transformation, hence influencing the teaching and learning paradigm (Morales & Roig, 2002). The new paradigm requires university professors and lecturers to have skills in instructional technology in addition to their subject expertise. Academic staff need to be cognisant of and use a new variety of learning styles, such as active learning, learning to learn, collaborative learning, problem-solving, role playing, etc., which are easily facilitated by ICTs. They (professors) need to adjust their instructional methods to incorporate the use of ICT-based tools such as tutorial software and courseware, and learn to develop content for each course by increasingly using ICTs as integrated instructional devices that foster greater hands-on learning, richer simulations, provision of exploratory environments, and flexi-time learning, in addition to automated pedagogy (Burbules, 2000). Presently, the *virtual classroom*, transcending time and space;

the *supported self-learning model,* allowing a learner to strategise, access core content and respond; and the *collaborative learning* model, involving dynamic horizontal information flow between learners, enabling them to share experiences, are all fully operational. This paradigm presupposes the availability of relevant ICTs and ICT support services. Generally, South African HEIs have sufficient levels of ICT diffusion. The main dilemma is the students' uptake of these tools as many students have not yet fully developed efficient ICT-based learning skills and many more do not have access to ICTs. LIS educators have to balance incorporating modern teaching methods while not marginalising some students.

4.1 Distance versus contact delivery

Contact or in-class delivery of an education programme has long held prominence, offering both the learners and the educators opportunities to interact and influence each other in very beneficial ways. Many successful professionals have fond memories of professors whose manner both in and out of class greatly influenced their professional development. Face-to-face interaction is invaluable. Furthermore, the impartation of content, knowledge and skills are more easily managed in contact delivery. But the prospect of earning a qualification without having to relocate or put the rest of one's life on hold is appealing to many students, especially at higher degree levels. Owen and Leonhardt (2009) observe that distance learning and teaching has gained new ground with the introduction of ICTs, and growing enrollments attest to this. It is now increasingly feasible to offer excellent LIS education through synchronous, asynchronous or even hybrid distance education. Considering the economic reality of many South Africans, the latter should be explored further by LIS educators. However, by the same token, distance learning presents huge challenges to the student. For example, a typical UNISA student is someone juggling a wide range of personal circumstances that militate against success. Such a student could be a working mother or father or wife/ husband and parent. Such a student could be from a poor background, both educationally and socially, having little or no resources for proper learning. Then there are the ever present barriers of language proficiencies, self discipline, textual literacy and the absence of positive role models. If a student is at the wrong end of the above, then distance delivery becomes less of a solution and more of a further barrier. Bringing such a student to campus would alleviate some of these challenges, especially access to resources. But it is no panacea since absence from family is a double-edged sword.

Thus it is clear that both distance and contact delivery have their merits and demerits. The important factor is quality assurance strategies, such as appropriate preparation of teaching and learning materials and the reorganisation of content and access, which need to be put in place to maximise learning. Indeed, whether distance learning and/or contact

delivery, the operative words should be efficiency and throughput. There is also the great possibility of blended learning.

4.2 Work Integrated Learning (WIL)

Some learning is best acquired through real-life experiences, and LIS offers such occupations. Such learning is traditionally known by many different terms, such as experiential training, work-integrated/-based learning, cooperative education, clinical training, professional practice, supervision, internship, candidacy, etc. In some disciplines, students studying towards a qualification cannot graduate without the successful completion of the prerequisite *in vivo* learning module, often accomplished in a related organisation. Many organisations regard the hosting of students for their life learning as a significant element of the provisioning strategy, with higher acceptance ratios and better yield. Likewise in LIS education, as commented by John Budd (in Peirce, 2009:24) at the recent ALISE conference: "If skills and practices are part of the outcomes we want, practitioners are part of the picture". In a recent survey of South African public libraries' training needs, Meyer (2009) found that the different, if not outright poor library background of library workers, is a setback for appointees because the whole environment and ethos is often very unfamiliar to such workers, rendering it an uphill task for them to make sense of general work, let alone professional tasks. To support their sense-making in the work-related context, library supervisory staff increasingly prefer library workers who have some basic understanding of library-related tasks and orientation before they embark on a career in LIS. Similarly, LIS education would greatly be enhanced by including a component that enables students to familiarise themselves with real situations. Meyer (2009) observes that "libraries that can support WIL are scattered across the country", but there is no audit of these libraries at present. The fact that many public libraries would be willing to participate (Meyer, 2009) suggests that South African LIS educators need to make an audit of these libraries and then enter into agreements with them with respect to the logistics of WIL. In accordance with the Department of Education Government Notice No 928 (Government Gazette No. 30353, 2007), as policy in terms of the Higher Education Act, South African HEIs are obliged to seek hosting partners for the prerequisite lifelong learning of students.

4.3 Mentoring

Mentoring is a relationship in which a more experienced person – a trusted friend, a guide, counselor or teacher – nurtures and supports a less experience person, novice or student, to learn the profession and gain confidence and expertise through the interaction. Underwood (2009) observes that a mentor should be a person who is knowledgeable and able to pass this

learning on to others, approachable (accessible, friendly and open) and responsible. He further emphasises that "at the core, is a relationship of trust by the organisation and by the protégé". Mentorship is one of the most important developmental tools for professional progression, often closely linked to productivity, career advancement, and professional satisfaction. In a keynote paper delivered at a recent symposium, Underwood (2009) likened mentoring to a 'bridge' that can enable students to safely cross the 'chasm' between non-knowledge to professionalism. According to Castiglioni, Bellini and Shea (2004), mentoring studies focusing on family medicine, general surgery, pediatrics, and physical medicine and rehabilitation residency programs, showed that mentoring is important for personal growth, defining career goals, research productivity, and the pursuit of academics.

Even though it is essentially a work environment process, mentoring may be used in two types of relationships within LIS education, i.e. educators' mentorship of students and experienced professionals' mentorship of student workers. However, it is important to note that not everyone has the necessary skills and motivation to be a mentor. The mentoring lad can also be too heavy for the few who have the aptitude. Secondly, as Underwood (2009) notes, the rewards are entirely through self-motivation, but the quality and success of experience for both mentor and protégé can contribute positively to organisational objectives. Mentoring as a teaching and learning method needs to be explored and adapted appropriately.

4.4 Critical resources

Most studies on LIS education and training tend to focus on curricula and content, often neglecting the question of resources. At the August 2007 IFLA conference in Durban, South Africa, a heated debate started regarding the relative importance (and possibly the ranking) of the curriculum versus academic staff versus students as factors that influence the quality of LIS education. The debate came to no specific conclusion but it was clear that each of the three components bears significance towards successfully producing good quality LIS graduates. What did not feature strongly in the discussion was the role of resources (e.g. the library and ICT infrastructure and facilities), perhaps not because these are of lesser importance, but more because the three were sufficient variables to contend with. Two of the most critical and influential resources in the quality of LIS education in Africa include quality academic staff and state-of-the-art ICT resources.

5 Quality assurance and benchmarking

Many professions have an accreditation process that is either focused on individuals who must qualify to join the ranks, or focused on the 'initiation' process. LIS's accreditation is

usually based on the latter, that is accreditation of the education and training programmes. The ALA considers 7 criteria, namely course design, curriculum content, student assessment, staff resourcing, quality assurance mechanisms, and infrastructure. The American Library Association (ALA) accreditation programme includes Canada and Puerto Rico and has developed 6 standards that form the basis of evaluation every 7 years. These include the mission, goals and objectives; curriculum; staff; students; administration and funding; and resources and facilities (Owens and Leonhardt, 2009:555). Sadly, there are no accreditation programmes in South Africa, let alone Africa.

6 Other challenges

The challenges facing LIS education in South Africa are neither new nor unique to the country. Among the most prominent are higher education imperatives, professional identity and curriculum issues.

6.1 Competition and the political economy of Higher Education

A twist in the tale of LIS education survival has been the commercialisation of higher education, where universities strive to operate as a corporate business with financial viability, if not profit, as the bottom line. This poses the danger of eliminating the so-called non-performing departments or programmes, of which LIS may fall victim. Non-performance refers to, among other things, the financial viability of a department or programme according to cost units. Cost units are essentially calculated from the number of students – therefore fees received – versus the expense in terms of facilities, resources and human capital expended to run the programme or department. Departments and programmes with few students are usually in danger of being unviable, and this is why LIS departments in many parts of the world have had to merge with other departments in order to survive. By nature of LIS work, the profession cannot be defined as a large one, at least not until the government legislates the establishment of libraries in every sector and locality. Thus LIS programmes in SA are striving to become more competitive and attractive to students if they are to survive. This often means an increase in ICT modules and the enhancement of management modules at the expense of traditional LIS modules such as classification and cataloging. While this solution is not necessarily bad, it may inadvertently further erode the core that shapes the profession's uniqueness or identity. It is no wonder that some of the departments previously known for LIS education have totally changed focus and/or even their names. Nevertheless, as Ribiero (2008) observes, universities should be made aware that the opportunity to educate or train an information professional is essentially an important service because such a professional will most likely be very useful in the information society.

6.2 Professional identity

The recognition of a discipline or profession is important for survival in both academic and social contexts. It is instructive that the ALIA presents as the first characteristic of the LIS workforce, "promoting and defending the core values of the profession" (Hallam & Calvert, 2009:289). Professional identity is in part a function of quality assurance and monitoring through accreditation and approval. These can be accomplished using a verification process of the credibility, authenticity and transferability of the qualifications. In countries where this has been successful, professional associations, such as the American Library Association, Australian Library and Information Association, the Chartered Institute of Library and Information professionals (CILIP), act as the standard bodies for education and training. The challenge for South Africa is to enhance LIASA's mandate and standing in order to get appropriate leadership that aims to foster professional identify and quality assurance. Many other professions, including nursing, accountancy, engineering and social work, have set standards that are influential in curriculum development and the education of their professionals. While appreciating the nobleness of academic autonomy, LIS education would also greatly benefit from direct contribution from stakeholders such as the body of professionals.

6.3 Needs of the employment market

Traditional employers such as libraries require market-ready professionals who will 'hit the ground running', meaning that they will not only know the ins and outs of information work, but also have excellent knowledge and skills. Yet the complexity of what librarians do, especially in this era, makes it difficult for education and training programmes to prepare such a highly specialised 'jack of all trades'. However, if this issue isn't addressed, LIS educators will lose students with further dire consequences for the various programmes, discipline and profession. The other side to this problem is the new market of employers who require a new caliber of professionals, such as knowledge managers, information managers, etc., each of which may incidentally have diverse meanings and interpretations. Such 'specialisations' are currently attractive but are still to stand the test of time and prove their worth as professional areas. But while they last, LIS educators have to respond to the need.

6.4 Curricula, educators and students

As mentioned earlier, there are diverse areas of core competencies, augmented by the expanding new disciplines. Besides this dichotomy, there is the issue of the digital divide, especially of important constituencies of LIS education such as remote/ rural/ under-resourced libraries and students. Students' learning styles and competencies are subject to

educational background, which in most cases is quite diverse. Even in a well resourced country such as the USA, a recent study by the Educational Testing Service (2006) reported that college freshmen lacked essential information literacy skills that were requirements for success in their studies. Generally, there is a slow rate of instructional integration of technology and related skills, such as digital literacy, even in the richer (economic and/or technological) countries. Thus the more the curriculum and pedagogy leans toward new media and world trends, the more certain constituents are marginalised. Should LIS education be bothered about this?

A more hidden problem lies with the educators themselves. LIS educators experience both extrinsic and intrinsic obstacles. Extrinsic obstacles are often institutional and structural while intrinsic obstacles are more in the domain of the individual, such as self efficacy. Hardly anyone undergoes training to become a university lecturer or professor. Most of the skills are acquired on the job and by attending relevant forums of discussion. Thus a high level of knowledge on a particular subject, even though an important ingredient, does not always translate into good teaching of the subject. Additionally, few LIS educators have experience as students in a technology-infused environment to enable them to perceive the best way to deliver content.

7 Opportunities in collaboration

The LIS educators' fraternity needs to forge more collaboration. It may be instructive to consider the efforts by European LIS educators for intensified consolidation and partnerships as a way of countering the Higher Education reforms and commercialisation of universities (Kajberg, 2007). The European Association for Library and Information Education and Research (EUCLID) obtained funding from the EU to address, among other things, issues of comparability and the equivalence of qualifications. The LIS Education Project, which was completed in 2005, has been instrumental in charting the course for European LIS education co-operation and convergence. South African LIS educators can draw from this example by forming a stable association or chapter within LIASA and working together to apply for NRF funding for projects and/or research. Some of the projects could centre around curricula issues while others could focus on manpower planning for the information sciences.

8 Conclusion

The role of librarians and other information workers in mediating technology and community dynamics in order to offer good information services needs to be continually scrutinised. Using new technology effectively to enhance and support communities is a core component of good service. In countries with a vibrant LIS profession or that at least demonstrate a

growing interest in LIS services, there is a corresponding growth in education programmes. Often, this growth or vibrancy is a spillover of government and public interest rather than professional attractiveness, alongside dedicated professionals. Unlike many professions that ride on the crest of the public's absolute need for them, e.g. health and engineering, the LIS profession does not always command government and public buy-in without serious promotion and marketing. Likewise, education and training in information professions requires a mix between an ardent focus on understanding market forces in order to attract students and produce employable graduates, and a dogged determination to uphold a noble profession in spite of encroaching competition. The significance of a strong professional association cannot be underestimated. In South Africa, such an association would be instrumental in nurturing government and public interest as well as in developing a strong profession. The association could then assist in attempts to bridge the gap between LIS education and LIS practice.

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Chapter Thirteen

Library and information management education and training in Swaziland: a review of opportunities and challenges

Khosie C. Ndlangamandla

Introduction

Swaziland is a landlocked country of 17 360km^2, surrounded by South Africa and Mozambique. Swaziland's population is estimated to be around 1.3 million and the majority of the population is ethnic Swazi. The country is governed under a form of constitutional monarchy, in which power is shared by the king and parliament. There are also executive and judicial arms of government. Independence was obtained in 1968 from British colonial rule. The country's currency is Lilangeni, which is at par with the South African rand.

Swaziland presently faces a number of socio-economic challenges, most notably literacy levels[2], poverty[3], unemployment[4], and the prevention, control and treatment of diseases[5]. Libraries and information centres are essential in the fight against these challenges because they provide access to various sources of knowledge. Access to and the full use of libraries and information centres is fully dependent on the educational levels and training skills of the personnel who manage them. Educated and trained professionals are better equipped to procure, organise, repackage and disseminate relevant information to communities and thereby address the country's socio-economic ills.

Swaziland has a notable number of Library and Information Management professionals trained at various levels in Librarianship, Library and Information Studies and/or Library and Information Science. Most professionals are employed within the country by university libraries, national and public libraries, college libraries, training institutions' libraries, special libraries and a few high schools. The main employers of Library and Information Management workers are University of Swaziland and Swaziland National Library Services. The University of Swaziland – only university at the time of the review – has three academic libraries in its three campuses. Swaziland National Library Services has one national library and fifteen public libraries scattered throughout the country. Of the eight colleges having libraries in Swaziland, five rely on the national library services for library positions and their

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2. Even though literacy is above 75% among the youth (15-24 years), it relates to basic reading and writing and has nothing to do with education levels that are required for socio-economic development
3. Two thirds of the population live below the poverty line, i.e. below $1.00 per day
4. Rate of unemployment is at 40%
5. The country has the highest rate of HIV in the word, currently at 26.1% among pregnant women. There are also devastating diseases like Tuberculosis, Malaria and Cancer

Library and Information Management workers are usually on secondment. Most schools have no running libraries, and government (through its civil service) has had no vacancies for school librarians. Fundza, a non-governmental organisation, assists schools without libraries by providing information resources [mainly books] and providing relevant library development and management skills to teachers.

In post-independence Swaziland, local higher education in Library and Information Management has been non-existent. Students have been acquiring tertiary education from higher education schools outside the country. Scholarships for prospective students have been [mainly] available from tertiary education schools in Botswana, Namibia, South Africa, Australia, the United States of America, and the United Kingdom. Government, through the Ministry of Education and Training (MOET) and the Ministry of Public Service and Social Security (MOPSSS), has been the main sponsor. Incumbent professionals have been trained at certificate, diploma, undergraduate and postgraduate degree levels.

Out-of-country education and training of Library and Information Management professionals presents some benefits to new incumbents, such as the experience and personal development gained from training in well established and reputable schools while experiencing different social and cultural environments, and also establishing out-of-country contacts and networks for sustainable professional development. However it also presents a number of challenges. One such challenge, as observed by Johnson (2007), is the relevance of imported tertiary education. Foreign acquired education is often based on foreign models and environments that may not necessarily be similar to the country of the incumbent. Another challenge is the continuous dependency on external agencies and the promotion of the idea that valuable education and training can only be obtained from outside. A further challenge is that of cost, because imported education requires a considerable amount of money, which limits the number of professionals that can be trained at a time. In Swaziland's case:

- Swaziland appears to be ignoring its own local education and training programmes in Library and Information Management. There is still a lot of dependence on out-of-country schools to supply the required professionals.
- Government announced a decrease in its scholarship funding and introduced new criteria for awarding scholarships based on certain priority areas, acceptable institutions, and exceptional academic performance. All of these do not favour the Library and Information Management profession. It is becoming more expensive for government to fund out-of-country education and training. Relocation of other partners, such as the German Embassy from Swaziland to Mozambique and the British Embassy to South Africa, that have been contributing to the funding of tertiary education in this profession has also added to this problem.

However, even with these challenges, the need for properly educated and trained workers in Library and Information Management needs to be addressed if libraries and information centres are to make a relevant impact on national development.

The state of Library and Information Management education and training in Swaziland

Formal education in the Library and Information profession can be traced back to the 1950s and 1960s in most developing countries. According to Johnson (2007), this formal education "was motivated by the need to raise the education level of the countries' populations, particularly to eradicate poverty". The era of the 1950s and 60s is when a number of developing countries gained their independence from colonial rule. Libraries under colonial rule, as observed by Ocholla (2000), were mainly used by the foreign settlers and dominated by literature influenced by their tastes, leisure and culture. They were not meant for the natural or local citizenry of developing countries but for the elite groups of the colonial era.

Concerns about developing libraries and improved education in the profession, as indicated by Johnson (2007), often went hand in hand with the attainment of independence. Independence meant countries had to rebuild their economies and be fully involved in national development issues. Therefore libraries and information centres began to receive recognition as role-players in national development initiatives. Ocholla (2000:35) observes that in most developing countries, training schools in library education were "established with government support within universities, colleges, national library services and through professional associations on the continent". Countries like Ghana and Nigeria had formal library education courses up and running by 1960, while other countries joined later, some only in the 90s.

The availability of library education on the African continent reduced the dependence of African countries on foreign and off-continent schools. This was, however, not the case in all countries in Africa, as some countries still continued to depend on foreign training in library and information education. Swaziland is one such country: it still has not fully established local education in library and information management and still sends personnel outside the country for tertiary qualifications. Even though the country gained its independence in 1964 and has an established local university, higher education colleges, and training centres, education in Library and Information Management within the country has been non-existent.

Swaziland has assumed and been recognised in a number of regional and global responsibilities and forums since independence. Some of these responsibilities and forums deal or have dealt with human development, capacity building and social security. For example, there was the chairmanship of the SADC Regional Training Council (RTC) which controlled the affairs of the Human Resources Development Sector that the country occupied

in the early 90s. One of the projects of this sector was to create a Regional Human Resource Information System (RHRIS). This project provided guiding principles to those in the region that were responsible for human resources planning and development (Thapisa, 1994). Even with this responsibility and other key responsibilities in global forums that related to capacity building, the country continued to depend on foreign countries for its human resource development in Library and Information Management education.

Basic library management and information seeking skills are, however, offered as courses under education courses in the University of Swaziland. These are meant to empower teachers and encourage them to take responsibility for starting and maintaining libraries in their respective schools. As mentioned earlier, since most schools have no running libraries and vacancies for Library and Information Management workers, it has therefore become the responsibility of school teachers and principals to take the initiative and start, maintain and/or run libraries. It is because of this that basic courses are integrated into the education curricula of teacher qualifying programs, e.g. Bachelor of Education (primary and secondary) and Postgraduate Certificate in Education. However, these courses are a small initiative considering the diversity and extent of library and information work. Therefore graduates of these teaching qualifications cannot be in a position to use the courses to look for jobs that require Library and Information Management qualifications under normal circumstances.

Local training in the profession in Swaziland has taken on various forms. Training seminars and workshops as well as conferences have been organised in the past by: the local library association – Swaziland Library and Information Association (SWALA); the local consortium – Swaziland Library and Information Consortium (SWALICO); the American embassy; the national library, documentation and information policy board; and the Swaziland Chapter of the Association of Health Information and Libraries in Africa (SCAHILA). These training initiatives targeted certain areas of professional practice, such as library advocacy, information and communication technology, policy formulation, collective bargaining, and marketing health information resources in the era of HIV and AIDS. These training initiatives did not cost the participants anything and were sponsored by partners and library and information supporting organisations. Training needs were scanned prior to the training provided by the responsible committees within these bodies.

Another form of training that is available in the country in Library and Information Management is short-term training courses offered by training and management centres. These are centres like Mananga Centre for Regional Integration and Management Development, Birch Cooper Institute, Swaziland Institute of Management and Public Administration (SIMPA), and the Institute of Development Management (IDM). These

institutions train the workforce and offer tailor-made courses to address the specific needs in organisations in the country and region. Mananga offers "Strategic Management of Libraries and Information Resource Centres (SMLIRC)" in four weeks through four module courses that run twice a year. According to the centre's training calendar, the courses are divided into levels one and two. The training targets senior library assistants, resource managers, and information managers who have formal tertiary education at diploma level or have no formal training in library and information management at all. Mananga also offers records management and electronic records management courses.

Birch Cooper offers training in one-week, two-week, three-week and four-week courses in library administration, automation, research skills and information technology. Birch Cooper's courses are provided through campuses in Swaziland and their other campuses in South Africa. SIMPA is a government owned training centre that offers single or separate courses in cataloguing and classification, Office suite applications, and management principles to Library and Information Management workers, especially those in the civil service. IDM also offers short-term courses in managing libraries, information and documentation centres, key records management practices, and information technology applications in library and information work. All the short courses in these training centres target people who are already working in service-oriented organisations or those who have been recently recruited and still lack practical skills in service provision.

Even though short-term training is available in the country through these centres and the government (at times) fully supports and funds this training, the knowledge gained by professionals through this training does not lead to a formally recognised and remunerated qualification. Certification may be awarded based on attendance and completion, but may not be used to attract higher positions in the job market that require certain qualifications.

Need for Library and Information Management education and training

To reiterate, Johnson (2007) and Ocholla (2000) observed that the recognition of libraries and the role of information in societal development in developing countries grew in the post-colonial period when libraries were not longer the prerogative of colonial dwellers but the inheritance of the concerned countries. The responsibility of developing libraries in the post-colonial era became the responsibility of the citizens and not the foreign settlers. The need to educate and train the personnel to manage local libraries and centres was a significant challenge which continues to be faced in present times.

Well educated and trained Library and Information Management professionals are essential in any country, both in the developed and in the developing world (Ocholla and Bothma, 2007). Education and training lead to professionals who can demonstrate the

desired approach, skills, attitude and relevance in service provision that lead to the full exploitation of information by the intended users. Such education and training, if acquired in a local or similar to local environment, translates to professionals who are well "versed with and grounded in African socio-economic, cultural and political challenges and are capable of designing suitable information services to meet those challenges" (Albright and Kawooya, 2007:115). Albright and Kawooya further emphasise that education and training in Library and Information Management in a local environment "should lead to professionals skilled in and attuned to solving unique local problems rather than those with general skills in information services delivery".

Library and information management work is a service-oriented industry whose ultimate aim, according to Diso & Njoku (2007:130), is to "bring about positive transformation in societal value systems, attitude, and world outlook. To achieve this aim, education must close the gaps between theory and practice, i.e. between the intelligentsia and the larger society, between scholarship, abstract philosophy and concrete human reality." Shiholo and Ocholla (2003) likewise suggest that it is better to provide basic professional education at home meaning in a local environment where the current needs of the society will be reflected in the curricula and the final product will serve the local populace.

Karisiddappa (2004) refers to the transitional shift from an agricultural economy to an industrial economy, which is characterised by manufacturing and production, entrepreneurship and distribution, and strong global interaction and communication. This has created a lot of awareness of information as a useful resource that can be used and manipulated in or by developing countries. According to Gosh (2001), the impact of information on all spheres of society coupled with the use of information technology to access information has dramatically changed the face of libraries and information institutions. These changes, Gosh explains, have led to the current knowledge-based society, where information and knowledge are crucial to the development of a nation. Thus expertise in the management and distribution of information and knowledge becomes extremely important. Local higher education and training in Library and Information Management has therefore become necessary to address these shifts and challenges and ensure the stable growth of the information market. Education is the primary and long-term solution for addressing poverty and ensuring sustainable development. Thus investment in research and development and in higher education is the key to knowledge generation, innovation, and wealth creation associated with the industrial society (Britz, Lor and Bothma, 2007).

The need for local higher education and training in Library and Information Management can also be justified by cost, as education and training at home is more affordable than out-of country; in addition to high fees, host countries are often influenced by

the state of their economy, cost of living, inflation, etc. Local education and training, as anticipated by Britz, Lor and Bothma, (2007), could combat the current brain drain of professional labour that is experienced by developing countries. There is a high possibility of being attracted to foreign country markets after being exposed to their education and training, their way of life, and also their practice environment.

Lastly, libraries and information centres continue to experience stiff competition from other emerging information services that offer better technology (Ocholla & Bothma, 2007). This emphasises the need for Library and Information Management professionals to continually update their knowledge and skills to cope with the competition and stay afloat.

The demand for Library and Information Management

In Ocholla's (2005) analysis of the job market for Library and Information Management professionals in South Africa, libraries certainly ranked higher than other information handling institutions as employers and potential employers of LIS graduates. Traditionally, the market for education and training products in the profession were mainly existing libraries. More focus was placed on library markets because libraries were also seen to be the sole custodians of information resources at the time. In fact libraries sustained the market, but challenges began to surface as information took on various new formats, and the information market was infiltrated by other service providers that provided stiffer competition to libraries in terms of presenting and packaging information products. While this presented threatening challenges to the library service environment, it also expanded the market for library and information workers to be exposed to other types of information work that may not have been conceived in previous times.

In Swaziland, libraries are also the main employers and potential employers of Library and Information Management professionals. However in recent times, this once 'guaranteed' market for the absorption of professionals has seemingly become saturated and less guaranteed. Library and Information Management professionals who are from library employment sectors usually go for tertiary education on a study-leave basis and with the full support of their employers. This therefore means that upon completion of their studies, they are guaranteed a job with their employer. The past and current job market guarantee is largely influenced by the pre-training scenario of having worked for libraries and information centres prior to formal education. The market has also been influenced by the requirements of training schools that made practical experience in library and information work a requirement prior to tertiary education in the profession. In light of the above, it is very difficult for the market to attract new candidates because it has to anticipate the return of its own candidates who have advanced their education in the field.

The employment market in Library and Information Management is now reflecting different types of information related activities. This emerging market, as noted by Ocholla (2005), offers professionals career opportunities in a broader environment that extends far beyond library and information science. In this market, the new positions are not library positions; rather they require information management skills and professionals who have a combination of skills that meet the current expectations of new markets. Some of these new skills and experiences are summed up by Mohammed (2008:15):

Knowledge, skills and experience in information management, information resources management; information delivery for enhanced creativity and innovations; expertise in the exploration and exploitation of information communication technologies and multi-media applications; expertise in knowledge management; good knowledge of management theories and practices; and information brokerage; and advocacy.

This kind of employment market is slowly surfacing in Swaziland where non-library markets are also beginning to require information managers to fill certain positions such as research officers, data and publications officers, corporate communication and information managers, information management consultants, resource managers, and records managers. In more technically-oriented (information technology-based) organisations, the professional must equally demonstrate more expertise in competitive information technology application and IT-based problem solving skills that reflect the digital age. The information technology skills required from the information manager can include hardware manipulation and programming or the development of systems to address certain functions within the organisation. This market is very competitive and hard to grasp for Library and Information Management professionals who lack the knowledge and skills summed up by Mohammed (2008:15). This is because other professions, although non-information management-based, have a high interest in the same market and work around the logistics to provide the set of requirements that the market looks for. Therefore it is possible to find positions in the market filled by other professions like journalism, communication and mass media, public relations, teaching/education and computer science. The requirements are not only about skills and expertise, but also about values, attitudes and the right mind-set. As Mohammed (2008:15) remarks, employers would naturally hire individuals who would add value to their organisations. Belief in adding value to an organisation is reflected more in how professionals sell themselves to employers and how they see themselves as part of the organisation than it is about a single profession.

An employment market that most professionals in Swaziland have not tapped into is that of records management. Even though there are a lot of records centres, registries and information deposit centres within government, the public sector, parastatals, and private

organisations that translate to a potential market for this cadre, nothing much is done by professionals and employers to explore these markets. Pure records management is an area that is very undermined, unsupported and unpublicised in Swaziland. Unfortunately, this important domain of records management is rendered valueless if it is not managed skillfully by professionals.

Education and training can be a useful tool in realising other seemingly dormant markets, reviving them, and addressing their needs. Here we agree with Ocholla and Bothma's (2007) assertion that: "Educating and training LIS graduates with more knowledge and skills in broader information disciplines is realistic, viable and rewarding. Graduates from broad LIS programmes can work in any information-related field." It is this broad-based education and training that will enable professionals to search for and realise other dormant, non-existing and emerging markets in the present society and also be vigilant or on the lookout for new markets evolving within the new century.

Clearly there is a potential demand for Library and Information Management workers. This demand is created by markets that already exist or that are potential, dormant and undiscovered. Library and Information Management education and training must be provided and re-oriented to supply or create and develop products for these markets.

Benefits and challenges of providing Library and Information Management education and training

Providing Library and Information Management education and training may lead to a number of opportunities, especially if the education and training is provided in a local environment. The opportunities may be compiled as follows:

- Easily accessible and locally affordable education and training programs
- Cost-effectiveness, in that funding can be delegated to more candidates in local schools
- Fully relevant and applicable programs that meet the needs of host and neighbouring environments
- Boost in the internal development of the profession as a result of local educational activities, new explorations, collaboration of educators and practitioners, and on-going, accessible, in-country research and knowledge generation and utilisation
- Greater impact and recognition of the profession in the host country
- The profession may attract more willing, 'fresh-minded', capable and motivated incumbents who will bring different expertise and diversity on board
- The profession will be easily sustained if education and training programs are available locally because a large number of entrants can be guaranteed

- Opportunities for networking and partnering for sustainable development with other education and training schools, partners, experts, funders, stakeholders, etc., in the profession
- Co-operation and co-ordination at national and regional levels
- Continuous education/ professional growth/ exposure for faculty members or educators
- Opportunities for (relevant) research also exist (Ocholla & Bothma, 2007). Ocholla (2007:10) maintains that: "Research and development form the backbone of any profession and also of any teaching programme" and emphasises that "there are many opportunities for relevant research in information-related fields in Africa" that are unique to the African continent and to each local environment
- Opportunities for students enrolling for diverse LIS programmes with either broader information orientation or specialised information qualification programmes in areas of Records Management, Publishing, Multimedia, Knowledge Management, Information Technology, etc. (Ocholla, 2007).

Despite these sound and attractive opportunities, challenges still exist and have been noted by a number of scholars (Minishi-Majanja & Ocholla, 2004; Ocholla, 2007; Ocholla & Bothma, 2007; Poon, 2006; Singh, 2009). The challenges can be summed up as follows:

- An ever expanding curriculum as a result of changing market needs, which over-stretches human resources and the skills of Library and Information Management schools
- Ever-changing and increasing technology applications, presenting a continuous demand for newer and more relevant skills and infrastructure from providers and recipients of Library and Information Management education and training
- Constant pressure to keep up with employers' expectations and maintain quality standards of graduates in unpredictable environments
- Meeting pre-set and agreed enrollment targets to justify existence
- High enrollment interests can be a challenge if there are limited resources
- Inactive professional association bodies that could positively influence education, content and quality expectations of graduate candidates
- Limited government (financial) support due to other priority areas. Tertiary education is largely funded by government and most tertiary institutions depend on government for subventions. The funding received might not meet all the requirements of Library and Information Management education institutions
- Lack of cooperation and resource sharing among stakeholders
- Extensive research and scholarship, which is a must for the provision of education and training. Not all educators may be keen or equipped for this task
- Marketing of LIS programs in the midst of all the available and attractive programs, creating strong competition

- Poor awareness and recognition of libraries and information organisations' importance by stakeholders in the development of Library and Information Management education and training
- Rapid growth of the Internet, necessitating the constant upgrade of hardware and software, which is difficult as funding is not immediately available to support these developments
- Inadequate access to computers or unequal distribution in terms of student/computer ratios because of inadequate ICT resources
- The financial and maintenance burden of infrastructure, equipment, facilities and resources
- Swaziland is a small country and there are not many libraries in existence. To make a library school viable academically and financially, a critical mass/pool of students needs to be available (Poon, 2006). Ocholla (2007) observes that, without student numbers, LIS schools cannot exist and thrive
- Limited job opportunities in libraries as the expansion of libraries in Africa is very minimal or in some cases non-existent (Ocholla, 2007). This negatively influences the enrolment for LIS education programs by prospective entrants
- Inadequate funding for libraries (especially national, public and community libraries) that are supposed to be the major market for Library and Information Management workers

The challenges presented above are not exhaustive. However, even with the presence of so many challenges, it is evident (from the discussion on demand) that the provision of Library and Information Management education and training is a necessary undertaking in addressing many of the country's socio-economic challenges. The opportunities suggest areas where more effort should be placed and where resources should be invested or directed.

The role of major stakeholders in Library and Information Management education and training

Partners and stakeholders play an active role in any profession that exists and aspires to grow and have a positive impact on society. Partners and stakeholders provide much-needed support, direction, a collective voice, a bargaining forum, and recognition of status. They can also provide a way forward for a profession in different times while facing different challenges. Sometimes these partners and stakeholders are just supporters and 'shoulder-offering' bodies and organisations that offer support without being deeply involved and connected to the profession and its practices. In other cases they can be a strong force that is behind the activities, ethics and definition of a profession. They can be professional associations, bodies, councils, commissions or denominations that provide disciplinary measures, award certification, and facilitate the withdrawal of qualifications and practice

rights of their members. This is all usually done in the spirit of protecting the public and ensuring expected responsibility and dispensation by professionals as well as maintaining true professionalism and good conduct.

In Library and Information Management education and training, the major partners and stakeholders are professional associations known as library and information associations. These associations provide a voice and a forum for the profession in their respective countries and have a mandate of keeping their members up-to-date with international developments, trends and expectations in the profession. Library and information associations are the first or initial step of professional association and deliberation within countries, and therefore the most important stakeholder in issues of education, training and professional development. Thus they sometimes offer educational courses in collaboration with other institutions, organise and provide short-term training through seminars and workshops, and also support professional development of any kind within the profession. They are the first contact with the major professional world for all practicing professionals. Library and Information Management associations are important in the development of LIS education since they have often been responsible for setting up short courses for people already working in libraries who have had no formal library training (Johnson, 2007). Harvard-Williams and Atan (1987) felt that a strong library association could positively influence government policy towards libraries and library education.

The Swaziland Library and Information Association (SWALA) is a local professional body that is involved in issues of the profession which include interaction (formal and informal), short-term training (seminars, workshops, tours and professional visits), promoting libraries and information to the society, and supporting the establishment of libraries, resource centres and reading initiatives. Some of its current objectives are:

- Promoting the establishment and development of library and information services
- Uniting all persons engaged or interested in library and other information work
- Safeguarding and promoting the professional interests of librarians and other information personnel
- Monitoring any legislation affecting libraries and information centres or whatever legislation is considered necessary for the regulation and management or extension of libraries and other information centres
- Promoting and encouraging bibliographical studies, research and library co-operation through networking (*http://www.swala.sz*).

SWALA has five (5) sub-committees, namely editorial, fundraising, legislation, member empowerment and information and communication technology (ICT).

Even though SWALA has it in its objectives to initiate, promote and support the short-term training of professionals, it is not fully involved in the tertiary education of its members.

It has no say or influence on the education received, the curricula involved, or the certification obtained. That is only the prerogative of the employer and the individual who desires training. Through informal deliberations at SWALA gatherings, an interest has been communicated about the association offering some form of formal education to members, like a certificate in LIS. However, up to now, the idea has never been properly followed and implemented. The association still has a lot of challenges to meet before it can fully address issues of professional development. Thapisa's (1994) study on human resource planning in Swaziland, challenges SWALA to develop a human resources database for the library profession through its sub-committee for human resources. The development of the human resources audit, according to Thapisa (1994), "Will help to determine what skills, knowledge, and abilities are required for particular vacancies or jobs in Swaziland libraries."

Apart from an active library and information association or professional body as a partner and stakeholder in the education and training of professionals, other partners and stakeholders tend to include government as a financer and employer, and also other employers. These partners and stakeholders, although not actively involved in professional issues, play an influential role in the education and training of professionals. For example the government, as a major financer of tertiary education and training, determines the budget allocation, the key areas to be pursued, and also the institutions in which education and training can be acquired. The employment sector also influences the education and training of professionals because their needs must be reflected in the curricula and training so that professionals remain relevant in the field. These stakeholders have a say in what constitutes a true professional in the field of practice and can provide good feedback for training institutions. It is for this reason that tertiary and continuous education institutions often base their views on the current needs of the market and require stakeholders for assistance in the practical placements of tertiary learners.

In developed countries, professional associations and bodies are not only influential partners and stakeholders, but also serve as accrediting authorities whose set standards must be met by any training institutions that either already exist, or are yet to be established (Diso and Njoku, 2007). In the developing world, library and information management bodies are not fully active in this accreditation. Reasons put forward are the lack of manpower (Shiholo and Ocholla, 2003), lack of expertise (Younis, cited in Johnson, 2007), and instability and internal wrangling (Ocholla, 2000) in these local associations. The education and training offered at tertiary institutions therefore continues to be uninfluenced by these bodies, which are supposed to be the main stakeholders.

Conclusion

The issue of relevance of imported education and training is widely covered in literature, although from the context of developed to developing countries' importation, and with seemingly collective agreement that education obtained from outside cannot be relevant to the needs of the African environment. There seems to be a general consensus on the financial implications of importing education and training from the western world and its negative impact on developing countries' economies.

Another concern is the change in the former predictable employment market of Library and Information Management professionals brought about by new and emerging information related services that compete unfairly with libraries. The feeling is that Library and Information Management professionals need to be relevantly equipped to tap into this new market and compete effectively, more so because traditional library markets are stagnant. Professional associations and bodies in developing societies are also not effectively contributing towards the profession through active involvement in tertiary education, standards setting and accreditation, particularly when compared to their counterparts in the developed world.

Throughout the literature, the concerns of the profession in the developing world remain consistently similar, although the degree or details may vary in certain applications. It is necessary to investigate the impact in other developing countries that are still not hosting their own education and training in Library and Information Management or those countries whose efforts are still very minimal and hardly noticeable. This paper has been extracted from a study that investigated the feasibility of providing Library and Information Management higher education in Swaziland.

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