University of ZUIUland

Proceedings of DLIS 10th Annual Conference

Theme

"The Research Challenges and Opportunities in Information Studies in a Changing National and Global Environment"

Editors

Dennis N. Ocholla and Daisy Jacobs

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2009

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The Research Challenges and Opportunities in Information Studies in a Changing National and Global Environment: Tenth DLIS Annual Conference, September 10-11th 2009: Opening Remarks

Presently, the DLIS annual conference is celebrating its 10th anniversary. Looking back, I can say without any doubt that our annual conferences are unique, that they have grown, and that we have been able to achieve the purpose of the conferences by popularizing LIS research among students, particularly among those coming from participating institutions from South Africa. Over the past years, we have also been very fortunate to host magnificent and prominent guests and speakers at these annual conferences, such as Prof. Andrew Kaniki (NRF), Prof. Gary Mersham (New Zealand), Prof. Myrtle Hooper (UZ), Prof. Patrick Sibaya (UZ), Prof. Christine Stilwell (UKZN), Prof. Jaya Raju (DUT), Prof. Stephen Mutula (UB), Prof. Johannes Britz (UWM), Prof. Archie Dick (UP), Prof.Patrick Ngulube (UNISA),Dr. Naresh Sentoo (DUT), and Prof. Mabel
Minishi-Majanja (UNISA).

It is with pleasure that I welcomed our Keynote Speakers for this conference: Prof. Mabel Majanja, University of South Africa; Prof. Myrtle Hooper, University of Zululand; Dr. Naresh Sentoo, Durban University of Technology (DUT); Prof. Jerry Le Roux and Dr. Janneke Mostert, University of Zululand (UZ); and Prof. Stephen Mutula, University of Botswana (UB), among other esteemed participants from the four universities.

The purpose of the DLIS conference has not changed. Above all, we aim to popularize LIS research and knowledge sharing among students and staff through mentorship, research presentations, discourse and publications. Research is given special attention in the LIS Department. We have included autonomous research courses in almost all (five) of our six degree programmes and the department has consistently occupied the top three positions among 48 academic departments in the university in terms of research output. The department regularly generates over half a million rand annually through research publication subsidies from the DoE to the university. Our annual conferences have been drawing papers from leading research reports produced by both

our undergraduate and postgraduate students and those produced by our faculty/staff. As a result, we have published our conference proceedings both in print and electronic format for open access on our website (http://www.lis.uzulu.ac.za). I believe that researchers studying LIS in Africa will always encounter publications originating from this conference in the proceedings or in popular LIS scholarly journals.

These conference proceedings consist of 12 exciting papers covering five themes: (1) Research concepts and application, (2) Information and knowledge management, (3) Informetrics, (4) Social/community informatics and ICT for development, (5) Information seeking and user studies, and (6) LIS education and training. These are also the main research focus areas of our department.

I hope you enjoy reading and invite you to join us for our next conference in September 2010.

Thanks
Dennis Ocholla
February 2010

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Social and Community informatics Past, Present, & Future: An Historic Overview

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Abstract

In keeping with the title of this session, "Community/Social informatics and ICT for Development", this presentation takes a brief look at the origins, meaning, development and current status of the concepts "social informatics" and "community informatics". Although the relationship between technology and society has been studied since the industrial revolution in the 19th century, the concepts "social informatics" (IS) and "community informatics" (CI) represent relatively new fields of multi-disciplinary study that developed out of seeming separate and unconnected discussions between computer scientists, sociologists, educationists and others on the role of computers and Information and Communication Technology (ICT) in society.

*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 the benefit of the Community.*

While Rob Kling, a computer scientist and sociologist from Indiana University, is closely associated with the formulation and popularization of the concept social informatics in the 90s, Michael Gurstein, a contemporary of Kling, is generally associated with the development and definition of the term community informatics. Although Kling died in 2003, his views, philosophies and numerous publications on the complex relationship between society and technology have become the foundation of the various schools of informatics around the world. One particular area that both social informatics and community informatics

concern themselves with is what is referred to as the "digital divide", i.e. the causes and general consequences of lack of access to computers and the Internet and its associated information technologies.

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[1] Jerry Le Roux is Associate Professor in the Department of Information Studies at the University of Zululand, South Africa. His paper was one of the Keynote addresses at the conference.

This presentation briefly examines the origins and development of these new research areas since the late 90s.

Keywords: Social informatics (SI), Community informatics (CI), Information and Communication Technology (ICT), Information Technology (IT), Social Determinism, Social Constructivism, Digital Divide, Social Shaping of Technology]

1. Introduction

Mr. Chairman, honourable guests, speakers, ladies and gentlemen, allow me to kindly thank the organisers for the invitation to deliver this keynote address at this fourth session of the 10th Annual DIS conference entitled: "*The Research Challenges and Opportunities in Information Studies in a changing National and Global Environment*".

In keeping with the title of this session, "Community, Social informatics and ICT for Development", this presentation takes a brief look at the origins, meaning, development and current status of the concepts "social informatics" and "community informatics".

Although the relationship between technology and society has been the subject of numerous studies and debates since the beginning of the industrial revolution in the 19th century, the concepts "social informatics" (IS) and "community informatics" (CI) represent relatively new fields of multi-disciplinary study that grew out of seeming disparate and unconnected discussions between computer scientists, sociologists, educationists and others on the role of Information and Communication Technology (ICT) in society. While both social informatics and community informatics developed out of the complex relationship between society and information technology in the 1990's, community informatics I unlike social informatics focuses more on the **relationship** between communities and information technology and how the former shapes the latter.

Developments in computer and information technology, especially the transformation of the Internet over the last 20 years, have played a major role in the popularisation and acceleration of social informatics and community informatics as new independent schools of thought that study the relationship between society and ICTs. The popularity of these new multi-disciplinary areas of study and research is clearly reflected in the fact that Google returns no less than 97,000 hits for the term "social informatics" and 83,500 hits for the term "community informatics" (http://www.google.co.za/).

2. The Etymology and History of the Terms "Social Informatics" (SI) and "Community Informatics" (CI)

While Rob Kling from Indiana University in the US is widely associated with the development and popularisation of the concept of social informatics, he was 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 Informationsverarbeitung*" (Informatics: Automatic Information Processing) [http://www.absoluteastronomy.com/topics/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.

By 1966-67 the term had, however, come to attain a wider interpretation thanks to the work done by the Russian information scientist, Alexander Mikhailov. Mikhailov, who worked at the Russian Scientific and Technical Information Institute of Russian Academy of Sciences (VINITY)[2], a 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 research and work by the Soviet Academy of Science in 1983 (Wilson, 2006) [see also
http://www.absoluteastronomy.com/topics/Informatics#encyclopedia;
http://www.db.dk/bh/Core Concepts in LIS/articles a-z/mikhailov.htm; and
http://informationr.net/ir/reviews/ revs223.html].

Today the term "informatics" is 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

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[2] **Vserossiisky Institut Nauchnoi i Tekhnicheskoi Informatsii (VINITI**)

technology (the study, design, development, implementation, support, or management of computer-based information systems). The restriction to scientific information has thus 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 fundamental to any scientific account of information (see http://www.merriam-webster.com/dictionary/informatics; and http://www.absoluteastronomy.com/topics/Informatics#encyclopedia).

Social and community informatics, the subject of this presentation, are therefore seen as sub-categories of the more general field of "informatics" or "informatika".

Kling 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 (http://rkcsi.indiana.edu/index.php/history-of-the-term).

Community informatics (CI) as a field of practice in applied information and communications technology was brought to prominence by Michael Gurstein in the early 21st century (Gurstein, 2000). While Gurstein is associated with the first representative collection of academic papers on Community informatics in 2000, others, such as Brian Loader and his colleagues at the University of Teesside, already used the term in the mid-90s (Loader and Keeble, 2002).

A comprehensive online research network for community informatics was established in 2003. Community informatics, unlike social informatics, places specific emphasis on the application of ICTs to enable and empower community processes that aim to overcome the "digital divide". (Gurstein, 2008:11).

Because of its obviously close association with social informatics' research and study areas, such as computer science, sociology, information science, library science, education, and rural, regional and development studies, many, including Kling, have argued that it is not a new or independent discipline but a mere subset of social informatics. Gurstein (2008:42) disagrees with this notion and argues that while it is true that Community informatics shares many of the research areas of social informatics, community informatics is nonetheless a separate and independent discipline like social informatics.

3. Technological Determinism and Social Constructivism

From the above, it is evident that social informatics and community informatics share many similarities. Since this is the case, it can also be argued that they share many similarities as well as differences with other dominant social theories, such as those pertaining to the schools of "technological determinism" and "social constructivism" (Oostveen, 2007).

Summarily, the school of technological determinism argues that:

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

Technological advances are therefore seen as the primary or causal element in processes of social change. As a technology stabilizes, its design tends to dictate users' behaviours, thus diminishing human society in the process, meaning that human society becomes subject to technology development. The weakness of this theory is that it 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 and Marx, eds: 1994).

The philosophy of the determinists is perhaps best summarized 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 viewed ideology and technology as a product of economic-capitalist interest. (http://en.wikipedia.org/wiki/ Technological determinism).

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).

In contrast to the determinists' school, the school of social constructivism, 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.

Organizational, political, economic, and cultural factors are thus seen as important in the development of technology. The downside of this 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 micro, meso and macro levels (Robbin, 2005; Oostveen, 2007), social constructivism tends to concentrate mainly on the micro-level. The origin of this school of thinking has been largely attributed to the cognitive psychologist, Lev Vygotsky, in the 1960s (Vygotsky, 1978; Williams and Edge, 1996).

An example of social constructivist thinking being applied to the design of information technology or ICT is the web-based, open-source, distant learning and management system called MOODLE **("Modular Object Orientated Developmental Learning Environment"),** designed and developed by the Australian computer scientist and educationalist, Martin Dougiamas, at the Curtin University of Technology in Perth Australia at the dawn of 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 (http://www.martin dougiamas.html;http://www.Moodle.org/). Moodle is currently being used in 204 countries, representing almost 40,000 registered sites worldwide. It is currently also the official e-learning platform at the University of Zululand.

4. Social informatics (SI) Defined

Kling defines 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 institutional contexts (Kling, Rosenbaum and Sawyer, 2005), Social informatics is different from both the determinists and constructivists' schools in that it takes an holistic or global approach to the study and examination of how the social aspects of computers, telecommunications, and related technologies shape organizational 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).

Broadly framed, Social informatics seeks to answer a range of questions about the present and future consequences of ICT developments and their influences on society

and vice-versa. 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) [http://www.rkcsi.indiana.ed/archive/SI/ si2001.html].

5. Community informatics Defined

According to Gurstein, Community informatics differs from Social informatics because it examines a different "*problematique*" (Gurstein, 2008:43-44).

Furthermore, while Social informatics is concerned with:

The "research and study of society and ICT", Community informatics is concerned with both the "practice and the research" of the use of ICT in a Community;

I. The general and abstract category of "society" or "societal" aspects of computerisation, Community informatics is more concerned with how ICT is used in specific concrete identifiable communities;

II. The more general or overall social or organisational systems level, Community informatics is concerned with more specific applications of ICT in the Community context, such as health, economic development, education, etc.;

III. The general description and understanding of the role of ICT in the world, Community informatics sees itself as being actively involved in changing the role and significance of ICT in a Community; and

IV. While Social informatics appears to have little or no direct interest in the design or development aspects of ICT, Community informatics has a particular interest in the design and development of ICT hardware and software and its application in and impact on communities (Gurstein, 2008:42-43).

While these differences are significant, Gurstein (2008:44) concedes that confusion may arise because an informatics' approach to social structures is in many ways parallel to the Social informatics approach to Community structures and Community processes. Moreover, there is also a clear link and nesting of Community structures and Community processes within these social structures and processes.

6. Social informatics Research Areas
Social informatics research largely comprises three empirical based 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, i.e. the analytical approach, refers to research theories about ICT in institutional and social or cultural contexts. The third and last 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, Crawford, Rosenbaum, Sawyer and Weisband, 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
- Organizational 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 referred to above are also covered by Community informatics. The concept "Community" and its connections to different forms/types of social networks have been endlessly studied and examined by both Community/social and computer scientists since the 1960s. According to definitions of Community informatics, the concept "Community" can be seen as both a "lived" and a "working experience", such as in rural Community areas, and as an

applied concept designed to enable and explore the reality and significance of neighbourhoods, ethnic and cultural associations, and provide frameworks for social meaning and social action (http://www.absoluteastronomy.com/topics/Community_informatics#encyclopedia).

Thus communities are defined as people coming together to pursue common goals through shared practices that are both physical and electronic. While there has been considerable investment and support in the electronic development of applications for individual use or for business communities -- corporate intranets and extranets and the development of social networking services (e.g. Ebay, MySpace and Facebook) -- there is far less investment in human-technical networks and processes that can be used to bring about social change, particularly in communities where electronic communications are of secondary interest (http://www.absoluteastronomy.com/topics/Community_informatics#encyclopedia).

Community informatics therefore extensively concerns itself with Community-based approaches to the design and implementation of ICT and how such developments can be used to enable and empower those who live in physical communities, especially in communities that practice communal ICT access (i.e. through telecentres, Community libraries, multi-media centres, etc.). Information and Communication Technology for Development or ICT4D has become a key approach to Community informatics research over the past decade. No less than 200 Community informatics researchers representing some 50 countries around the world are currently doing research on ICT4D in areas ranging from ICT in Community development, to development studies, computer science, information science, social science, planning, management, and social administration (http://www.ciresearch.net/about). ICT4D initiatives that aim to assist with social and economic development in Less Developed Countries (LDC) have been initiated by NGOs and private sector agencies concerned with development, such as the UN, the International Monetary Fund (IMF), the World Bank and the Swiss Agency for Development and Cooperation (SDC), which have all emerged as key players in the poverty relief component of the UN's Millennium Development Goals for the developing world (http://www.absoluteastronomy.com/topics/Community_informatics#encyclopedia).

Since its introduction in the early 21st century, there has been growing interest among social and computer scientists in Community informatics as an academic discipline examining the impact of different ICTs on communities and how they can enable and empower poor communities in the developing world and thus help to breach the "digital divide". The term "digital divide" had its origins in America in the early 90's, and originally referred to the gap or divide in ownership of computers among certain ethnic groups in the US. By the mid-90s, the term had largely shifted in meaning to refer

to those who do not have computers and broadband access to the Internet or what has been termed as the "new economy". Computer ownership alone was no longer seen as the "dividing" norm - high-speed connectivity to the Internet was (Williams and Kate, 2001)
[http://www.osmond-riba.org/lis/DigDivide.htm; http://www.umich.edu/~katewill].

8. The UN Millennium Development Goals and the Digital Divide

In September 2000, world leaders from 189 countries, including representatives from the World Bank, the International Monetary Fund, and the International Telecommunications Union (ITU), came together at the United Nations Headquarters in New York to adopt the United Nations Millennium Declaration (MGD). The declaration committed the signatory nations of the world to a new global partnership that set eight goals with 21 quantifiable targets and 60 indicators.
The 8 Main goals are:

- Goal1: Eradicate extreme poverty and hunger
- Goal 2: Achieve universal primary education
- Goal 3: Promote gender equality and empower women
- Goal 4: Reduce child mortality
- Goal 5: Improve maternal health
- Goal 6: Combat HIV/AIDS, malaria and other diseases
- Goal 7: Ensure environmental sustainability
- Goal 8: Develop a Global Partnership for Development

The 8 goals were revised in 2007 and reduced to consist of 18 targets and 48 indicators. Section (f) of Goal 8 commits the United Nations (UN), in cooperation with the private sector, to make available the benefits of new technologies, especially ICTs, to developing countries and commit the International Telecommunications Union (ITU), a special agency of the UN, to monitor the progress in terms of the number of fixed telephone lines, cellular mobility and Internet users per 100 units of population (http://www.un.org/millennium/declaration/ares552e.htm;Road Map towards the Implementation of the United Nations Millennium Declaration, A/56/326 [PDF, 450KB).

According to data collected by the International Telecommunications Union (ITU), there has been a steady narrowing of the digital divide in terms of the number of fixed phone lines, mobile subscribers and Internet users over the last 10 years. And yet, despite this positive development, more than half of the world's 6.8 billion people (as of 2008) [http://www.xist.org/default1.aspx] have yet to make their first basic telephone call, let alone have access to the Internet and the new economy. These people remain

completely shut off from the digital revolution and the social, economic and educational promises it holds. As the pace of the technological revolution increases, so does the digital divide for all sectors of society, from governments to the private sector, multilateral organisations, financial institutions, non-governmental organisations and everyday citizens (http://www.itu.int/wsis/tunis/newsroom/ stats).

The ITU has been credited with having played a major role in breaching the digital divide in some developing countries, such as Malaysia, Korea and Singapore, since the adoption of its six-point Valletta Action Plan (VAP) in 1998. VAP aims to address the key elements needed to bridge the digital divide, namely:
(1) Sector reform
(2) Access to new technologies
(3) Gender issues
(4) Rural development and universal service/access
(5) Finance and economics, partnerships with the private sector
(6) Human resource development.

VAP also includes a special programme to take into consideration the needs of Less Developed Countries (LDC), 35 of which are in Africa, 15 in Asia and 1 in Latin America and the Caribbean (http://www.itu.int/ITU-D/digitaldivide/strategy.html; http://www.digitaldivide.org; http://www.unohrlls.org/en/ldc/related/62/).

9. Africa and the Digital Divide: The Current Status
Although Africa is falling behind the rest of the developing world in breaching the digital divide, there are encouraging signs that the delivery and uptake of broadband Internet services by African businesses and consumers are steadily gaining momentum in parts of the African continent, such as South Africa and the North African countries of Morocco, Tunisia and Egypt.

According to the Arthur Goldstuck of World Wide **Wrox** , the number of Internet users using ADSL technology in South Africa grew by 12.5% in 2008 and is expected to continue to grow at a similar rate, pushing the number of broadband Internet users to 9 million over the next five years. High prices rather than infrastructure or inadequate capacity seem to be main reason most people, at least in South Africa, have thus far avoided mobile technology as an Internet connectivity tool (http://engineeringnews.co.za/).

Below are two tables showing statistics on the digital divide collected by the ICU up until April 2008. Table 1 shows that some **13.3 percent** of the developing world's

population had access to information via fixed telephone lines by the end of 2007, compared to **48.8 percent** of the developed world. At the same time, some **12.7 precent** of the developing world's population had access to the Internet. This suggests that those with access to fixed telephone lines were probably the same people with access to the Internet in the developed world. The Internet access figure for the developed world, however, was **65.5 percent**.

As far as mobile devices (mainly cellular phones) are concerned, 38.6 percent of the developing world compared to 100.3 percent of the developed world had access to such devices by the end of 2007 (http://www.itu.int/ITU-D/ict/statistics/at_glance/af_ictindicators_2007.html).

Table 1 further shows that North Africa, when compared to Sub-Saharan Africa as a region, had a higher rate of connectivity in terms of **fixed telephone lines** (**12.1%** as to 1.5%), **mobile devices** (**57.3%** as to 22.9%) and the **Internet** (**14.4%** as to 3.7%) by the end of 2007.

Table 2[4]
ICT in South Africa as Compared to North Africa, Sub-Saharan Africa and South Africa as a Percentage of the Population by April 2008

Table 1[3] ICT Trends in the Developing World compared to those in the Developed World 1990-2007						
	Fixed telephone lines per 100 population		**Mobile cellular subscriptions per 100 population**		**Internet users per 100 population**	
	1990	*2007*	*1990*	*2007*	*1990*	*2007*
World	9.9	19.0	0.2	50.3	0.3	20.6
Developed region	44.2	48.8	1.2	100.3	0.3	65.5
Developing region	3.1	13.3	0.0	38.6	0.0	12.7
Northern Africa	2.9	12.1	0.0	57.3	0.0	14.4
Sub-Saharan Africa (SSA)	1.0	1.5	0.0	22.9	0.0	3.7

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[3] http://www.itu.int/ITU-D/ict/statistics/ at_glance/af ictindicators_2007.html.

[4] http://www.itu.int/ITU-D/ict/statistics/ at_glance/af ictindicators_2007.html.

	Population	Main telephone lines		Mobile subscribers		Internet users	
	000s	000s	p. 100	000s	p. 100	000s	p. 100
AFRICA	**963'530**	**35'411.2**	**3.77**	**264'475.0**	**27.48**	**50'406.4**	**5.34**
North Africa	**157'070**	**18'670.9**	**11.91**	**83'865.0**	**53.39**	**21'402.2**	**13.64**
Sub-Saharan	**757'880**	**12'098.3**	**1.65**	**138'310.0**	**18.28**	**23'904.2**	**3.23**
South Africa	**48'580**	**4'642.0**	**9.56**	**42'300.0**	**87.08**	*5'100.0*	*10.75*

Conclusion

The Future of Social informatics and Community informatics
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. Both disciplines have acquired a 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 debate as to whether Community informatics is a sub-category of Social informatics is also long from settled. In 2006, the authors Berleur, Nurminen and Impagliazzo 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, J. Nurminen and Impagliazzo, 2006). 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 (Berleur, Nurminen and Impagliazzo, 2006:53).

The same can be said for the school of Community informatics, since borrowing ideas, concepts and theories from other disciplines and applying them to ICT applies as much to the future of Community informatics as it does to the future of Social informatics. Likewise, exporting Social informatics and Community informatics' theories to other fields allows them to become referenced disciplines in their own right. In this way, these new disciplines communicate their findings and results to other researchers and thus develop unique and distinct multi-disciplinary identities

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Which Way for LIS Education and Training in South Africa? Some Considerations from Contact and Distance Learning[5]

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Introduction

The changing patterns of social-economic interaction in society often mean that professions need to re-examine their premise and re-align themselves with current trends and perspectives. Of the latter, the most influential to Library and Information Science (LIS) education have been the democratization of information and the emancipation of the user (de Bruyn, 2007). The democratization of information points to the fact that 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 was 20 years ago. The emancipation of the user is a direct offshoot of both technology and globalization. New technologies not only increasingly provide information to the user whenever and wherever they are, but also employ more user-friendly formats such as sound, video and images (as opposed to text which has to be deciphered. Globalization 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.

Obviously, these changes have had profound impact on the provision of library and information services and hence LIS professionals. It is imperative that the type and quality of LIS education graduates should both reflect and be a reflection of the types of

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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 recognized the need to reorganize 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 'tunes' about the relevance of LIS education may differ because of different social political environments and cultures, but the 'lyrics' are 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/information society. De Bruyn (2007:114) warns that technological development coupled with democratization 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/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 bachelors degrees, while postgraduate levels include the postgraduate diploma, honours degree, Masters degree and Doctoral degree. 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 length of study, while being a historical accident that is often perpetuated by national or institutional structures and practices, militates against the desire to participate in globalization. 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 (2007) 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 standardize 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 merely 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.
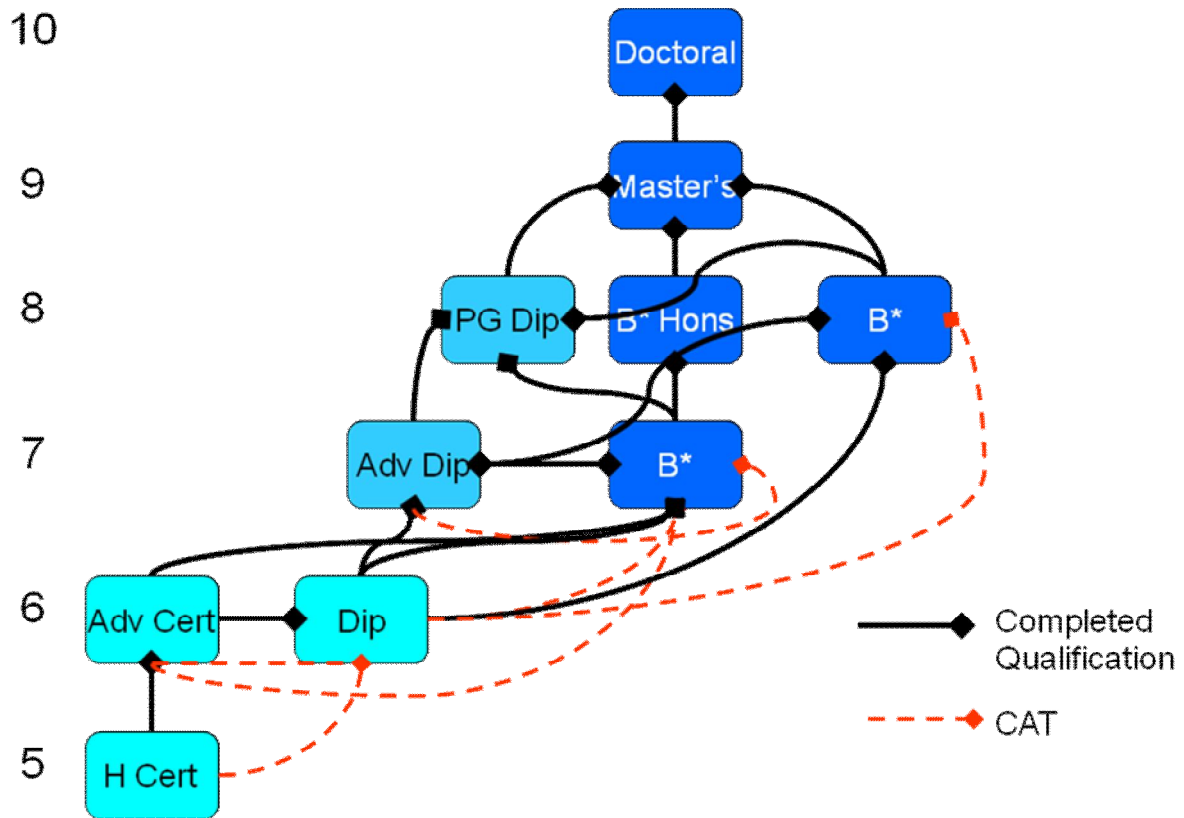
Figure 1: South African Higher Education Qualifications Framework. Source Havenga, 2007 *(reproduced with permission)*

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 bachelors, Masters and Doctoral degrees only, using the link word "of", e.g. *Bachelor of Information Science.* A qualifier indicates the field of specialization 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 specialization 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 specialization denoted by the qualifier" (Government Gazette, 2007:11).

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

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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 of concern 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 recognized 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/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, emphasizing 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, ICT, 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/continuous evolution of the profession. The 10 "core elements"[7] 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

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[7] **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) Organization, 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.

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 specialization 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 specializations as electives.

3.2   *Continuing 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 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 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 formalized 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 organizations, 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/lecturers to have skills in instructional technology in addition to their subject expertise. Academic staff need to be cognizant 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/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 strategize, 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 marginalizing some students.

4.1   *Distance vs 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/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/father or

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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/learning materials and the reorganization of content and access, which need to be put in place to maximize 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 familiarize 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 life 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 to others, approachable (accessible, friendly and open) and responsible. He further emphasizes 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 & 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 load can also be too heavy for the few who have the aptitude. Secondly, as Underwood (2009) underscores, 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

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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 Africa, let alone South 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 commercialization 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. Nonperformance 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/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/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 one of the two major stakeholders, 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 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 'jack of all trades' who is also highly specialized. However, the issue has to be addressed, otherwise LIS educators will lose students with further dire consequences for the various programmes, discipline and profession. The other facet of 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 interpretation. Such 'specializations' are

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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 or/and technological) countries. Thus the more the curriculum and pedagogy leans toward the new media and world trends, the more certain constituents are marginalized. Should LIS education be bothered about these?

A more hidden problem concerns 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 commercialization 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

It is well accepted that 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 scrutinized. Using new technology effectively to enhance and support communities is a core component of good service. In countries where there is a vibrant LIS profession or at least growing interest in LIS services, there is corresponding growth in education programmes. Often, this growth or vibrancy is a factor 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 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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    I.

Main factors impeding the adequate use of print-based information sources in institutions of higher learning in South Africa: The case of the University of Zululand

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Abstract

This paper sought to identify the main factors impeding the adequate use of print-based information sources by students at the University of Zululand so that strategies could be designed to promote and sensitize the use of these sources. The paper is informed by the Satisfaction and E-learner Satisfaction Theory. Satisfaction is an important aspect of product or service marketing because it determines whether a customer will continue using a product or service or not. The theory observes that when a customer is satisfied with the service offered by an organisation or a company, the client is more likely to continue using the company's product or service. However, if a client is dissatisfied with the service on offer, he or she may decide to discontinue using that particular product or service. Thus if students are dissatisfied with the print-based sources or with the services on offer in the library, they may decide to discontinue using print-based sources or they may not use them at all. Postgraduate students from all four faculties within the institution were sampled and surveyed using the purposive sampling technique. Structured questionnaires were distributed to 80 students; 20 questionnaires were distributed per faculty. The overall response rate was 96% (77 students). Data was analyzed using thematic categorization and tabulation. Most students at the University of Zululand do not use print-based sources. The data suggests that the university does not equip students with the skills they need to effectively use these sources. Furthermore, when students are not encouraged to use print-based sources by their lecturers and information skills training occurs outside the curriculum, students are less likely to make use of print-based sources for academic purposes. In order to use the growing range of information sources, be they print or electronic, students should acquire and practice the skills necessary to exploit them.

Keywords: Print sources, information sources, South Africa, University of Zululand,

1. Introduction

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This paper sought to identify the main factors impeding the adequate use of print-based information sources by students at the University of Zululand so that strategies could be designed to promote and sensitize the use of these sources. It should be pointed out that no student should leave a university without being able to cope in today's information society, meaning that they should be able to discern/use or select the best information sources at all times. In order to achieve the stated aim, the paper set out to establish what prevents students from effectively and actively using print-based information sources. This was posed in a research question: Why do students registered at the University of Zululand not make adequate use of print-based sources? The paper's premise is that there is over-reliance on the Internet amongst students at the university, despite the extensive publication process that traditional print sources go through to ensure quality in their publications.

The importance of a study is judged by the contribution it makes towards furthering knowledge. That said, this paper is significant because it would promote the adequate use of print-based sources by the UZ students. Literature would suggest that there are no studies that have hitherto been conducted on the factors that impede the adequate use of print-based sources at the University of Zululand. It is believed that this paper will be of value to students, academics, researchers, tertiary institutions and the University of Zululand's library.

2. Literature Review and Theoretical Framework

This section discusses the theory that informs the study and also highlights the importance of print-based sources. In addition, this section evaluates both print-based and web-based sources. This paper was largely informed by *Satisfaction and E-learner Satisfaction Theory*. Satisfaction is an important aspect of product or service marketing because it determines whether a customer will continue using a product or service or not. The theory observes that when a customer is satisfied with the service(s) offered by an organisation or a company, he or she is more likely to continue using that company's products or services. However, when a client is dissatisfied with the service on offer, he or she may decide to discontinue using that particular product or service. Satisfaction refers to a customer's "cognitive state of being adequately or inadequately rewarded for the sacrifice they have undergone" (Kim, Yeon & Park, 2002:11). Students will therefore prefer not to use print-based information sources if they are not satisfied with them. According to Hayashi, Chen, Ryan and Wu (2004:1), satisfaction was initially defined

within the context of job performance as a "pleasure or positive emotional state resulting from the appraisal of one's job".

Hayashi, Chen, Ryan and Wu (2004:1) further define satisfaction from the context of consumption as: "The summary psychological state resulting when the emotion surrounding disconfirmation expectations is coupled with the consumer's prior feelings about the consumption experience". Both definitions highlight a psychological or affective state related to and resulting from a cognitive appraisal of the expectation-performance discrepancy (confirmation) [Hayashi et al., 2004: 2]. Kort and Gharbi (2008:3) regard satisfaction as: "An ex post evaluation of consumers' initial (trial) experience with the service, and is captured as a positive feeling (satisfaction), indifference, or negative feeling (dissatisfaction). Therefore the consumer is satisfied when his affect is resulting from his experience fit with his

expectation." Satisfaction therefore comes from the use of the product/service. Thus if students are dissatisfied with the availability of print-based sources or with the services they get in the library (where most print-based sources are housed), they may decide to discontinue using the library or not start using it at all.

The *Expectation Confirmation Theory* offers a framework for defining satisfaction (Kort and Gharbi 2008: 3). The theory states that: "Consumers form an initial expectation of a specific product or service prior to purchase, they accept and use that product or service following a period of initial consumption, they form perceptions about its performance vis-à-vis their original expectation and determine the extent to which their expectation is confirmed. They form a satisfaction, or affect based on their confirmation level and expectation on which that confirmation was based. Finally, satisfied consumers form a repurchase intention, while dissatisfied users discontinue its subsequent use."

As indicated earlier, according to the *Expectation Confirmation Theory*, satisfaction is "the summary psychological state resulting when the emotion surrounding disconfirmed expectations is coupled with a consumer's prior feelings about the consumer experience" (ibid.). Customers with low expectations about a product or service often have lower satisfaction levels after using it (Hayashi et al., 2004:2). Applying the Expectation Confirmation paradigm to the use of technology and online learning environments, Thong, Hong and Tam (2006: 800) state, "While the existing studies have tended to investigate individuals' decisions to initially adopt an information technology, there is less attention paid to the post-adoption environment where individuals decide between continuing and discontinuing usage of an information technology." They further argue that until the post-adoption use of the IT can be confirmed, it is premature to classify an IT adoption as a success.

The Internet introduced the concept of e-learner satisfaction - e-learners conduct their educational activities over the Internet and therefore their satisfaction with online studies is called e-learner satisfaction. Kort and Gharbi (2008:3) define e-satisfaction as: "The consumers' judgement of their Internet retail expertise as compared to their experiences with traditional retail stores." The most important difference between traditional and electronic retail services is the replacement of human-to-human interaction with human-to-machine interaction. Therefore, new or modified approaches to conceptualising and measuring satisfaction may be required for electronic commerce settings. In the case of e-learning content, the student is considered a customer and therefore satisfaction is the net result of the interaction between the student and the website of the online university (ibid.). With reference to e-learning environments, factors that may influence the student's judgement and satisfaction (or lack thereof)

with respect to the website include content, user interface, learning community, customisation and learning performance (Kort & Gharbi, 2008:3).

The problem under investigation pertains to the poor use of print-based sources by students at the University of Zululand. The literature consulted (e.g. Dutton, 1990) suggests that lecturers are largely to blame because they do not motivate or instruct students to use print-based information sources when completing their assignments, dissertations or projects, even while most of the (print-based) sources are written by academics. A study by Dutton (1990) found that many academics in tertiary institutions seemed reluctant to use print-based sources. However, the opposite also applies; there are universities that force students to use print-based sources. An example would be the University of South Africa (UNISA), where students from the Department of Information Science are obliged to use print-based sources - a student will not pass his or her assessment/dissertation/project without predominantly using print-based sources. To make this more efficacious, the Department of Information Science at UNISA introduced a departmental policy which all students registered in the department must adhere to. The policy states that when writing an assignment, dissertation or project, two out of three sources consulted must be print-based. This has seen a number of students registered in the Department of Information Science at UNISA visiting the library time and again, indicating that they feel either motivated or forced to use print-based sources. Either way, it is still a move in the right direction because these sources are written by professionals and should therefore be used.

2.1 Evaluating print-based versus web-based sources

A study conducted by Purdue Owl (2009) observes that the advent of the World Wide Web has led to a massive influx of digital texts and sources. Understanding the difference between what one can find on the web and what one can find in more traditional print sources is key. Some sources, such as journals or newspaper articles, can be found in both print and digital formats. However, much of what is found on the Internet does not have a print equivalent, and hence has low or no quality standards for publication. By and large, understanding the difference between the types of resources available would help an individual evaluate or reflect on what he or she finds (Purdue Owl, ibid).

Publication Process

(a) *Print-based sources:* Traditional print sources go through an extensive publication process that includes the editing and review of articles. The process has fact-checkers, multiple reviewers and editors to ensure quality (Purdue Owl, ibid).

(b) *Web-based sources*: Anyone with a computer and access to the Internet can publish a website or electronic document. Thus, most web documents do not have editors, fact-checkers, or other types of reviewers (Purdue Owl, ibid).

Authorship and Affiliations

(a) *Print-based sources*: One of the main advantages of print sources is that they clearly indicate who the author is, what organisation(s) he or she is affiliated to, and when his or her work was published.

(b) *Web-based sources:* Authorship and affiliations are difficult to determine on the Internet. Some sites may have author(s) and sponsorship(s) listed, but many do not (Purdue Owl, ibid).

Sources and Quotations

(a) *Print-based sources:* In most traditional publications, external sources of information and direct quotations are clearly marked and identified.

(b) *Web-based sources*: Sources the author used or referred to in the text may not be clearly indicated in an Internet source (Purdue Owl, ibid).

Bias and Special Interests

(a) *Print-based sources:* While bias certainly exists in traditional publications, printing is more expensive and difficult to accomplish. Most major publishers are out to make a profit and will either not cater to special interest groups or will clearly indicate when they are catering to special interest groups.

(b) *Web-based sources:* The purpose of online text may be misleading. A website that appears to be factual may actually be persuasive and/or deceptive (Purdue Owl, ibid).

Author Qualifications

(a) *Print-based sources:* Qualifications of an author are almost always necessary for print sources. Only qualified authors are likely to have their manuscripts accepted for publication.

(b) *Web-based sources:* Even if the author and purpose of a website can be determined, the qualifications of the author are not always given (Purdue Owl, ibid).

Publication Information

(a) *Print-based sources:* Publication information, such as date of publication, publisher, author and editor, are always clearly listed in print publications.

(b) *Web-based sources:* Dates of publication and the timeliness of information are questionable on the Internet. The dates listed on websites could be the date posted, date updated, or may not be listed at all (Purdue OWL, ibid).

3. Methodology

Postgraduate students from all four faculties at the University of Zululand were targeted after being sampled using purposive sampling. A survey consisting of structured questionnaires was subsequently distributed to 80 students; 20 questionnaires were distributed per faculty. The overall response rate was 96% (77). The instrument sought out the demographic characteristics of the respondents and asked whether respondents used print-based sources; how respondents learnt to use print-based sources; purposes for which print-based information sources were used; whether respondents were satisfied with the availability of print-based sources; whether they always found the information they sought using on print-based sources; and the problems they encountered when using print-based sources. The data collected was analysed using thematic categorisation and tabulation. The findings were presented descriptively with the help of the Statistical Package of Social Sciences (SPSS) and Micro Soft Excel.

4. Results and Discussions

4.1 Demographic profile of the respondents

Respondents were from all four targeted faculties within the university, with the majority (76%) pursuing their Masters degrees. Only 6% respondents were busy with their Doctoral degrees. The respondents were mainly between the ages of 22-30 and predominantly male.

4.2 The use of print-based information sources

The study sought to establish whether the respondents used print-based information sources in their studies. The respondents were therefore provided with a list of options

and asked to rate them on a Likert scale of 1 (Very often), 2 (Often), 3 (Seldom) and 4 (Never), depending on which situation applied. Figure 1 below summarizes the responses.

Figure 1: Using print-based sources (N=77)
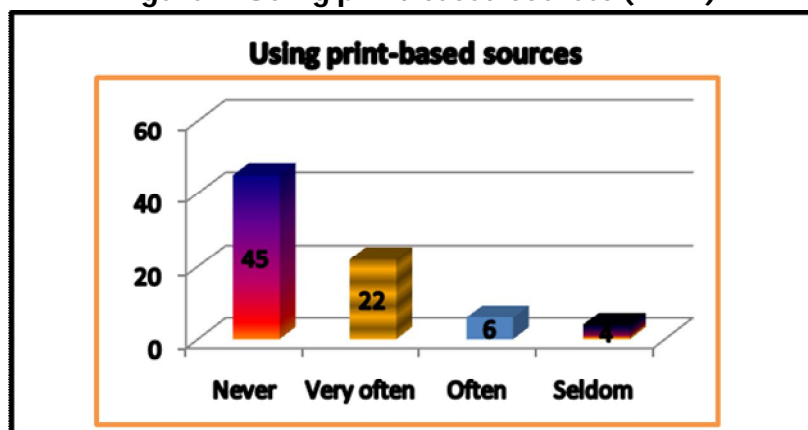
The above table shows that most (45; 58%) of the respondents didn't use print-based information sources. A fairly large number used print-based sources (22; 29%), while very few (6; 8%) indicated that they often used print-based sources. The minority (4; 5%) were those who seldom used print-based sources. Students in institutions of higher learning are free to use print-based and/or electronic information sources. The data suggests that many students at the University of Zululand prefer electronic information over print-based sources.

The above is reflected in an earlier study conducted by Brinkley et al. (1999), who described how computers and related electronic resources have come to play a central role in education. The authors argued that whatever one's feelings about what some have called the 'digital revolution', lecturers must accept that many, if not most, of their students are fully immersed in this revolution. On a very simple scale, one will rarely receive work from a student that has been written without the help of the web. Most students in tertiary institutions have considerable experience with the Internet and will always make use of it in much of their academic work. Brinkley et al. (ibid) caution that given the many advantages that electronic databases have over print indexes, not to mention patrons' preference for electronic sources, many institutions must be considering cancelling their print indexes and replacing them with digitized versions. Indeed, it may become financially untenable to provide and pay for two means of access to the same bibliographic information. Space considerations alone tempt one to cancel a particularly voluminous printed index as one's index tables overflow with seemingly endless hefty volumes. On the other hand, some would argue that there are archival advantages to maintaining print subscriptions. Ultimately, the *Satisfaction and E-learner*

Satisfaction Theory states clearly that if a client is dissatisfied with the service(s) on offer, he or she may decide to discontinue using that particular product or service (Kim, Yeon & Park, 2002: 11). This suggests that most students do not use print-based sources because they are dissatisfied with the services or printed information sources available in the library.

4.3 Ways of learning to use print-based information sources

One of the objectives of the study was to establish the ways in which students learn to use print-based information sources. Respondents were therefore provided with a list of possible options to choose from and were at liberty to choose more than one option where necessary. The results are summarized below.

Table 1: Methods of learning to use print-based sources (N=77)

Response	Number
Trial and error	67
Guidance from other students	43
Self taught	29
Guidance from Library staff	22
Courses offered by the University	19
Guidance from Lecturers	16
External courses	0

*NB the table represents multiple responses

The most popular method was through trial and error (67). Help (Guidance) from other students was also significant (43). An average number of the respondents (29) indicated that they'd learnt to use print-based information sources by teaching themselves (self taught). Those who acquired skills from library staff were 22, while 19 indicated that they'd learnt through the courses offered at the university. The minority (16) were those who received guidance from their lecturers, which means that lecturers are not playing a major role in teaching students how to use print-based information sources. However, it appears as if most students approach the learning process as individuals or with their peers. With the number of students entering higher education increasing and the number of staff not rising accordingly, ensuring that students have acquired the skills they require if they do not attend sessions and orientation or seek guidance is very difficult to monitor.

The University of Zululand offers Library Orientation to all first year students who join the university, teaching them how to access and use print-based and electronic information sources. These findings suggest that the University of Zululand is not succeeding in its fight to curb students' information illiteracy. In their study, Ray and Day (1998) state that experience in user education programmes has shown that teaching information retrieval skills to students should be embedded into the curriculum and done at a time when the user can understand the skills' appropriateness. This training should also be adapted to the varying abilities of the users which, as this survey has demonstrated, differ considerably. If students are aware that the skills required for using print-based information sources are not insular and indeed provide them with valuable transferable lifelong skills--skills which employers will be looking for--they may be more likely to learn how to use them. Therefore, if academic staff were to promote print-based resources by providing references by which students could locate the required content, the number of students who would try to acquire (print-based) information retrieval skills would increase. Clearly, this depends on the academic staff's ability to do this. Similar studies conducted by Dutton (1990) suggested that although many academic staff members seem to be reluctant to use web-based sources, there is also a large number of academic staff and students who are reluctant to use print-based sources. The basis of their argument is that they are unaware of what is available to them and what the services are capable of doing. This can also be seen in Fig 1, where a significant number of students (58%) revealed that they had never used print-based sources because in most cases, they did not receive the information they were looking for and most print-based sources were outdated. Dutton (1990) and Ray and Day (ibid) add that when students are not encouraged to use print-based information sources by their tutors and information skills training occurs outside of the curriculum, students are generally less likely to make use of print-based sources for academic purposes.

To reiterate, in order to use the growing range of information sources, be they print or electronic, students must acquire and practice the skills necessary to exploit them. To this end, Brophy (1993:55) states that students do not often appreciate the skills required to search these sources, which often seem deceptively easy to use. The ability to find and retrieve information effectively is a transferable skill that is useful in future life, also enabling the positive and successful use of information resources at university. As indicated earlier, Brophy (ibid) argues that libraries must reach a point where acquiring information skills is acknowledged as one of the main learning objectives of every student entering a university, so that no student leaves without being fully able to cope in the information society as an end-user.

4.4 Reasons for using print-based information sources

On this theme, respondents were asked to provide their own comments to an open-ended question. The aim of this question was to capture varying opinions and attitudes related to the use of print-based information sources. The respondents generally indicated the following:

I.   *I use them to look for job opportunities;*
II.   *I use printed sources for my research;*
III. *I use them for my assignments; and*
IV. *To further develop my knowledge.*

A similar study by Conner (1995) established that print is still used for some reading and is part of research in almost every discipline. Print-based information sources are considered important in certain disciplines, especially in the humanities. The author argued that print remains the most popular medium for books; e-book use is still at its very early stages. To reiterate, understanding the difference between the types of resources available would help one better evaluate or assess what he or she finds. For example, print-based sources are often better than web-based sources because traditional print sources go through an extensive publication process that includes editing and article review. Another advantage of print sources is that they clearly indicate who the author is, what organisation(s) he or she is affiliated to, and when his or her work was published. Furthermore, in most traditional publications, external sources of information and direct quotations are clearly marked and identified. As indicated earlier, while bias certainly exists in traditional publications, printing is more expensive and difficult to accomplish. Most major publishers are out to make a profit and will either not cater to special interest groups or will clearly indicate when they are catering to special interest groups (Purdue Owl, 2009).

4.5 Satisfaction with the availability of print-based sources

The study sought to establish whether the respondents were satisfied with the availability of print-based information sources at the University of Zululand. Figure 2 below summarizes the responses obtained from the respondents.

Figure 2: Satisfaction with the availability of print-based sources (N=77)
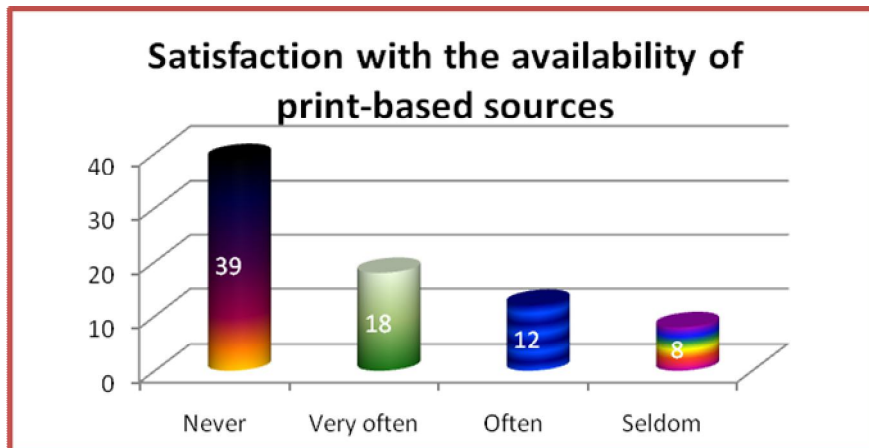
Figure 2 above illustrates that most (39; 51%) respondents were never satisfied with the availability of print-based sources, while 18 (23%) said 'very often'. 12 respondents said 'often' (16%) and only 8 (10%) 'seldom' or 'rarely get satisfied'. To reiterate, Kim, Yeon & Park (2002: 11) are of the view that satisfaction is an important aspect of product or service marketing because it determines whether a customer will continue using a product or service or not. If a customer is satisfied with the service offered by an organisation or a company, he/she will most likely continue using the company's product or service. However, if or when a client is dissatisfied with the offered service, he or she may decide to discontinue using that particular product or service. The findings indicate that students at the University of Zululand are not satisfied with the available print-based information sources. Therefore, the results support the theory that if customers are not satisfied with a product on offer, they will not use it. The *Expectation Confirmation Theory*, states that satisfaction is: "The summary psychological state resulting when the emotion surrounding disconfirmed expectations is coupled with a consumer's prior feelings about the consumer experience". Customers with a low expectation about a product or service often have lower satisfaction levels when using it (Hayashi et al., 2004:2). As indicated earlier, this supports the findings because most of the students indicated that they were not satisfied with the available print-based sources at the University of Zululand and therefore opted not to use them.

4.6 Getting information in print-based sources

The study sought to establish whether respondents found the information they required in print-based sources. The question aimed to establish whether print-based sources were useful in students' studies. Respondents were provided with a list of options to choose from and asked to rate them on a Likert scale of 1 to 4 depending on how it

applied to their situations: 1 (very often), 2 (often), 3 (seldom), and 4 (never). The figure below summarizes the responses.

Figure 3: Getting information in print-based sources (N=77)
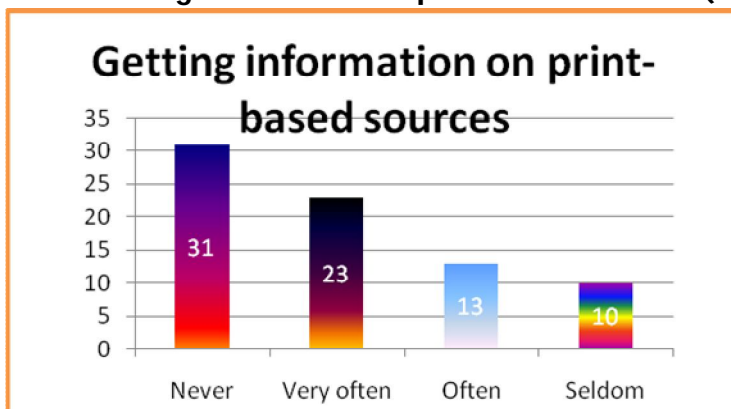
The data shows that most of the respondents (31; 40.2%) said they 'never' got the information they required from print-based sources, 23 (30%) indicated 'very often', and 13 (17%), 'often'. Those who indicated 'seldom' were only 10 (13%), which was the minority. There appears to be a perpetuation of the stereotype that printed information sources always provide outdated information while the web provides new/current information. In some instances this may be true, but this is not always the case. This misguided notion discourages students from using print-based sources. To reiterate, Purdue Owl (2009) points out that with the advent of the World Wide Web, there has been a massive influx of digital texts and sources. It should be noted that understanding the difference between what one can find on the web and what one can find in traditional print sources is key. Some sources, such as journal or newspaper articles, can be found in both print and digital formats. However, as indicated earlier, much of what is found on the Internet does not have a print equivalent, and hence has low or no quality standards of publication. To reiterate, if students do not get the information they want from print-based sources, they will definitely discontinue using them or not start at all.

4.7 Problems encountered when using print-based sources

One of the objectives of the study was to establish the conditions that are necessary to enhance the use of print-based information sources at the University of Zululand so that strategies can be designed to address them. In essence, the main purpose of this question was to capture varying experiences, opinions, and attitudes related to the use of print-based information sources by students at the University of Zululand. By and large, the respondents noted that:

- Students generally lack information retrieval skills

- Most print-based sources at the institution are outdated

- Computers for searching and locating books/articles are sometimes not operational

- Students cannot find the books they need because they are out

- Books are not available

- There are very few copies of certain books or articles in the library (e.g. 5 copies to be shared by 600 students)

- Sometimes a book is available but some of the pages have been removed

- It takes a lot of time to locate a book

- Students don't know how to look for information sources in the library

- There is a lot of noise in the library

- Students do not attend Library Orientation

An earlier study by Ray & Day (1998) established that limited time and lack of effective information retrieval skills in tertiary institutions seem to be the main barriers to students' use of print-based information sources. It cannot be denied that printed information sources come with some huge advantages. However, there are serious problems with printed sources, for example when 600 students have to share 5 copies of a textbook located in the library. This is one of the main factors that prevents the effective use of print-based sources by students at the University of Zululand and confirms what the Satisfaction and E-learner Satisfaction theory states - that satisfaction is an important aspect of product or service marketing because it determines whether a customer will continue using a product or service or not.

5. Conclusion

The aim of this paper was to identify the main factors impeding students' use of print-based sources at the University of Zululand so that strategies could be designed to promote the use of these sources. Findings from the sample population suggest that many students do not use print-based sources and are not aware of their benefits. The main factors that discourage students from using print-based sources include: poor information retrieval skills in the library; unavailability of textbooks; outdated sources; the amount of time spent looking for a textbook; noise in the library; and the failure of

students to attend Library Orientation. Moreover, the paper has found that the university does not equip students with the skills they need to be able to effectively use print-based sources. Students are not encouraged to use print-based sources by their lecturers, and information skills training often occurs outside the curriculum. Thus students are less likely to make use of these sources for academic purposes.

Furthermore, dissatisfaction with the products and services on offer by the library seems to be one of the main barriers to the use of print-based sources. The Satisfaction and E-learner Satisfaction theory clearly states that if a client is dissatisfied with the service on offer, he or she may decide to discontinue using that particular product or service. As already pointed out, in order to use the growing range of information sources, be they print or web-based, students should acquire and practice the skills necessary to exploit them. The ability to find and retrieve information effectively is a transferable skill that is useful in future life while enabling the positive and successful use of information resources at a university. As already suggested, in order to ameliorate the situation, libraries should reach a point where acquiring information skills is acknowledged as one of the main learning objectives of every student entering a university so that no student leaves without being fully able to cope in the information society.

6. Recommendations for Further Study

The results from this paper are discouraging, and previous studies undertaken indicate that many students do not use print-based sources. It is apparent that a large number of students from the sample population are leaving university without all the transferable skills they should have. That said, further research is necessary to find how best to encourage students to make effective use of print-based information sources. In order to promote the use of these sources, the paper proposes the following:

- A policy on the use of information resources should be introduced in order to ameliorate the situation. The policy should clearly state that each and every assignment, dissertation or project produced by students should be dominated with print-based sources;
- Information retrieval skills training should be embedded in the curriculum, undertaken at an appropriate time and supported by academic staff. Academic staff should be aware of the services that are most beneficial to their courses and therefore their students;
- Ensuring that students studying subjects without an emphasis on technology receive sufficient information retrieval skills' training so that they are not prejudiced against because of their chosen subjects; and

- Ensuring that information skills training is pitched at a level that is appropriate to the individual needs of the student.

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

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Abstract

This paper investigates the challenges faced by Communication Science students in the electronic learning (e-learning) arena at the University of South Africa (UNISA) in order to improve the university's services to students, ensure a seamless learning experience, and bridge the transactional distance in an Open Distance Learning (ODL) context. In order to achieve the stated aim, the paper set out to establish the barriers that prevent students from effectively using e-learning in their studies. The paper is informed by Michael Moore's Transactional Distance theory which addresses dialogue, transactional distance, and telecommunication systems. The study targeted executive members of the Communication Science Student Association (COMSA), which consists of ten members, and UNISA's Radio employees (200 Communication Science students). A survey questionnaire was administered to all COMSA executives and 50% of UNISA's Radio student employees who were chosen using simple random sampling. The data collected was analyzed using thematic categorisation and tabulation and the findings were presented descriptively.

The findings revealed 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. In light of this, UNISA needs to consider its unique circumstances in order to ensure maximum diffusion, adoption and the success of e-learning. The paper recommends a broader study in the future that focuses on academic and ICT staff as well as students chosen from across the Communication Science discipline at UNISA.

Keywords: E-learning, Open Distance Learning, University of South Africa

Introduction

The paper investigates the challenges experienced by Communication Science students in the electronic learning (e-learning) arena at the University of South Africa (UNISA) in order to improve the university's services to students, ensure a seamless learning experience, and bridge the transactional distance in its Open Distance Learning (ODL) context. 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 and any place in the world (WorldWideLearn, 2009). E-learning is not completely unlike any other form of education and it is widely accepted that it can be as rich and valuable as the classroom experience. With its unique features, e-learning is an experience that leads to comprehension and the mastery of new skills and knowledge, just like its traditional, class-based counterpart.

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 further 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 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 importance of a study is judged by the contribution it makes towards furthering knowledge. This 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.

1. Theoretical Framework

2.1 Transactional Distance theory

This paper 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 exist 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, ibid).

Moore (1997) emphasizes 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 (ibid) 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.

2. Methodology

A survey questionnaire was administered to all COMSA executives and 50% of UNISA Radio 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 characteristics of the respondents; students' 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 analyzed using thematic categorisation and tabulation, and the findings were presented descriptively.

3. 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 summarizes 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 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 generally felt that:

- 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 easy and fast
- 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. In strengthening the above views, 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 student in partaking 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), that lack of computer skills in tertiary institutions is the main barrier to students' use of ICTs. Strengthening this view is Moore's (1997) reference to student-lecturer interaction, 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 the material, and student to student interaction is

the exchange of information, ideas and dialogue that occurs between students about the course. A crucial component revealed 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   Discussions

Students correctly referred to *my*UNISA as the e-learning resource offered by UNISA. Central to this process is access to this infrastructure and how to convert it into content that can aid e-learning. One would say that there should be a two-pronged approach to research, namely the relationship between infrastructure and e-learning on the one hand and content and e-learning on the other. Although the study is only an initial

effort to gauge the challenges experienced by students in the e-learning arena, it is clear that access is limited and acts as an impediment in 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 or 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%. The above 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."

It is important to note that students appreciate the role played by e-learning and the flexible learning environment it creates. Students 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 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 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 in computer skills 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 life 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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The relationship between user studies, information seeking behavior, and information architecture, with special reference to web design

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Introduction

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. 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.

Conceptualization

In 1975, Richard Wurman, a trained architect with a keen interest in the way information is gathered, organized 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 structures or computer systems.

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

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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 organization, 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/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 simple model where the user simply entered a query and received matching results (Bates, 1989). 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.
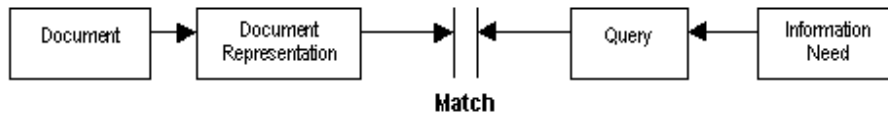
Source: Robertson in Kalbach 2000

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

The end of the 70's and early 1980's 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 analyzing a broad spectrum of complex human activity. Its aim was to understand user situations, gaps in knowledge and information utilization.
- 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 digitized 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 paper. 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 utilization.

Bates (1989) (Berrypicking model)

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.
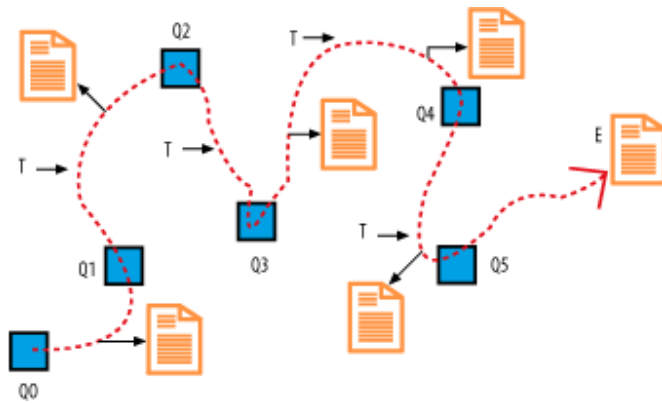
Fig.2 Information searching process (Poteet 2006)

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/documents in the vicinity of the original document of interest
- **Subject searches:** scanning subject indeces 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's 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 (2002) 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 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 (McKenzie 2002). In their model, Choo et al. (1999; 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 characterize web information seeking:

Behavioral Modes and Moves of Information Seeking on the Web						
	Starting	Chaining	Browsing	Differentiating	Monitoring	Extracting

	Identifying, selecting, starting pages and sites	Following links on initial pages				
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

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.

Source: Bates, 2002

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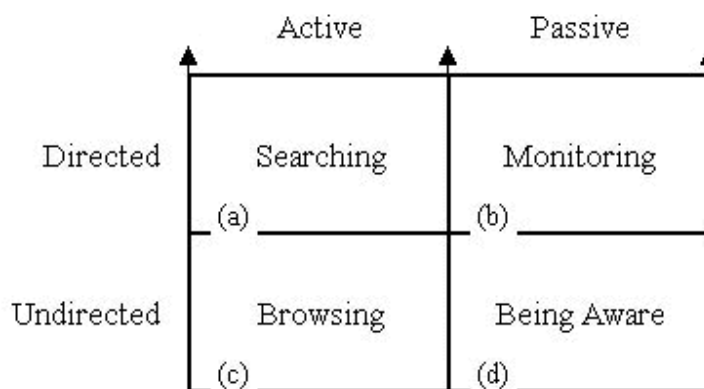
Awareness ('being aware') refers to all we know and learn though passive undirected behaviour (Bates 2002).

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.

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 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 emphasizing 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/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 optimized 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/her eliminate choices, hone in on the correct information, and support the user's

growing confidence that he or she will find the desired result. 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 utilized 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

- Emphasizes 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. 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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Challenges of Postgraduate research: Global Context, African Perspectives

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Abstract

Research can generally be subdivided into basic, applied/action, collaborative, contract and/or sponsored research. Postgraduate research is a form of study offered by a university or an institution of advanced learning/education that is (academically) recognized and can take any form of the above types of research. The emphasis of postgraduate research is on developing systematic skills of investigation during the research process. The aim is therefore not necessarily to produce ground-breaking innovations or extend knowledge, as often emphasized by promoters. Most postgraduate research largely and rightly consists of basic research, and to a lesser extent, applied and collaborative research. This paper discusses the challenges of postgraduate research from a global context with specific reference to universities in Africa. The challenges are many and include 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. These challenges can generally be reduced to three, namely research capacity, research productivity and research utility.

Research capacity refers to the availability of research facilities and the availability of trained human personnel. Research utility focuses on how the research outcomes relate to the national development agenda or priorities. Research productivity refers to the optimisation of the resources available to enhance the quality of research. While not peculiar to Africa, the continent lags behind the developed world in making discernible progress in addressing these challenges. The author proffers interventions to minimize these challenges with particular reference to Africa.

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Introduction

Universities the world over are recognized 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 current 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 bachelor's degree or a diploma. Consequently, nomenclatures such as postgraduate diploma, Masters degree, Master of Philosophy, PhD or higher PhD are now 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 bachelor's degree, or a distinguished academic track record. Another trend is to award a doctorate degree 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 between 9 to 12 months (e.g. UK, South Africa) 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 2 and 6 (years), with the average duration being 4 years (Mouton, 2007).

Generally, postgraduate research is not intended to yield ground breaking 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 'doctor' (Latin – 'docera') – 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's 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 research 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, 2006).

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 Doctorate 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, such 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 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/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 analyze online public access catalogue use). Applied/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).

Post graduate research is a form of apprenticeship taken under the supervision of senior faculty members. The faculty member involved in the supervision of post graduate research must have the right expertise to play the role of promoter/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 on the job market; a requirement for promotion by the employer; enhancing 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 stringency requirements for a thesis/dissertation to significantly extend knowledge or generate new products and services.

For students planning to pursue postgraduate studies/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/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 use ICT in teaching and research, availability of digitized 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/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), a few research best practices regarding students' supervision were learnt. 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. Students 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 postdoctoral/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 and 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 them (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 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. Presently, this is exacerbated by the unimpressive figures of student completion of postgraduate programmes. It takes on average 6-8 years to

complete a PhD in most African universities because of inadequate resources and bureaucracy in the 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-varsity 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. Jordaan and Biermann (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 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 specializations. 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 digitized, 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 of 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 little cross-disciplinary research endeavors, 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

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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 that require an interdisciplinary approach. Often, academic rresearch 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 a number of objectives in a single project, which calls for elaborate data collection and analysis, making it difficult to relate one objective to 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 and 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 - i.e. 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: ppoor quality of the students admitted, students' delays in submitting their work, and the inability of students to balance work/occupations and their studies. The students were asked when they consulted their supervisors and responded as follows: oonce a week (28%); oonce 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%). 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/occupations and school (44%); intimidations by supervisors (28%); difficulties in finding relevant literature (28%); and ddelays 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, M. Phil and PhD degrees. Factors affecting the rate of completion were found to include: availability/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 - equipment, software, chemicals; problems combining studies and work/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 for 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 less 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 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 recognizing the importance of research and are increasing support for research to 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 expected to increase to $130 billion by 2010 (Zakri, 206). 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, African digital library and African Online Digital Library have made possible access to resources that include digitized 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 digitized content. For example, the University of Botswana library's OPAC is used to provide access to digitized 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 Daventer 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 syllabi, course objectives and external content links.

Libraries are also transforming/translating their print collections into electronic format through digitization 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 a number of 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 and 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 relevance to such priorities. Investing in Open Access and institutional repositories (departmental, national, academic, specialized, 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 on to postgraduate students to develop their ability to seek, organize and apply information. Students' theses should be digitized 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's 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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The impact of the digital divide on information literacy training of Extended Curriculum Programme students at the Durban University of Technology

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Abstract

The demographics of tertiary institution student enrolment in South Africa has changed and evolved over the years. Today we have a heterogeneous group of students with different economic, cultural, digital and educational backgrounds, and hence different levels of literacy, information and otherwise. Mutula (2005) describes the digital divide as a "multi-dimensional phenomenon" that could be divided into three categories, viz. the divergence of Internet access by developed and developing societies, the gap that exists between the information rich and the information poor, and the divide that dictates who uses or does not use technology. In South Africa, which is a developing society, there are students entering the tertiary environment who have never used the Internet, and disadvantaged students from rural areas who have little or no knowledge of technology. Salinas (2003) argues that access to technology is not enough to bridge the digital divide; training thus becomes an important aspect to address this problem. Students at the Durban University of Technology (DUT) have access to technology, but many have no prior knowledge of how to use the tools to retrieve information that is needed. The researcher has observed firsthand that students in South African tertiary institutions fall within the realm of two extremes: students that have no access or skills, and students that have vast Information Technology (IT) experience. The proposed study, outlined here, is qualitative in nature, and intends to use questionnaires and interview schedules to collect data. Data will be collected from students enrolled for information literacy (IL) training. An interview schedule will also be used to collect data from the subject librarians involved in the teaching of information literacy. Finally a separate interview schedule will be used to collect data from the Extended Curriculum Programme

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coordinator. The paper aims to share details of the proposed study with fellow postgraduate students and academics to facilitate improvement.

Keywords: Digital divide, information literacy, Extended Curriculum Programme, Durban University of Technology, students

1. Introduction

Most students entering tertiary institutions today had gone through some form of apartheid designed education or schooling. This generally meant under-resourced schools and segregated teaching, and these and other reasons obstructed the students' exposure to technology or digital information (Swartz and Foley, 1996:38). Although South Africa has since moved on and is fifteen years into democracy, the divide has yet to be eliminated. Singh (2004:5) maintains that it will still take a long time for South Africa to heal from the effects of apartheid education The impact of this divide is still experienced and visible in tertiary institutions across the country.

Thus, this study sets out to investigate the impact of technology on students - who have been disadvantaged or advantaged in terms of achieving the information literacy (IL) skills in the current classroom environment, seeing that information literacy lessons are usually pitched at one level.

2. Research problem

To reiterate, the study intends to investigate the impact of having the "digital native", the "digital immigrant", and those completely new to IT in the same information literacy classroom, and particularly how to reach the teaching/learning objectives without frustrating students from any of the groups. Such a study would help determine whether the current training provided is meeting the expected learning outcomes of the IL module of the Extended Curriculum Programme (ECP). Many tertiary institutions are now offering the ECP to redress the historical legacy of poor education in South Africa, and this study hopes to contribute towards improving the IL module of the ECP offered at tertiary institutions in the country. Future ECP students would benefit from the study because universities will be shown how and why information literacy training should cater for diverse groups of students. Librarians, who generally tend to teach the IL module of the ECP, might be encouraged to approach IL differently. For example, online tutorials could be used to tutor digitally advantaged students while other teaching/learning methods could be adopted in the case of digitally disadvantaged students. The study will also benefit countries or regions that have similar development challenges. It will also contribute to the existing body of knowledge on the digital divide and information literacy.

3. Objectives of the study:

The overarching aim of this study is to investigate what impact the digital divide has on the IL training of ECP students at the DUT and to develop a model for the teaching and learning of IL that would accommodate both the digitally advantaged and the digitally disadvantaged students.

The following **objectives** need to be addressed in order to achieve the above:
- To identify in what ways the digital divide impacts on the IL training of ECP students;
- To identify innovative teaching/learning methods to accommodate the diversity of students in the IL classroom; and
- To develop a model that can be used in the teaching and learning of IL in the ECP that accommodates the digital divide separating participating students.

4. Literature review

The following literature review briefly outlines concepts and issues relevant to the study.

4.1 Overview of South African Education

The legacy of apartheid haunts every aspect of South African society. Educational practices were based along the lines of segregation or division according to racial groups. According to Pavlich and Orkin (1993:1-3), institutions were funded unequally on racial grounds. Black students were oppressed and denied access to universities (Swartz and Foley, 1996:34). Singh (2004:4) confirms that apartheid education promoted separate development, providing inferior education to non-whites. The above scenario has most certainly contributed to the current digital divide that we experience today.

The demographics of tertiary institution student enrolment in South Africa have since changed. During the apartheid era, students attended such institutions based on their race, and therefore the student body was largely a homogenous group. Today, we have a heterogeneous group of students with different racial, economic, digital, cultural and educational backgrounds, and hence with different levels of literacy, information and otherwise. This heterogeneity has contributed to the digital divide.

4.2 The Digital Divide

The "digital divide", according to Mutula (2005:122), is a "multi-dimensional phenomenon" that can generally be divided into three categories, viz. divergence of Internet access by developed and developing societies, the gap that exists between the information rich and the information poor, and the divide that dictates who uses or does not use technology. South Africa, which is classified as a developing country, has students entering the tertiary environment who have never used the Internet and disadvantaged students from rural areas who have little or no knowledge of technology.

Salinas (2003:134-135) argues that access to technology is not enough to bridge the digital divide; training thus becomes an important way to address this problem. Students at the Durban University of Technology (DUT) have access to technology but many have no prior knowledge of how to use the tools to retrieve the information that they need. Thus while IL is important, training that focuses on the general use of information and communication technology (ICT) must be addressed first.

Cullen (2001:311) defines the digital divide as the gap/divide that exists between those with ready access to ICTs and those without such access or the ability to use them. The researcher has observed first hand that South African tertiary institutions have students who fall into both these categories. Some students have no such access or skills, while others have been exposed to ICTs and know how to use them. Still others have vast experience with ICTs.

Singh (2004:1) defines the "global information society (GIS)", as "a society where every individual is connected to anyone in the globe by the Internet". The problem here is that there are billions of people who have no access to technology and may not have any access in their lifetime. Singh (2004:1) elaborates on the digital divide as a situation where there are the "information haves and the information have-nots". He argues that poverty, illiteracy, lack of infrastructure and inadequate government interest continue to expand the digital divide. According to Singh (2004:4), the digital divide is fairly extreme in South Africa; he cites statistics that reveal the gap to be 4.5% for 'information haves' and 95.5% for 'information have-nots'. Singh (2004:4) reiterates that apartheid was the main contributor to these figures. Darch and Underwood (1999:285) support Singh (2004:4) in claiming that the gap between the information rich and poor in South Africa is the largest in the world and agree that this is due to the skewed resource provision during the apartheid era.

4.3 Information literacy

Serious interest in information literacy (IL) began in the 1990s and has since grown rapidly. According to Ojedokun (2007:xiii), the concept of 'information literacy' became important because of the emergence of the 'information age'. IL has generally been described as the ability to identify the need for information; know the importance of accurate and authentic information; develop search strategies to assist in finding information; source information; evaluate information; and use and organize information effectively (Andretta, 2005:15).

In recent years, there has been an extremely high "failure, repeat and dropout rate" at higher education institutions, and thus the Department of Education (DoE) has provided special funding for the Extended Curriculum Programme (ECP) at South African Universities (Cape Peninsula University of Technology, 2008:1). Rambharos (2009) of CHED (Centre for Higher Education Development), now known as Centre for Excellence in Learning and Teaching (CELT), explains that the ECP has been offered at DUT since 2005, initially as a pilot study. In 2006, the ECP was formalized. The aim of the ECP is to assist students in developing independent learning skills and gaining conceptual knowledge of the subjects that they are enrolled for (Cape Peninsula University of Technology, 2008). The Extended Curriculum Programme at DUT includes various modules/interventions. Some of these interventions include English Communication, End-User Computing, Academic Literacy, and Information Literacy (Hlengwa, 2005). These modules are not add-on modules, but rather supplement the skills that students require to complete assignments, projects, etc., in their core courses. All teaching/learning aspects of the programme are well integrated into mainstream assessments.

At DUT, a single ECP class tends to have a number of students who come from a rural background with no prior (ICT) experience and thus grapple with the use of the mouse, keyboard or other information technology tools or resources that have to be mastered in the classroom. The class may also contain "digital immigrants", described as students who were not born into the digital world but readily adopted or are adapting to technology (Prensky, 2001:3). Prensky (2001:1) also describes the "digital native", meaning students who have grown up with technology. The latter term does not adequately describe the current South African situation because most current students are born in the digital era, but not all students have prior exposure to the technology of today.

Lippincott (2005:1) uses the term "net generation" to describe the students that currently enter tertiary institutions. The term "net generation" can be interchanged with Prensky's "digital native" (2001:1). Manual (2002:195) observes that there are many terms synonymous with "digital native". These terms include "Nintendo Generation", "Millennials" or "Generation Y". All these terms refer to individuals who have grown up with computers, cell phones, video games, etc., and are thus accustomed to the multimedia environment. Students that fall into this category prefer to figure things out on their own. For the purpose of this study, the term "digital native" will be used.

A digital native cannot be expected to sit in a traditional classroom and learn about the library system or databases from librarians who are considered to be experts in the field, or for that matter, learn in a traditional library setting or learn text-based information (Lippincott, 2005:1). The current setting in which most training is undertaken at the DUT library puts together both the digital native and the digitally disadvantaged student who needs to be nurtured and does not understand the basics of technology, let alone databases or other advanced library systems.

The proposed research thus focuses on the Information Literacy module of the DUT's Extended Curriculum Programme. The above literature review has provided an overview of the impact of the digital divide on information literacy training and described the evolution of the South African higher education environment and its impact on teaching and learning.

5. Methodology
This section covers the population of the study, method(s) of data collection, and the type of data analysis the researcher intends to use. The researcher intends to use multiple research techniques to collect data in order to enhance the validity and reliability of the study.

5.1 Target population:
According to Bless, Higson-Smith and Kagee (2006:98), a population consists of the entire set of people who are the focus of a study/research. For this study, the elements of the population will consist of the ECP students at DUT, the subject librarians engaged in the Extended Curriculum Programme, and the CHED coordinator of the Extended Curriculum Programme.

Not all students registered for the ECP are necessarily engaged in the IL module. Some may have completed the module in the previous year. A total of 644 students are currently (2009) enrolled for ECP at DUT, and only 431 of these students are in

the IL module (Rambharos, 2009). The breakdown of the number of students for 2009 registered for the IL module and divided according to the various faculties is as follows:

Faculty	Number of students registered for IL
Accounting and Informatics	68
Applied Science	12
Arts and Design	50
Engineering and the Built environment	101
Health Sciences	142
Management Sciences	58
Total	431

The seven subject librarians involved in the delivery of the IL programme will also be included in the study because they have been engaged in teaching the Information Literacy module to the ECP students since 2008 and should thus have valuable experiences and contributions to make.

The ECP coordinator from CHED is assumed to have an overall picture of the impact that the ECP is having on the throughput rate of students, and should also be aware of all the problems that students experience while following the programme. Thus the ECP co-ordinator has an important contribution to make to this study.

5.2 Sampling

Sampling is necessary because people are different, i.e. different characteristics, economic backgrounds, etc. (Babbie and Mouton, 2001:164-203). Thus information must be systematically gathered from a portion of the population, the sample, before the subsequent findings can be generalized onto the entire population. It is therefore important to ensure that a sample is representative of the entire population.

However for this project, the researcher will carry out a census instead of selecting a sample. A census involves acquiring and recording information systematically about the members of a particular population (Babbie and Mouton, 2001:230). Thus a census of the students in the Extended Curriculum Programme who are engaged in the IL module will be carried out. The number of ECP students engaged in the IL module is large (**431**), but manageable. The DUT campuses that offer the Extended Curriculum Programme are all based within Kwa-Zulu Natal and there are therefore no geographical restrictions that could prevent the researcher from reaching the

entire population. By carrying out a census rather than sampling, many problems that could threaten the validity of the study will be eliminated, e.g. sampling errors or sampling bias, and concerns of representativeness.

5.3 Data collection

Marshall and Rossman (2006:97) note that there are different data collection techniques in qualitative research, such as observation, interviews and survey questionnaires. In this instance, the researcher has opted for interviews and questionnaires.

5.3.1 Interviews

Kvale (2007:5) describes interviews as the exchange of views between individuals. This exchange can take place either face-to-face, via a telephone, or using new technologies like Skype (Babbie and Mouton, 2001:249). The advantages of interviews are varied. Denscombe (2003:165), for example, notes that the interviewer can obtain factual information from people and address immediate issues that may come up, such as experiences and feelings. For this project, the researcher will interview subject librarians who have had experience with the IL module. Another advantage of interviews is first-hand information and the opportunity to delve into the information the interviewee provides (Denscombe, 2003:165). For example, the ECP coordinator has an overall picture of the Extended Curriculum Programme and therefore interviewing her will be extremely useful.

Seven subject librarians will be interviewed and a separate interview schedule will be used to interview the ECP co-ordinator. Their perspectives will help clarify the objectives of the study. Additional and valuable information could also potentially be gained by probing the interviewees with follow up questions (Bless, Higson-Smith and Kagee, 2006:119). The researcher will conduct the interviews owing to the researcher's understanding of the content of the interview schedules and the topic as a whole. The concept of reliability is often questioned when conducting interviews because many interviewees may not want to be completely honest when asked direct questions (Kvale, 2007:122). It is also often pointed out that the same set of questions could be asked by another individual and the responses may differ. The researcher will thus assure the interviewees that all the information that they provide will be kept confidential and that their participation will be of great benefit to the study.

5.3.1.2 Design of interview schedules

The interview can take on different approaches, such as structured interviews, semi-structured interviews and completely open/unstructured interviews. The researcher has opted for semi-structured interviews. In structured interviews, the interviewer

keeps to the questions on the interview schedule and doesn't probe further, thus maintaining tight control over the questions and the answers (Denscombe, 2003:166). In contrast the semi-structured interview allows the interviewer to delve a little further to get clarification or obtain further information on a topic (Bless, Higson-Smith and Kagee, 2006:119). When designing the interview schedule, researchers need to think of research ethics in order to avoid bias. The questions in this questionnaire will be unambiguous and therefore very little rephrasing will be required (Babbie and Mouton, 2001:253). Generally, interview questions should also cover all the research objectives (Bloomberg and Volpe, 2008:82-83). The researcher will therefore have to ensure that the interview questions link directly to the research objectives of the study. Overall, the questions will be precise, arranged from general questions to specific questions, and will attempt to avoid bias (Babbie and Mouton, 2001:250). The interview schedule will be pretested to ensure that it elicits the required information and to check that the interviewer is able to articulate the questions as outlined in the interview schedule.

5.3.2 Questionnaires

The census will consist of self-administered questionnaires because these will be relatively simple to administer to a population of 431 ECP students. The target population is literate and will be familiar with the content of the questionnaire. Questionnaires are also relatively cheap to administer and less time consuming, and it will be easy to track returns because a register of the ECP students will be used.

5.3.2.1 Questionnaire design

Questionnaires have to be very carefully designed in order to provide reliable and valid results. Reliability refers to the researcher's level of confidence in the ability of the research instrument to repeatedly deliver the same results. A good level of reliability, according to Denscombe (2003:300), is produced by a research instrument that provides the same results repeatedly and is not the cause of change (in data). The validity of an instrument, according to Struwig and Stead (2001:138), can be defined as the "degree to which an instrument measures what it is supposed to measure". Content validity is very important. Marshall and Rossman (2006: 201) describe it as the content relevant in an instrument. The questions in the questionnaire and the interview schedules must therefore relate to the topic of the study. As with the interview schedule, questions will have to be precise, avoiding bias, and be ordered from general questions to more specific questions (Babbie and Mouton 2001:233-236).

The use of multiple methods of data collection is referred to as triangulation, and this ensures validity (Bloomberg and Volpe, 2008:73). Triangulation involves collecting

data from different sources and using different research techniques during collection. According to Denscombe (2003:132), using triangulation improves the researcher's chances of arriving at useful and correct findings. The researcher intends to use multiple research techniques to enhance the validity and reliability of the study.

5.4 Data analysis

The *Statistical Package for the Social Sciences* (*SPSS)* (version 16) will be used to analyze data. The researcher chose the *SPSS* because it facilitates data management and will be able to clearly illustrate the findings in graphs which are automatically generated by the *SPSS* package. The *SPSS* package will also allow the researcher to easily transfer the data and graphs across to a word processing package (Fielding and Gilbert, 2000:23).

Once all the data is captured and labels are assigned, the researcher will begin to analyze the results to draw appropriate conclusions. Based on the findings, the researcher will subsequently be able to make recommendations that would benefit librarians offering information literacy training to their students.

6. Conclusion

This study aims to contribute to the existing body of knowledge on the topic of the digital divide. The findings will also help the higher education sector in South Africa, which is offering the Extended Curriculum Programme, and the higher education sector in developing countries. The study could also contribute to the delivery of other programmes that have digital components, such as End-User Computing. The findings will certainly contribute towards improving the IL module currently on offer to ECP students. An improved model of teaching IL to ECP students will be provided.

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Indigenous Knowledge Research in Kenya and South Africa: An Informetric Study

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Abstract

This paper applies informetrics using descriptive bibliometrics to determine the state Indigenous Knowledge (IK) development in Kenya and South Africa. Data was analyzed using the following variables: document type; growth of literature on the subject from 1990 - 2008; document source(s); document affiliation; subject domain; country of publication; and nature of authorship, among other attributes. 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 - were analyzed using content analysis. Two keywords - indigenous knowledge and traditional knowledge - were used in all database searches. We found that IK was strongly represented in the SABINET and OCLC databases. The absence of a national (online) database showcasing Kenyan research output made it difficult to

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account for IK research in the country. Recommendations are provided for a follow up study and further research. The paper could prove useful for decision support in IK management.

Key Words: Knowledge Management; Indigenous Knowledge; Informetrics

1.0   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 organization. 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 utilization) and therefore requires significant attention.

Despite emerging interests 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 marginalized areas where modern forms of communication are relatively unavailable. This problem 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 recognize 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 organize 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 internationalizes the experiences, concerns and struggles of some of the world's colonized 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 (2004:247), 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, stigmatized, illegalized and suppressed among the majority of the world communities" (Ocholla and Onyancha, 2004:248).

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 institutionalize 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 underutilized 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, nd; Mendoza, 2001), legal systems (Gupta, nd; Gupta, 2000), disability (Enwereji, 2000), agriculture (Gerritsen, 2000) and policy (Vivekanandan et al., 2004). International organizations have not been left behind and have 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, nd; Mumba, nd;

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 analyzed.

2.0   Methodology

In order to determine the trends and types of IK research in the two countries, an analysis of IK records was carried out according to the distribution of IK records by database, document type, institution, and the trend of IK literature from 1990 to 2008.

An informetric analysis was applied to capture IK research output. According to Jayroe (2008:2), informetrics is a mathematical and statistical study of patterns in documentation and information. Other related branches, as cited by Jayroe, include scientometrics, which deals with the mathematical and statistical analysis of research patterns in life and the physical sciences; cybermetrics, the study of the quantitative analysis of scholarly and scientific communications on the Internet; and even cliometrics, the study of historical data through statistical techniques. Wolfram (2000:78) suggests that informetrics is a type of research that investigates the existence of empirical regularities and attempts to develop mathematical models and ultimately theories to better understand information processes. Another closely-related branch is bibliometrics, which deals with the study of the properties and behaviour of recorded knowledge so as to analyze various structures and components in scientific research areas and evaluate research activity and the administration of scientific information (Wormell, 2001; Ungern-Sternberg, 1995). Others, like Brookes in Wolfram (2000:78), argue that bibliometrics and scientometrics, which are often used synonymously with informetrics, are actually sub-fields within informetrics.

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 knowledge* and *traditional knowledge*, were used in all the databases to retrieve relevant bibliographic information. It is, however, important to point out that 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 analyzed using Microsoft Excel software according to the set objectives
- The results were graphically presented in tables and figures

3.0   Results and Discussion

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 analyzed as per (the number of) records generated. A total 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.

	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

Table 1: Coverage of IK records in databases

The inclusion of both international and national databases was primarily done to assess the visibility of IK research. With IK being as "neglected, vindicated, stigmatized, illegalized 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 (e.g. 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 possibly 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 (please refer to page 5).

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.
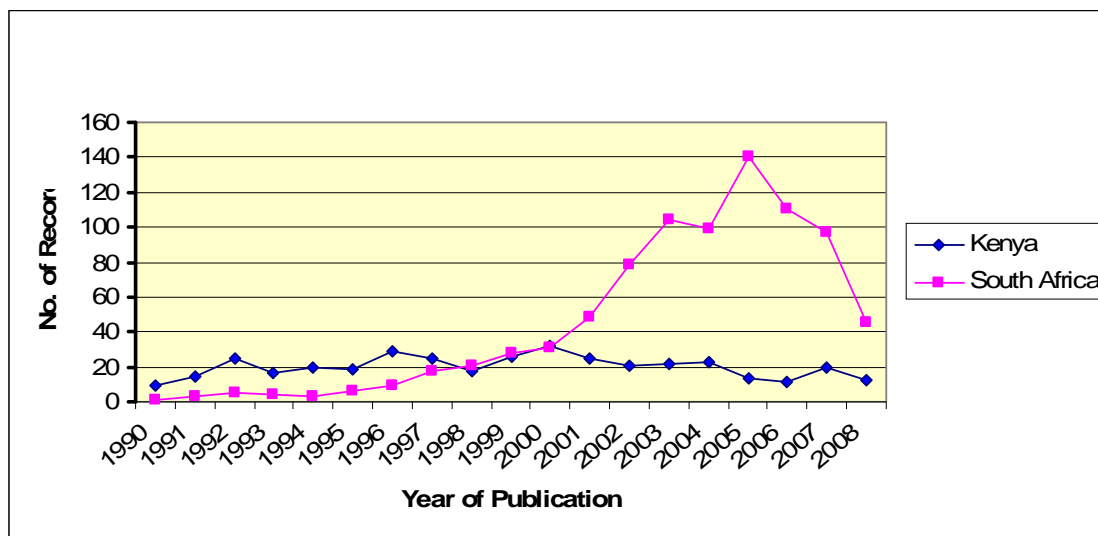
Fig 1: Trend of publication of IK literature, 1990-2008

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), and 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.

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

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 – 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.

	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**

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

While SABINET's UCTD could be analyzed 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 %), video (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 %), video (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.

Document type	Kenya No. of Records=(N=381)	%	South Africa 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**

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

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 (of academic institutions) through funding incentives and also because of 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, bioprospecting, 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 graphically below.

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**

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

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. Land was normally left uncultivated for vegetable or plant manure accumulation (Ayayo, 2004:40). Besides achieving food security, this practice was and is still used to ensure continuous soil fertility.

4.0   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/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). In addition, the presence of an IK journal, *Indilinga,* 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 gaining visibility on the web and that Kenyan scholars prefer publishing in international journals as opposed to local journals. This can also be interpreted differently, 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, to name a few. 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, recognizing, 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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Mechanisms through which Information Systems Capabilities Create Benefits to e-schools: A theoretical Perspective

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Abstract

A variety of school systems have evolved in the new millennium to meet the demands of complex society and work life of the 21st century. Scotland introduced reculturalisation of schools which entailed introduction of information communication technology, ICT, for accessing resources to support classroom work and management of the school processes (Simpson, Payne & Condie, 2005, p.337). Malaysia initiated smart schools whose main objectives were to train students in secondary schools, equip them with state of the art ICT skills, make the students critical thinkers and ICT savvy. 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-school 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 curriculum is rooted in findings in recent studies that ICT generates benefits to organizations (Gunasekaran et al., 2004) and similar benefits may be obtained in application of IS in any organization.

Consequently researchers and practitioners variously recommend integration of IS in all organizations in every sector of the economy. However the way IS generates benefits to organizations is not well understood. Some studies for example Zhu and Kraemer (2002) have revealed that IS benefits in technology producing firms are explicit but not so in traditional manufacturing organizations. The underlying mechanisms through which information system capability leads to improved organizational performances (Bharadwaj, 2000) and the directions of causality (Brynejolfsson & Hitt, 2000) are not clear. Likewise the potential benefits of IS in e-schools is not well studied despite the huge investments that is currently being channeled to their establishment. This paper makes a literature survey of IS benefits in traditional firms and apply these in theorizing how similar benefits may accrue to e-schools. It concludes with a suggestion on an approach to measuring IS benefits in e-schools.

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Keywords: Information systems, e-schools

Introduction

A variety of school systems have evolved in the new millennium to meet the demands of complex society and work life of the 21st century. Scotland introduced reculturalisation of schools which entailed introduction of information communication technology, ICT, for accessing resources to support classroom work and 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, make the students critical thinkers and ICT savvy. 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-school 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 curriculum is rooted in findings in recent studies that ICT generates benefits to organizations (Gunasekaran et al., 2004) and similar benefits may be obtained in application of IS in any organization.

Information system (IS) net benefit is the hallmark question in IS investment. Successful IS investments, in many cases, create impact to the institution through one or combination of the following ways: improving individual processes (efficiency), enabling process synthesis and integration across disparate physical and organizational boundaries (effectiveness) (Basu & Blanning, 2003), and facilitating innovation (Newell et al., 2003; Bharadwaj, 2000; Rivachandran & Lertwongsatien, 2005). An efficient process is one that maximizes production from a combination of factors of production. Traditionally, an efficient process occasioned by investment in IS results in decline of firm size (Brynjolfsson, et al, 1994), decentralization of decision making (Zenger & Hesterly, 1997) and therefore substitution of certain functions. Effectiveness is performing a task correctly. Specific to business processes, effectiveness is strategizing in interaction with other organizations with a view to out performing the other organizations in the market. The strategizing, interestingly, at times comes through cooperation of organization in networking and exchanging or trading information (Teigland & Wasko, 2003). On the other hand innovation is doing something differently by combining existing knowledge with new ones (Edquist, 2005). For example instead of repeatedly dissecting an animal for teaching of its anatomy, simulation of the process could be used to reduce the cost and time and still achieve the same learning (Kozma,

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2005).Different IS tend to have different impacts on organizations 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 other resources (assets, knowledge, capabilities and processes) of an organization, additional value, described as complementary asset (Zhu & Kraemer, 2002; Sambamurthy, Bharadwaj & Grover, 2003; Brynjolfsson & Hitt, 2000) is created which could not be attained when either IS or the resources were deployed separately. Complementary asset is however not automatic; it has to be fostered (Newell, et al, 2003). IS therefore gives organizations 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 asset drive some chief executives to seek additional expenditure on IS stock. Nevertheless other chief executives' main reason for voting for additional IS stock is for purposes of staying on technology adoption lead. Therefore chief executives are at times on the sport to justify the huge investments in information system calling for reliable measures of IS benefits.

Measuring IS benefit not only help managers argue their case for huge expenses but also help organizations align the IS capabilities to organizational core business operation. A firm's IS capability is its ability to mobilize and deploy IS-based resources in combination or co-present with other resources and capabilities (Bharadwaj, 2000). Three forms of IS capabilities are: tangible resources (comprising IS physical infrastructure components) human resources (comprising the technical and managerial IS skills), and the intangible IS-enabled resources, including knowledge assets, customer orientation and synergy (Bharadwaj, 2000). IS 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 decision 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 has prohibitive costs. Secondly the pre-implementation BPS method can hardly give a true picture of intra and inter-organizational interactions. Torkzadeh and Doll (1999) posit that IS benefit is multifaceted. According to Gialglis, Mylonopoulos and Doukidis (1999), proposal for a particular IS system is initiated with specific business goals in mind, and a set of primary objectives being sought by 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 to organizations which have deployed the systems for example whereas the benefits are easily identifiable in service oriented organizations, it is hard to trace benefits in manufacturing industries (Zhu & Kraemer,

2002).The focus of this paper is to survey literature on IS benefits in traditional firms and apply these in theorizing how similar benefits may accrue to e-schools. It concludes with a suggestion on an approach to measuring IS benefits in e-schools.

Survey of Literature on IS Benefits

Information system has the broad power to reduce the cost of coordination, communications and information processing (Brynjolfsson & Hitt, 2000). Coordination can be within or between organizations. Within a firm, a process of acquisition of new capital equipment may faster be done in a network. Processes of approving budget, analyzing economic value of the presented bids, approving payment vouchers and releasing payments could all be done within a couple of hours by networked people collocated in an organization as opposed to moving files around offices. A showcase of inter firm coordination is exemplified in the design of B-2 "stealth" bomber; an American war plane that was designed by four firms almost entirely in computer (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 fit with low tolerance. The different organizations accessed data from one another through an integrated database. Such communication through networks emphasizes speedy resolution of problems, and reduces wastage that may arise from non standardized product. Work practices are combined with IS capability, strategy and products and services (Brynjolfsson & Hitt, 2000) to lead to efficiency.

Part of complementary assets generated when IS capabilities combine with other capabilities of the organization are tangible for example cost reduction arising from implementation of supplier stock management system (Gunasekaran, Patel & McGaughey, 2004) and productivity improvement (at firm level) occasioned by investment in hardware and communication networks (Brynjolfsson & Hitt, 2003). Other complementary assets are intangible for example product quality improvement (Karimi, Somers & Gupta, 2001; Brynjolfsson & Hitt, 2000), decentralization (Abernethy, Bouwens & van Lent, 2004) and human capital (Brynjolfsson, Hitt & Yang, 2002). In the remaining part of this literature survey, we discuss how IS capabilities combine with other resources in obtaining benefits from both tangible assets (stock order level control and output productivity) and intangible assets (product quality improvement, decentralization and human capital). More emphasis will be put on intangible assets as they are more prevalent in service sectors such as education – the focus sector of this paper.

Tangible Benefits

Supply chain management (SCM) enables organizations to meet the needs of their customers (Gunasekaran, Patel & McGaughey, 2004). It integrates suppliers with

organizations breaking boundaries of departments and organizations with the consequence of 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 organizations to adopt the technologies (Petterson, Grimm & Corsi, 2003). SCM therefore gives firms benefits from more than one way; through reduction in cost of held stock and operation strategies that help improve business performance. SCM enables organizations to strategize in earning trust of customers and therefore stable market share. Gunasekaran et al. (2004) in a survey of 21 firms confirmed that in most of the firms return on investment had increased to expected levels after implementing contemporary SCM (p.345).

A show-case example of benefits of SCM is exemplified in routines of knowledge exchange between Toyota and its network of first-tier suppliers (Dyer & Nobeoka, 2000). Dyer and Nobeoka argue that when networks create 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 result in far superior learning opportunities. Toyota group, as the network is commonly known, transfers both tacit and explicit knowledge through four main routines. According to Dyer and Nobeoka (2000) association of network members conduct general and top management meeting every other month to share explicit knowledge critical to all members in the network. The second routine is creation of learning teams through visit of excellent firms within the network or at times out of the network. This, according to Dyer and Nobeoka (2000) facilitate transfer of tacit knowledge. Tacit knowledge is further transferred through employee transfer system where an employee with required knowledge is transferred to a firm that requires that knowledge on either 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 it difficult to transfer and therefore the knowledge holder stays on sight for a much longer time. Lastly, the Toyota network members 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 price reduction of supplies after a grace period of up to two years.

The routines of knowledge sharing within Toyota group help group members to improve in their operations, an achievement which tends to be 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 to inspection. This is a much cheaper commitment than the alternative option of directly

paying for proprietary knowledge. The risk of operating with outdated system in network cooperation is corrected by interaction with organizations outside the network thus keeping the network members at competitive advantage always (Dyer and Nobeoka, 2000). Infusion of external knowledge however results in innovation.

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

Intangible Benefits

Integration of information system into organization's processes increase productivity in the organization. For greater productivity to be realized, processes have to be restructured and desirable skills acquired. Resources allocation in computerized organization is more efficient resulting in savings in factors of production. Brynjolfsson, Hitt and Yang (2002) established that investors put high value on firms with high installed information system capital. The stock market value of computerized firms is in excess of nine times the book value of installed IS capital and this value increases with time period (p.163). Brynjolfsson, Hitt and Yang therefore conclude that installed IS capital creates intangible asset – organizational capital.

Other studies have shown that a rise in customer satisfaction index corresponds to several folds increase in market value of the organization (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 organizations 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 in a survey of 213 organizations in financial services and banking industry, established that organizations implementing IS could be categorized as IS laggards, IS enabled operations focused, IS enabled customer focused or IS leader. Of these three categories, IS enabled customer focused organizations were found to have the requisite IS sophistication that impacts on

customer service. However implementation of strategies demand sophistication of IS management which the study found was highest in IS leader organization. These organizations compete in IS-based service differentiation, operations, inbound logistics, outbound logistics, and after-sales service (Karimi, Somers & Gupta, 2001). For these organizations 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 IS planning, control, organization and integration (Karimi, Somers & Gupta, 2001: 146).

Customer satisfaction is one of the outcomes of stakeholder management. The impact of stakeholder management on organization's value has received attention among researchers (Jensen, 2002; Hillman & Keim, 2001; Berman, Wicks, Kotha & Jones, 1999). Organization's stakeholders (all individuals or groups who can substantially affect the welfare of an organization) can be desegregated into employees, suppliers, stockholders and the community (Jensen, 2002). Management of stakeholders is found to result in loyalty among employees, suppliers and customers. Hillman and Keim studied the relationship between customer management performance and firm market-value added. Firm market-value added 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. KLD index comprises 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 in Hillman and Keim, (2001). The study established positive and significant relationship between market-value added and stakeholder management performance. Thus organizations may improve shareholders wealth by strategically managing stakeholder issues. This is one area that organizations can exploit using installed IS.

The foregoing discussion hinges on positioning the organization. Ideally an organization 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 the 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 time period from adoption (Wight, Dunford & Snell, 2001). This suggests that organizations with competitive advantage have to be learning organizations capable of improving the value of the combination – at least to keep ahead of competitors. It is only when the resources

combination process is superior that the organizations maintain competitive advantage in the industry. The competitive advantage causes the organization to get higher profitability and market value than the other organizations in the same industry (Wight, Dunford & Snell, 2001: 708).

Human resources practices (mentoring, incentives and performance appraisal) may also help develop and sustain social networks (internal and external relationship) among the top management team (TMT) of organizations which in turn impacts on organization's performance (Collins & Clark, 2003). Collins and Clark studied the relationship between organization performance and TMT social network and the contribution of HR practices to the building of TMT social network in 73 high technology firms. The study established a significant relationship between certain aspects of TMT social networks and firm performance. Further the study identified links between HR-practices and formation of TMT. The study therefore concluded that TMT social networks improve organizational performance and HR-practices mediate organization performance through TMT social networks (Collins & Clark, 2003:748). Collins and Clark (2003) study was specific to high-technology organization and therefore the findings may not be generalized to low-technology organizations. The study did not investigate the effect of social networks at other levels below TMT. However, the bottom line in social network contribution is collecting information through the networks and making use of the information in the organization. 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.

The next section will highlight limitations in extant literature followed by imputation of expected benefits of e-school as informed by benefits of information system to other organizations.

Limitations in Extant Literature

Researchers believe that intensity of IT creates complementary assets to the organization's processes. However, the value adding, while clear cut in technology manufacturing and service organizations, is not explicit in traditional manufacturing industries (Zhu & Kraemer, 2002) and e-schools where the value creation is not measurable in monetary terms. Many researchers have confirmed that IS capability (Bharadwaj, 2000) and assets (Ravichandran & Lertwongsatien, 2005) both lead to improved firm performances, however, the underlying mechanisms through which these are achieved and direction of causality (Brynejolfsson & Hitt, 2000) are not clear. In other words studies have not conclusive on whether it is improved firm performances that lead to increased investment in information system or the converse – whether increased investment in information system improves firm performance. Some studies actually show causality from IS investment to firm improvement while others claim causality from firm improvement to IS investment. The value of IS investment is

difficult to measure and where measured is full of miss-measure (Brynjolfsson & Hitt, 2000). Likewise the intangible complementarities such as quality, convenience and timeliness of IS impact on organizational improvements go unmeasured. Extant 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 lack of theoretical and empirical treatment of how new HRM practices affect innovation performance (Laursen & Foss, 2003).

The current study investigates some of these limitations in the environment of e-schools. Specifically, the study addresses impact of human resources system on benefits of e-schools, measure perception of stakeholders on quality improvement in learning attributable to e-school system and suggests mechanism through which e-school generate benefits to the school (students, teachers and management) and the external customers (parents and government).

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

Theoretical Benefits of e-school

E-school system consists of administration sub-system, library sub-system, teacher sub-system and student sub-system. These sub-systems are interfaced in such away 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.

E-school systems are owned by parent owners of the schools (communities, governments and non governmental organizations) and therefore the operations of majority of e-schools are not for profit (Sedera et al.,2001). Consequently, the value the public puts on e-school system is therefore not interpreted in the same way as the stock value markets put on firms. Whereas 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, handling of stakeholders and above all academic quality of students and their suitability for the job markets. The resources of the school (human and capital) can be deployed with an efficient configuration to impact on school's productivity. High productivity in schools creates a saving to the stakeholders and therefore increases the value of the school in the public opinion. The configuration of resource combination tends to depend on management style and its effectiveness is often a credit to the leadership of the school.

Contribution of Human resources

Teachers in a school have mixed background but as is generally agreed the quality of a teacher's effectiveness in mainly a function of the teacher's training. If a teachers'

performance improve over time, it could be attributed to incremental training. Incremental training could be conducted in-house to save on time or externally. Implementation of e-school system requires retraining of teachers to help them cope with use of technology and change their pedagogical skills to suit IS integration in teaching. The improved training of the teachers creates skills pool in the e-schools. Different schools may have diversity of skills stock depending on the expertise of the teachers and their commitment to learning. E-school system enables sharing of these skills stock and therefore encouraging homogeneity of skills stock in the collaborating e-schools. As a consequence the quality of education can be speedily improved at regional, national and continental level. This quality improvement may be reflected in the quality of students. Academic quality of students reflects on the resourcefulness of their teachers. One way of assessing students' quality is their performance in national examination. Kenya, in particular 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. Nevertheless grade four students in Kenya hardly get employed immediately. Instead they proceed for tertiary education before seeking employment. Their performances in employment may be attributed more to the tertiary institution they graduate 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 for example admissions and enrollment by gender and teaching strength by subject at certain intervals in the school year. The schools implementing e-school systems have such reports updated on a daily basis as they derive from school attendance record which is updated daily. The capabilities of e-school system enable parents to view reports of their children. A parent may view attendance and performance report of his/her child conveniently at home through the Internet and without taking the trouble to travel to school or wait for the child to bring 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 expectation. 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 experience in teaching new areas in the curriculum, conduct classes on behalf of their colleagues remotely (using Skype, Elluminate or Moodle) and jointly write text books which can

be adopted nationally. Sharing of experiences increases the speed of innovation amongst the e-schools and at a lower cost. Using mentor teacher to teach on behalf of an 'apprentice teacher' in another school can be a great source of tacit knowledge transfer and cost reduction in human resources. Collaboration of teachers may be extended to text book 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 text books more cost effectively and still retain the monetary gains within the network. The text books may be more informative as they would have been produced by a larger than usual team with the desired expertise.

Contribution of infrastructure

Students using e-school system are endowed with resources at their conveniences. The library sub-system enables students to access electronic books from any point of Internet access. This could be within the class room, study areas, library or even living areas. The access of e-books has no time limitation that traditional libraries impose. Secondly, an electronic book can be accessed by any number of users simultaneously. When a new addition of electronic text book is released, the time lapse between ordering and accessing is very short and the cost is quite small. Students therefore access new editions as soon as they are released. E-school system has Internet connection which gives students opportunity to get additional resources to supplement school resources. If a student finds it difficult understanding explanation of a process in a text book, the student may turn to other resources of the Internet or easily surf related e-books for in-depth explanation of the subject.

Contribution of network externalities

The Internet connection in e-schools facilitates communication between student-teacher and student-student within the school and between schools. This connection provides effective communication with peers and experts outsides the confine of school boundaries. The system facilitates peer couching, remote mentoring by experts outside the school and acquaintance to demands of the job market. These accesses make students very enthusiastic towards learning and encourage them to expand their knowledge beyond the curriculum.

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

Measurement of Net Benefits of e-school

Measuring intangible benefits of information system has been elusive to 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 formulae. Keplan and Norton (1996) observed that "if you cannot measure an outcome, then you cannot manage it". It is therefore incumbent upon researchers to seek objective methods of measuring IS intangible benefits so that more informed investments may be made. Early studies measured intangible benefits as residual (Jarboe, 2007). Other studies (Martinsons, Davison & Tse, 1999; Hasan & Tibits, 2000; Grembergen & Amelinckx, 2002) have proposed use of balance 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) while that of Martinson et al. had business value, user orientation, internal processes and future readiness as its layers. In scorecarding, the achievements of objectives in the different layers are negotiated into measurable terms.

Murphy and Simon (2002) examined how a large computer manufacturer attempted to incorporate intangibles in traditional cost-benefit analysis in an enterprise resource planning (ERP) project. They established that the computer manufacturer applied Hares and Royle (1994) quantification technique which entails 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 level would increase the organizations market share and this would reflect on sales revenue. They therefore considered sales revenue as the measurable form of customer service. Future cash stream to PCC were found to be very close to what was predicted by the ERP implementation team (Murphy & Simon, 2002:316). There may however have been many other tangible and intangible benefits which were missed out by PCC's ERP implementation team. The customer service evaluating that was considered is one aspect of BSC – the customer layer.

A complement to BSC in measuring intangible benefits of IS is the use of Tobin's q (Bharadwaj, Bharadwaj & Konsynski, 1999). Tobin's q is the ratio of organization'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 unmeasured source of value. Bharadwaj, Bharadwaj and Konsynski (1999) examined the association between IS investment and q values of firms listed in the US

public market places. They approximated capital market value by combining value of total common shares, value of outstanding preferred stock and debt. On the other hand replacement value of assets was represented by book value of total asset. The values of investment in IS in firms was estimated from data published by Information Week magazine and Computerworld magazine. 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 current study, we propose a measuring technique of e-schools net benefit which combines BSC (Kaplan & Norton, 1996) and Tobin's q derivative which we call e-school performance index (espi). As was explained in earlier sections, e-schools are not listed in market places. However, the public places a value on schools based on fundamentals including quality of teachers, physical facilities and students' performance. Implementation of e-school requires improvement in quality of teachers (attained through in-service training) and improvement in physical facilities (installation of IS). We represent the value the public put on e-school with the change in the number of applications (ΔAppl) from students seeking admission to the school. Other known source of increase in demand for positions in a school is population increase which we estimate from the change in number completing primary level education and control for. The assets of the e-school internally improve learning performance and this is reflected in the change in student performance index (Δspi). We test for the following two regression equations:

$$Espi_t = A + {}^{\Delta Appl}/_{\Delta spi} \qquad (1)$$

$$Espi_t = A + {}^{\Delta Appl}/_{\Delta spi} + \beta_{IS} \qquad (2)$$

β_{IS} is the contribution of IS installation to e-school performance index.
$Espi_t$ (1) is calculated with values in the year before implementation of e-school
$Espi_t$ (2) is calculated after implementation of e-school.

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

The BSC is applied in evaluating the achievement of four objectives; customer perspective (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 organizations extract from implementation of IS and has used these to inform potential benefits of IS to e-school. It highlights that potential benefits of IS to e-schools are largely intangible. Measurement of net benefits of e-schools is expected to be as elusive as measuring intangible benefits of IS in any organization. The paper therefore proposes a multi dimensional approach to measuring benefits of e-school. In particular the paper proposes use of both BSC and Espi$_t$ which it argues is closely linked to would be Tobin's q of e-school were these schools listed in market places.

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Provision of Library and Information Management Education and Training in Swaziland: a Feasibility Study

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Abstract

This paper presents a chapter on the dissertation entitled: "Provision of Library and Information Management education and training in Swaziland: a feasibility study". The paper reviews and discusses major concepts that relate to Library and Information Management as a profession and how they relate to education and training. It also highlights the current state of Library and Information Management education and training in Swaziland; the need for such education and training; education and training levels in the profession; and the demand for Library and Information Management workers. Issues pertaining to the infrastructure and resources required for establishing and sustaining education and training in Library and Information Management; opportunities and challenges of providing education and training; and the role of major stakeholders in Library and Information Management education and training are also reviewed and discussed in this paper. The overall intention of this paper is to showcase the major contributing forces in the development of Library and Information Management education and training locally in the country.

Introduction

Swaziland presently faces a number of socio-economic challenges, most notably illiteracy, poverty, unemployment, and the prevention, control and treatment of diseases. 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 dependant on the educational levels and training skills of the personnel who manage them. Educated and trained professionals are better equipped to procure, organize, repackage and disseminate relevant information to communities and thereby address the country's socio-economic ills.

Ever since Library and Information Management became a recognized and required profession in Swaziland, students have been acquiring tertiary education from higher education schools outside the country. Local higher education in Library and Information Management is non-existent. 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, under-graduate and post-graduate 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 dependency 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 outside education and training. Relocation of other partners 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.

This paper discusses the underlying concepts and components of Library and Information Management education and training and how they relate to professional practice. The aim of the review is to provide a clearer background for further investigation into providing Library and Information Management education and training locally in Swaziland.

Concept of Library and Information Management Education and Training

Library and Information Management as a profession has several concepts that define key practices, approaches, and expectations of professional practice. Concepts that will be discussed in this section include *Library and Information Management*, *Education and Training*, and *Profession & Professional*. A further breakdown of these concepts will be thoroughly discussed, compared and analyzed, the intention being to present common definitions and usage from practitioners, researchers, educators and other relevant stakeholders and also to identify links between education & practice (or vice-versa), and continuouseducation.

Library and Information Management

A library is a collection of information resources and services and the structure in which these are housed. Traditionally, libraries were associated with book collections. However in modern times, libraries have been re-defined as places where one can get unrestricted access to information in many formats and from many sources. They are therefore now often called repositories, information centres and resource centres. More recently, libraries have extended their focus beyond the physical walls of a building by including material that can be accessed electronically and providing professional assistance in navigating and analyzing tremendous amounts of knowledge with a variety of digital tools (http://en.wikipedia.org/wiki/library).

Information

Information is loosely defined as facts, data or instruction in any medium or form. It is mostly associated with the meaning derived from data. Losee (1997) defines information as: "One or more statements or facts that are received by a human and that have some form of worth to the recipient." In order for anything to be called information, it must mean something to the intended person; in other words it has to inform.

Library Management

Libraries and information are related in that libraries house and disseminate a lot of its information resources. Information and its management is a function that defines the existence of libraries. In the past, Library Management and Information Management were treated as two different professions. Library Management has been known as Librarianship which, according to Line (2007: 27), has been concerned with "making available and exploiting information for the benefit of people". Library Management is also referred to as Library Science and encompasses a lot of activities including

collection, storage, arrangement, management and the dissemination of information in all formats.

Information Management

Although it has been viewed as a different occupation from Library Management in some sectors, Information Management is part and parcel of Library Management. Laffan (2009) defines Information Management as: "The means by which an organization efficiently plans, collects, organizes, uses, controls, disseminates and disposes of its information and through which it ensures that the value of that information is identified and exploited to the fullest." From this definition of Information Management, common activities that are also handled by library managers feature a lot. There is undeniably overlapping in practice that makes it unnecessary to separate the two in present times. Willpower Information Management Consultant's (2009) definition of Information Management practice confirms this close relationship. Here Information Management is defined as:

> *An interdisciplinary field that draws on and combines skills and resources from Librarianship and Information Science, Information Technology, Records Management, Archives and general Management. Its focus is information as a resource, independently of the physical form in which it occurs http://willpowerinfo.co.uk/infoman.htm.*

Library and Information Management

Libraries in the past were more concerned with recorded knowledge and its management. As the information age evolved with a 'boom' of information in all formats and new information technology, Information Management became associated with library work. As a result, in recent times Library and Information Management have been treated as a single occupation. Libraries and information units have been increasingly involved in management practices that, according to Jordan & Jones (1995), "Impel them to justify their services in relation to user needs as they adopt more systematic approaches to management."

Management practices are part of Library and Information work because the profession is not immune to organizational culture, bureaucratic practices and resources that require the application of management principles. Stueart & Moran (2002) emphasize that from its inception, Library and Information Management showed "no identifiable characteristics that set it apart from other types of organizational management". They argue that trends, theories and techniques introduced into organizations and discussed in management literature easily found their way into library practice and have over the years been adapted with varying degrees of success. However, the feeling that Library and Information Management has assumed a new dimension in present times is still evident. Karisiddappa (2004) notes that this is due to the adoption of different services

that are intended to satisfy different kinds of information needs and different kinds of users. This, according to Karisiddappa, is the direct impact of economic development and the growing dependency on information by national economies. This attempt to link library work to management and information work outside traditional libraries is viewed by Haigh (2007) as quite new, and follows the model of western practices in Information Science. Dong (1997:6) also shares similar sentiments, noting that changes in the social, economic and technological environment have introduced new requirements for the professional personnel in library and information work.

The use of management with library and information work, instead of science, has had a lot of acceptance in the present era and is seen to be responding to contemporary requirements of the modern environment. Scholars who support the change, according to Dong (1997:6), have argued that Information Management broadens the original coverage of Library Science into a:

> *Wider acceptable area related to information production, information collection, information sorting, information storage and information dissemination. The aim of information management is to provide services for consultants, businesses, enterprises, new agencies and government institutions. The area of information management should include scientific information management, business information management, government information management and cultural information management (Dong, 1997:6).*

The impact of management science has been seen as a significant achievement in the profession of librarianship. Karisiddappa (2004) emphasizes that apart from the application of the principles and functions of management, the areas of human resource management, financial management and the aspects of information resource management have been considered as important areas in Library and Information Science in recent years.

Library and Information Management is a profession of managing libraries, information, resources (financial, human, physical and technological), and contributing to an informed citizenry. Library and Information Management is not only concerned with libraries and within walls as such, but extends beyond to corporate organizations and enterprises. Information is an important resource that influences decision-making on various levels and its management is very central in achieving developmental success. Library and Information Management work provides the required competencies for handling information and ensuring its full exploitation by users. All discussions in this paper will use Library and Information Management as a single

phrase that encompasses all the activities of libraries, information centres, resource centres and other related services in the information industry.

Education and Training
Education
Broadly defined, education refers to the process of giving "intellectual, moral and social instruction" to learners or recipients (Concise Oxford English Dictionary, 2004). In academia, education is "formal full-time instruction in an institution of higher learning" in a certain field (Grogan, 2007). It enables the recipient to be proficient in collecting knowledge, understanding its value, and processing information. Since it is associated with formal learning institutions, education can be tested and graded to certify competency through merit, award or a title equivalent to what the learner has achieved and the level of achievement.

Selassie (1974) stated that: "Education develops the intellect; and the intellect distinguishes man from other creatures." It is education that prepares a human being to harness nature and utilize resources for the well-being and improvement of human life. It is in this spirit that Jeffs and Smith (1999) observed that education is "future-oriented – it is about development and growth even when we are studying the past".

Education in Library and Information Management
Education in this profession, as in other professions, is also associated with formal institutions of higher learning like universities, colleges and training centres. It is also full-time instruction that is designed to develop the recipients' intellects so that they can respond effectively to challenges in the information environment and provide solutions that benefit all stakeholders. Education in Library and Information Management teaches fundamentals in theory, history, future applications, problem-solving, and knowledge generating (research) skills in professional practice. As noted by Britz, Lor & Bothma (2007), it contributes to "socio-economic development" in the states or countries of recipients.

Training
Training is defined as a "learning process that involves the acquisition of knowledge, sharpening of skills, concepts, rules or changing of attitudes and behaviours to enhance the performance of employees" (http://traininganddevelopment.naukrihub.com/training.html). It is an activity leading to skilled behavior at work and is related to professional development. Even though training is termed a 'skill-oriented activity', Salvi (2009) argues that it is still an 'educational process'. This is because people can always learn new information, re-learn and reinforce existing knowledge and skills. Training provides trainees with the

opportunity to consider new options and develop skills that can help them improve their effectiveness at work.

Training can be narrowed down or tailor-made to teach a particular skill and prepares the trainee to be effective in a particular aspect of a job or task. It is specific and 'now'-oriented, less formal and more practical in approach. It is centered on the trainee's needs and expectations. Even though the impact of training can be assessed through trainer evaluation and on-the-job monitoring, it is not usually tested and graded through an examination process. Certification in training is awarded based on attendance, completion and competency because of the exposure to a training programme.

Training in Library and Information Management

In this profession, training is usually in the form of short courses, workshops, seminars, on-the-job training or induction, and practical placement. It is also skills-oriented and part of the professional development of staff members. Training is not a once-off activity but a continuous process that goes on throughout the professional lives of employees. This is necessitated by changes in approaches to work, development and growth, introduction of new services, new markets, and the need to continually excel in service provision.

Education versus Training

The difference between education and training is sometimes not very clear, as these terms tend to be used interchangeably. While there can be overlaps between the two, the differences are prevalent and well noted. Milano & Ullius (1998) summarized the distinction very well when they wrote that: "Education focuses on learning about, while training focuses on learning how." Education has broader goals than training and the material covered is intended to fit many different contexts. Training helps someone do something better and the skills it develops are usually specific to a particular task. The objectives in training, as indicated in http://download.aibd.org.my/books/manual_for_media_trainers/section1.pdf, are more specific than those in education. The difference between the two, according to Moore (1998:135), is an important one.

> *Training means narrowly focused programs that lead to high proficiency in a specific skill. It prepares the participant for one particular job or activity but provides neither broad perspective nor flexibility of approach. Education, on the other hand, enables students to see the forest and the trees. It encourages general approaches to problem-solving and inculcates ways of thinking that are productive, effective and rewarding (Moore 1998:135).*

Education prepares learners to deal with and solve a broad range of problems and choose which problems are important and which are not. Blumenfeld (2000) expands on this distinction by noting that "education should come first and training later" because education is concerned with the development of the mind (intellect), while training deals with learning specific skills.

> *Education is a more personal activity in that its main purpose is the enhancement of an individual's ability to use his mind for his own personal gain, while training means developing skills that will be used for social and economic reasons than for the self (*http://www.wnd.com/index.php?pageId=2917*).*

Education also has an impact on socio-economic development and should not only be viewed in terms of personal gains or pleasure. The education versus training debate can be summed up in these simple phrases:

- Education is far transfer; training is near transfer
- Education emphasizes first principles; training emphasizes application
- Education focuses on building the mind; training focuses on building skills
- Education is content-driven; training is mostly job-specific
- Education has to sell the content; training has to sell itself
- Education teaches one to fish; while training gives one the fish (http://simply-speaking.blogspot.com/2008/02/education-versus-training.html)

Education versus Training in Library and Information Management

In Library and Information Management, education and training are also different, although some overlapping still exists. Grogan (2007) highlighted some of this overlap in his article on persistent issues in education for librarianship. One such issue, which has been discussed without resolution in the profession, is 'learning by doing' (training) versus learning through formal instruction (education). Grogan reveals that since the profession came into being, scholars and practitioners were divided on the best approach to teach Library and Information Management practice. Some professionals felt learning is best achieved by doing (practice) in the profession, as is traditionally the case in other professions like medicine and law. This influenced the transfer of skills in the profession. Those who went along with this school of thought, as Grogan observes, made this "remain the normal method in librarianship for decades". It even influenced the admission requirements of some Library and Information Management schools in the not-so-distant past, which emphasized pre-education, on-the-job experience as a requirement for tertiary education at all levels in potential candidates.

Those who thought that Library and Information Management could be taught in the formal classroom had a tough time dealing with practitioners and professional bodies. As Grogan (2007) observed, professional bodies, especially in developed countries where the profession was beginning to be recognized, demanded much input and control of the curriculum, testing and grading methods. These bodies were also highly critical of the classroom-instruction atmosphere and felt it was totally uncalled for in this profession. However, despite these challenges and major division in professional opinions and approaches, Library and Information Management schools persisted and flourished in the tertiary institutions set-up in a lot of countries. They preserved their argument that "would-be practitioners can be more effectively and economically educated in the classroom than on the job".

These arguments contributed to the overlap of education and training in Library and Information Management for a long time. This overlap has, however, been minimized in contemporary times. To a large extent, tertiary institutions continue to provide education in the profession. Training is still available on-the-job, through professional associations, training centres and by design from other hosts who partner with Library and Information Management professionals. Such training is usually skills or deficiency (need) based and is short term in nature.

Profession and Professional
Profession
A profession is generally used to refer to a certain area of expertise in one's field or discipline. Expertise in doing something may become somebody's profession and is not necessarily acquired through education or formal instruction, but by observing or habitually being engaged in some activity for a long time. In this scenario, other terms associated with profession are vocation, occupation or 'veteran'. Examples are housekeeping, gardening or painting as a profession. However, scholars feel that the emphasis of the word 'profession' is associated with formal knowledge and a form of science. Lillard & Wales (2003) define a profession as a: "Systematically organized body of knowledge that is usually acquired through a significant amount of formal education." These scholars emphasize that "widely accepted degree requirements help define a profession". Others supporting this view of profession are Nassimbeni & Underwood (2007), who equate a profession to a career obtained through "vocationally directed qualification". Gorman (2004) adds that "professions are defined by their ability to control education for that profession and by agreement on the basic areas of study required for such an education". Davis (1976) maintains this view by highlighting the difference between a profession and non-profession (clerical); in his view, a profession is acquired through formal education. This latter definition of profession has certain elements that help define it or distinguish it from other professions. These

normally include philosophy, body of knowledge, guidelines for behavior, and admission requirements.

Professional

Professional refers to relating to or belonging to a profession. The concise dictionary defines 'professional' as habitually engaging in a particular activity as a paid occupation rather than as an amateur. A professional is a person who has impressive competence in a particular activity (Concise Oxford English Dictionary, 2004). From Wikipedia, a professional is a member of a vocation founded upon specialized educational training. The emphasis in Wikipedia is 'educational training' and therefore reference is made to western nations where the term is associated with "highly educated, mostly salaried, economically secure and people who are in creative and intellectually challenging work" (http://en.wikipedia.org/wiki/Professional).

In a more technical definition, a professional is a specialist in a certain field of human knowledge, whose skills and knowledge are above the generally qualified person in that field. In this particular case, the term is pre-fixed to an occupation, such as a 'professional banker', to denote extra, extensive or deep knowledge and proficiency in that profession. In narrow usage however, not all possession of expertise leads to a professional. In certain occupations, such as construction work, carpentry or plumbing, expertise is obtained through apprenticeship and is more associated with skilled labour or trades. In certain areas of practice and designations, the professional status or professionalism is designated by a particular body (professional body, qualifications authority, standards and quality body, etc.).

Some organizations and enterprises include the term 'professional' in their name to signify the quality of their workmanship or service. An example could be a 'professional recording studio'. In describing what it takes to be a professional, Wikipedia states that: "You do not have to have a degree to prove that you are a professional, but rather prove that you are a master of a trade set/skill, or act in what is looked to be a professional manner." With this latter argument, impressive competence in a particular activity, a kind disposition and fruitful judgment are of more concern than academic qualifications.

Library and Information Management as a profession

Library and Information Management, as discussed earlier, is an occupation concerned with planning, collecting, organizing, using, controlling, disseminating and disposing information and ensuring that the value of that information is identified and exploited to the fullest. The activities carried out in this profession are unique and distinct from other professional practices. Library and Information Management as a profession requires certain knowledge, exposure, specialty and proficiency. It is, according to Gosh

(2001), a "service-oriented profession, the basic ingredient of which is content, information and users". This profession is also 'skills-oriented' in that certain skills have to be extremely outstanding and well applied in professional practice. The diversity of skills within the profession accommodates the different activities performed and services offered.

The profession also has its own body of knowledge, professional ethics, admission requirements and commitments. There are also challenges experienced by the profession which other professions are not necessarily concerned with. These include the cost of services (free or fee-based services), intellectual freedom, the broadening gap between technological haves and have-nots, and outsourcing or privatization (http://www.tsl.state.tx.us/ld/tutorials/professionalism/prof.html). The profession also has national and international bodies that 'keep an eye' on the profession as a whole and various segments to ensure universality and quality in approach and service delivery.

Library and Information Management Professionals

This refers to the personnel responsible for all the activities mentioned above in the 'service- and skills-oriented' profession. They are the drivers behind planning, acquiring, organizing, disseminating and ensuring the full exploitation of information by the intended clientele. It is obvious that without the personnel (professionals), physical resources (structures), information resources and financial resources are simply meaningless. A professional gets things done and delivers the final product or service. Mohammed (2008:2) observes that Library and Information Management professionals are required:

> Not only to gather, organize and coordinate access and use of the best and rich available information resources of organizations and the society, but also to package, repackage and market them to ensure their effective access and utilization by the target audience (Mohammed 2008:2).

In less specific cases, a professional in Library and Information Management practice is used to refer to all personnel at all levels, whether they have formal education or enough experience. These are the people who are often found in libraries and information centres habitually engaged in providing library and information resources and services to users. However, a different view is shared by Line (2007) who argues that requirements are not the same at all levels of work. According to Line (2007): "At lower levels clerical skills may be most needed, at intermediate levels more special (professional) skills and knowledge, and at upper levels management abilities."

A number of justifications define who is a professional and who is not in Library and Information Management practice. One such justification is tertiary qualifications, where those who support the 'dividing-line' state that a professional is one who possesses a degree (bachelor's) qualification or a graduate (post-bachelors) qualification in the profession, while a diploma holder is a para-professional (suggesting semi-professional), and non-qualified personnel are clerical or non-professional (Mohammed, 2008; Gorman, 2004). This 'definition' is based on academic qualifications and does not take into consideration work experience, competency and service delivery.

The above sentiment is not shared by all in the profession, as other practitioners feel that the emphasis on academic qualifications alone is not what makes a professional in Library and Information Management practice. Academic qualifications in this instance are more into defining 'status' than defining a professional or professionalism in service delivery. As in the general definition of professional, the mastery of skills and outstanding performance can be the true reflection of professionalism in Library and Information Management work. This is argued in (http://www.tsl.state.tx.us/ld/tutorials/professionalism/prof.html) where: "Standards of excellence benchmarked against others should be the ultimate measure for Library and Information Management professionals. True professionals often use the satisfaction of patrons to measure excellence in service provision."

With regard to the 'true professional' argument, Line (2007) warns that "there should be no barrier to advancement, no requirement for advancement except proven ability and also no dividing lines between professional and non-professional work". The obsession with 'professional' status, which Line describes as the "worst features of the present system", has contributed to the profession "becoming the prisoner of its own pretensions, and the sufferer thereby" (Line, 2007). An absence of these "professional pretensions", Line argues, would mean that "the bright late developer would no longer be barred from upward mobility" while "the dull late decliner" would also not be "protected from downward mobility". True professionalism in this case would encourage and recognize fruitful and productive service dispensation rather than cling to qualifications that contribute less or non-effectively to professional practice.

The Current 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 were 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.

Concern with 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) 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 (up until the 1990s). Library and information education spread to the southern part of the continent with countries like Botswana and South Africa gaining popularity in their tertiary education programs. The availability of library education on the African continent reduced the dependency 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 that 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 is still non-existent.

Swaziland has assumed and been recognized in a number of regional and global responsibilities and forums since independence. Some of these responsibilities and forums dealt with human development, capacity building, social security and democratic governance. Of significance here is 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 whose responsibility was 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 still depends on foreign countries for its human resource development in Library and Information Management education.

Local education in Library and Information Management
Tertiary educational qualifications in Library and Information Management are not yet obtainable locally in Swaziland. As pointed out already, the country is still dependant on schools outside for tertiary education in library and information work.

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, most schools have no running libraries, and government (through its civil service) has had no vacancies for school librarians. 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 & secondary) and Post-graduate 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 in normal circumstances.

Advertisements for a two year diploma course in Library and Information Management started appearing in the training calendar of the Institute for Development Management (IDM) for 2009. According to the Senior Information Management Consultant at IDM, Mr. Vusie Tsabedze, IDM is fully venturing into information management training in the areas of library and information management, records and archives management, and information communications technology applications in library and information work. Currently, as stated by Tsabedze, no one is registered for the full time course, but it is anticipated that by the end of the year, the educational programs would have commenced. IDM is the only training institution in the country to have formally advertised complete formal instruction that leads to diploma qualifications in Library and Information Management and its related professions. If the programs successfully take-off, as anticipated by Tsabedze, the graduates of these diploma programs will be the first to be awarded locally in the country in the history of the profession. It is also worth noting that the Institute of Development Management has sister institutions in Lesotho and Botswana, and their courses usually 'cross-pollinate' in the three countries. However the two-year diploma courses are only reflected in the Swaziland campus calendar.

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Local training in Library and Information Management

Local training in the profession in Swaziland has taken various forms. Training seminars and workshops as well as conferences have been organized 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 organizations. 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 organizations in the country and region. Mananga offers "Strategic Management of Libraries and Information Resource Centres (SMLIRC)" in 4 weeks through 4 module courses that run twice a year. According to the centre's training calendar, the courses are divided into two levels – level one and level 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. These incumbents are faced with the challenges of running libraries on their own at branch level in public libraries or in private sectors, but often lack the skills required for strategic planning or knowledge of key collection development protocols, information technology, etc., in their service provision. 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 application, 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-providing organizations 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 government fully supports and funds this training at times, the knowledge gained by professionals through this training does not lead to a formally recognized 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 prestige 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 that 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). Albright and Kawooya further emphasize 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), 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." In support of this view, Shiholo and Ocholla (2003) observed

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 environment.

Karisiddappa (2004) refers to the transitional shift from an agricultural economy to an industrial economy, which is characterized 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/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. The need for locally educated and trained professional library and information managers 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, J. J.; Lor, P. J. & Bothma, T. J., 2007).

The need for the local education and training of Library and Information Management professionals can also be justified by cost, as education and training locally is more affordable than out-of-country fees, which are often influenced by the economy, cost of living, inflation, and the foreign demands of the host country. Local education and training, as anticipated by Britz, Lor & Bothma, (2007), could combat the current brain drain of professional labour that is experienced by developing countries. Their observation of the brain drain situation is based on recent statistics provided by Britz et al. (2006) which clearly indicate that "most African scholars who graduate from American and European institutions do not return to work in Africa". There is a high possibility of being attracted to these 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 emphasizes the need for Library and Information Management professionals to continually update their knowledge and skills to cope with the competition and stay afloat.

Levels of Library and Information Management Education and Training

Library and Information Management tertiary qualifications are obtained from higher education institutions known as universities, technikons or colleges. Qualifications are offered in undergraduate and postgraduate levels. Undergraduate qualifications include certificates, advanced certificates, diplomas, higher diplomas, associate bachelors and bachelors. Postgraduate qualifications include Honours, post-graduate diplomas, Masters and Doctorates. Specific names of programs, educational approaches (theory, practicum, combination of both), curriculum content and entrance requirements may vary across these higher education institutions. However, in all cases, the education obtained from the tertiary institutions is expected to relevantly equip the candidates for Library and Information Management work at all levels (semi-professional, professional, managerial, etc.).

Training in Library and Information Management, as stated earlier, is part of professional development and therefore has no specific levels and no entrance requirements. It is determined by service needs from time to time. Training can be conducted internally within an organization, or externally by training institutions or other resource persons. Most organizations, including Library and Information Management organizations, consider training to be an important aspect of professional development and continuous education.

The Demand for Library and Information Management Workers

In Ocholla's (2005) analysis of the job market for Library and Information Management professionals in South Africa, libraries certainly ranked higher as employers and potential employers of LIS graduates. Traditionally, the market for education and training products in the profession were mainly existing libraries. This, as already observed, may have been due to the status of the libraries and the then evident need for local incumbents to take over their management. More focus was on library markets because libraries were also seen to be the sole custodians of information resources at the time. Indeed libraries sustained the market, but challenges began to surface as information took various formats, and the information arena was entered 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. Although no formal study has been

conducted as yet to validate this claim, participative observation of practicing areas for Library and Information Management professionals suggests that this is the case. 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 study-leave basis and with full support from 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, although still dominated by libraries and traditional information resource centres, 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 (Mohammed, 2008:15).*

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) organizations, 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 organization. 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 organizations. Belief in and confession to adding value to an organization is reflected more in how professionals sell themselves to employers and how they see themselves as part of the organization than it is about a single profession.

An employment market that most professionals in Swaziland do not tap 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 organizations that translate to a potential market for this cadre, nothing much is done by professionals and employers to have these markets explored. The area of pure records management is very unfortunate, unsupported and unpublicized in Swaziland. But it is a concern, as indicated in a study by Tsabedze (2008), and therefore renders this important domain of records management value-less if not managed skillfully by professionals. This market belongs under the umbrella of the information market, and it is possible that with the right re-orientation of skills, attitudes and funds, new information management education and training products can and would be developed.

It is worth pointing out that a market does not necessarily have to be pre-existent all the time. Education and training can be a useful tool in realizing other seemingly dormant markets, reviving them, and addressing their needs. It is on this premise that I 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 realize other dormant, non-existing and emerging markets in the present society and also be vigilant or on the lookout for new markets evolving with the new century.

From all the discussions in this section, the indications are clear that there is a demand for Library and Information Management workers. The demand is created by markets

that are existing, potential, dormant and undiscovered. Library and Information Management education and training must be provided and re-oriented to supply or create/develop products for these markets.

Infrastructure and Resources needs for Establishing and Sustaining Library and Information Management Education.

Ocholla & Bothma (2007) observe that Library and Information Management education is offered through established higher education institutions such as universities, colleges and technikons. These higher education institutions usually have the infrastructure and resources in place to offer diverse academic programs. The infrastructure, resources and facilities found in higher education institutions (with or without Library and Information Management education) are as follows:

- Training resources
    - Physical infrastructure
        - Lecture rooms
        - Examination rooms
        - Demonstration rooms
    - Equipment & furniture
        - Lecture room furniture
        - Teaching equipment

- Information and research resources
    - Library / resource centres
    - Computer laboratories
    - Internet Connection
    - Information databases

- Administrative facilities
    - Administration offices
    - Academic offices
    - Student affairs & welfare services

- Human resources
    - Academic staff
    - Administrative staff
    - Support staff
- Extra-curricular & sporting facilities

Library and Information Management makes use of the same infrastructure, resource and facilities as above, in addition to suitably qualified educators and relevant practice measures.

Opportunities and Challenges of Providing Library and Information Management education and Training

Providing Library and Information Management education and training brings about 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 utilization
- 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 to the current practice
- 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) maintains that "research and development form the backbone of any profession and also of any teaching programme" and emphasizes 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 specialized information qualification programmes in areas of Records Management, Publishing, Multimedia, Knowledge Management, Information Technology, etc. (Ocholla, 2007)

Despite these sound and attractive opportunities of local education and training in Library and Information Management, 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 and developing curriculum as a result of 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 in a world of limited resources
- Inactive professional association bodies that could positively influence education, content and quality expectations of post-education 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 organizations' importance by stakeholders in the development of Library and Information Management education and training
- Incredible growth of the Internet, necessitating the constant upgrade of hardware and software, which is difficult as funding is not readily available to support these developments
- Inadequate access to computers or unequal distribution in terms of student/computer ratios because of poor 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 of students needs to be available (Poon, 2006). A similar observation is made by Ocholla (2007), 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, the provision of Library and Information Management education and training is a necessary undertaking in addressing many of the countries socio-economic challenges. The opportunities suggest areas where more effort should be put 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, aspires to grow and have a positive impact in society. Partners and stakeholders can 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 organizations 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 its members. This is all usually done in the good 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. It is not a surprise that they sometimes offer educational courses in collaboration with other institutions, organize

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 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 & informal), short-term training (seminars, workshops, tours & 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 study, 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 desire 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. 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 & Njoku, 2007). In the developing world, library and information management bodies are not fully active in this accreditation. Reasons put forward are a lack of manpower (Shiholo and Ocholla, 2003), lack of expertise (Younis, 2002), and fragility and internal wrangling (Ocholla, 2000) in these local associations. Therefore, the education and training offered at tertiary institutions continues to be uninfluenced by these bodies which are supposed to be the main stakeholders.

Conclusion
This paper was intended to broadly clarify concepts that relate to Library and Information Management education and training and how these in turn relate to professional practice. Evidence would suggest that the practice of librarianship has been replaced by Library and Information Management in order to accommodate the range of services and diversity of applications currently on offer by the LIS profession. The name change is reflected in the wider adoption of Library and Information Management instead of the former Librarianship, Library Science, and Library Service. 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 specifics may vary in certain applications. There is a need to investigate the impact in developing countries that are still not hosting their own education and training in Library and Information Management in their local countries or those countries whose efforts are still very minimal and hardly noticeable. This paper was based on a literature review that looked at the situation in a developing country that does not yet host its own local education programme in Library and Information Management

South Africa's regional and international research collaboration: an informetric study of participating countries, 1986-2005

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Abstract

The paper reports on the findings of an informetric study of countries participating in collaborative research with South Africa. The study's period spans 20 years (Notes: from when to when), 10 during and 10 after the apartheid era. Data was extracted from the Thomson Reuters Citation Indexes, i.e. the Science Citation Index (SCI), Social Sciences Citation Index (SSCI) and Arts and Humanities Citation Index (AHCI). Because the three databases share a search platform, a uniform search query ('AD=South Africa') was used to extract relevant data. This was analyzed using the 'analyze' option provided in the 'search results' interface of the Web of Science. It was observed that multiple country-author papers and the number of collaborating countries were on the rise since 1986. The USA topped the list of countries collaborating with South Africa internationally. Regionally, Zimbabwe recorded the highest number of co-authored papers. The strengths of association (or research collaboration) were low in both categories of countries. Impact-wise, international collaboration yielded higher average citations per paper. The subject categories of research collaboration yielded both similarities and differences between regional and international collaborations. Conclusions and recommendations are provided.

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). South Africa's apartheid system came under regular attack from the international community from 1952 onwards, culminating in the country's withdrawal from various international organizations (Saunders & Southey, 2001). South Africa was forced to withdraw from 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. 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/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 recognized 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 collaboratewith 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 collaboration 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 he 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) 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 (Tijssen, 2007:310).

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." This 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 paper 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 analyzed 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 normalize function to generate normalized frequency counts which in turn were used as indicators of strengths of association between South Africa and each collaborating country. The normalized 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 analyzed 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. (Notes: check interpretation – unclear)

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.
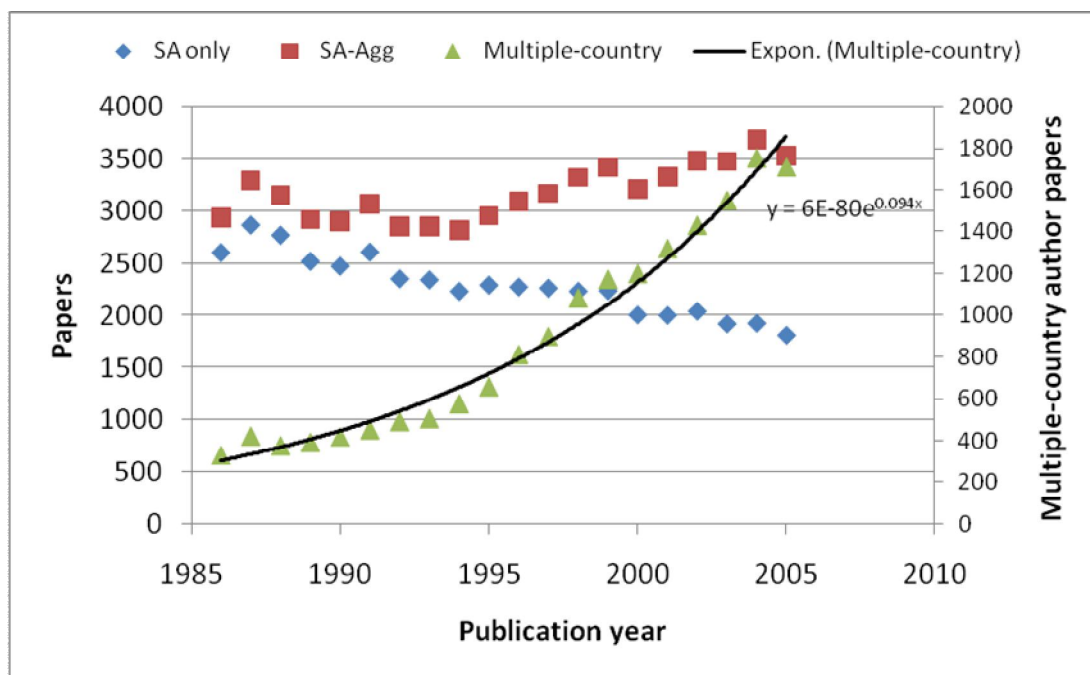
Fig 1: Trend of single-country author (South African only) papers in relation to total (South African) publications output
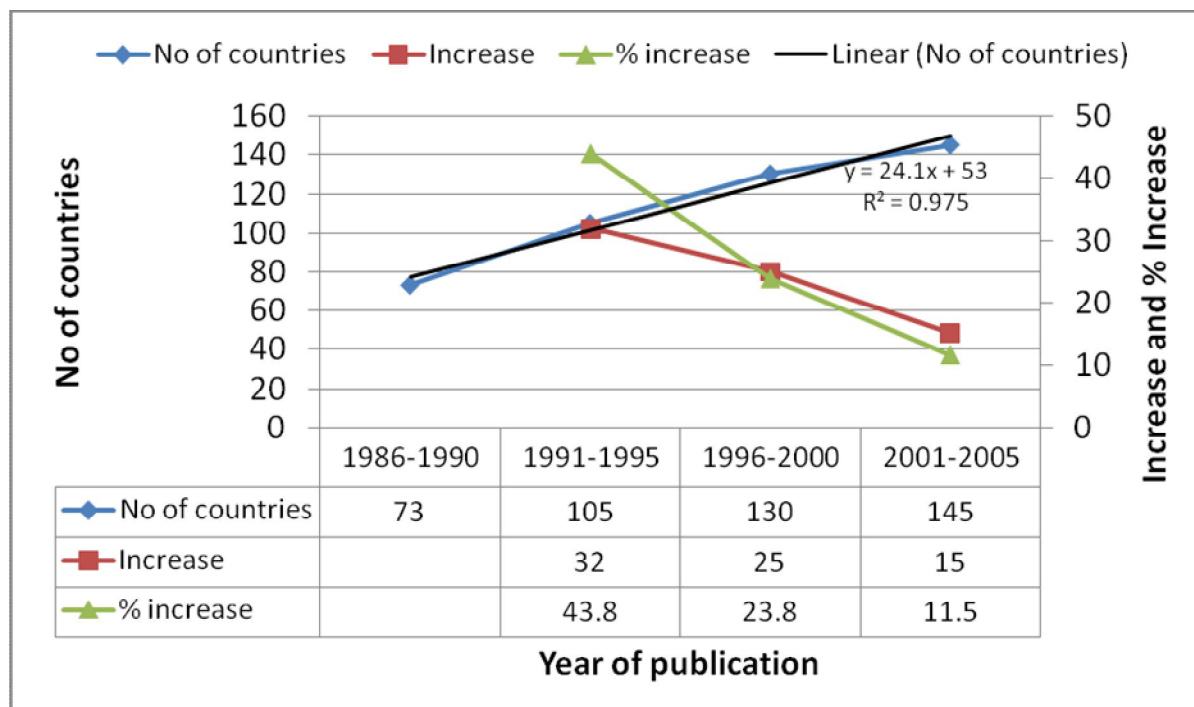
Fig 2: Growth in the number of collaborating countries

4.2   Number of collaborating countries

Fig. 2 provides the number of countries that collaborated with South Africa in the production 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 stabilize 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.

	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 FASO	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

Table 1: South Africa's African country collaborators

Key

$\%^a$: 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 examination 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 production of approximately two-thirds of regionally 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%).

	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

Table 2: South Africa's international country collaborators

Key
%[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 & 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), 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 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 collbration, 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' research was largely 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 normalization of raw frequency counts using UCINET's analytic approaches. The latter was used to examine how strong the partinerships between South Africa and its country collaborators were. According to the author of UCINET (Borgatti, Everett & Freeman, 2002), the euclidean technique of normalization "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 normalized 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), 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 a strength value of 0.001 each. The rest of the countries yielded zero normalized 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. 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.

	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

Table 3: Research impact of South Africa's regional and international collaboration

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.

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 which 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 found the most researched areas to be: 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.

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

Table 3: Subject focus areas in international and regional collaboration
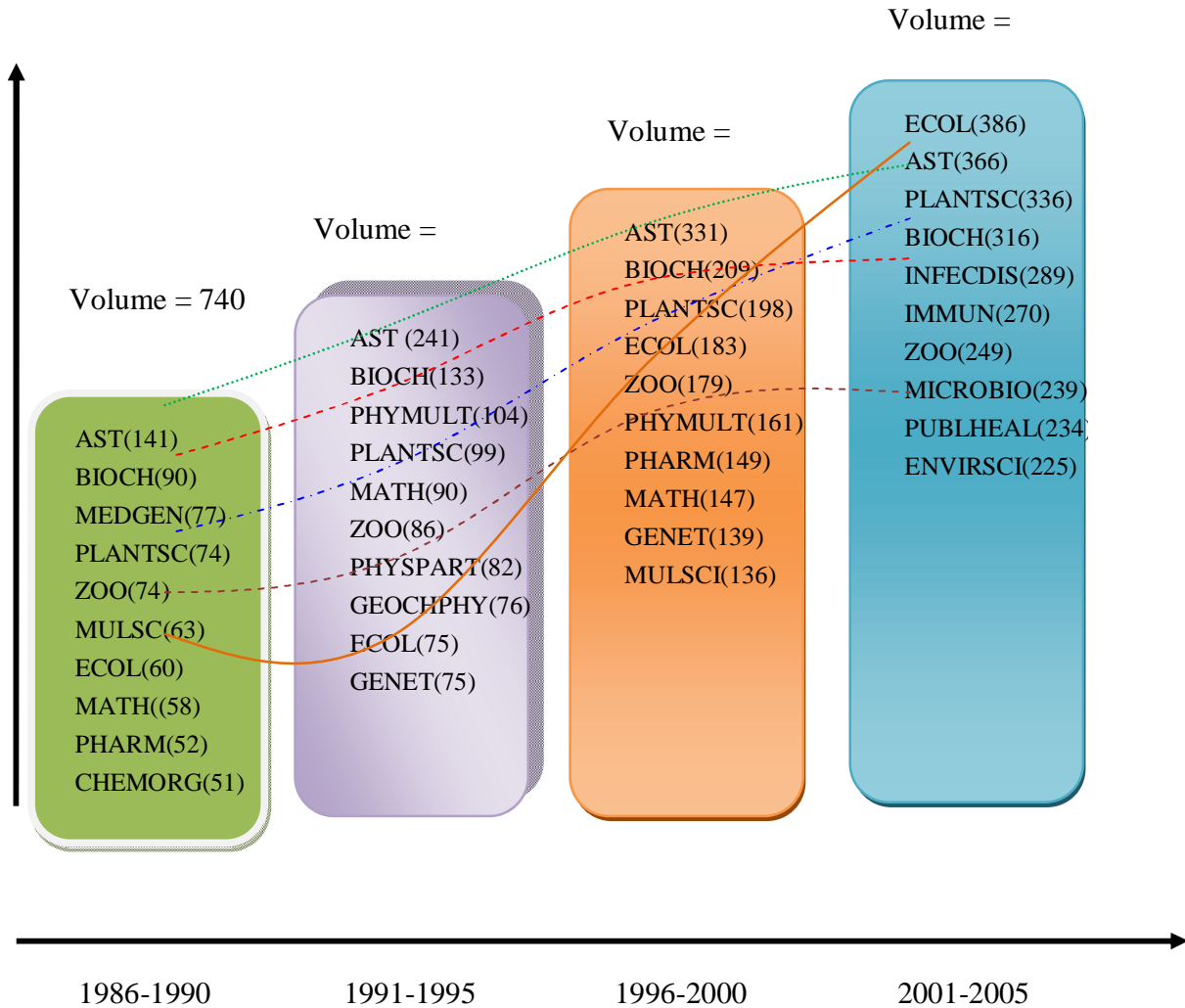
Fig 3: Shifts in collaboration in selected subject focus areas

Key:

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 post-graduate level, from other neighbouring countries. South African institutions of higher learning continue to dominate various ratings of African research institutions and organizations, 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, industrialized nations (or developed countries) contribute the majority 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/councils' calls for collaborative research (see Section 1).

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; by doing so, their international visibility as well as citation influence will 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 constitute 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 industrialized 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 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 affects the quality of the groundwater supply and makes clean water a luxury; the youth's lack of educational opportunities because their main task is to fetch water and wood or to herd animals; practices that make the soil void 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 - increased urbanization, 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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Conceptualizing 'knowledge management' in the context of Library and Information Science using the core/periphery model

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Abstract

'knowledge management' (KM) lacks a universally accepted definition, therefore this study attempts to 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. Data was analyzed using a variety of approaches and analytic techniques (core/periphery analysis, co-occurrence of words as subject terms and social networks) with the aid of UCINET for Windows, TI, textSTAT and Bibexcel computer-aided software. The study identified the following as the terms that most frequently co-occur with KM: information resources management, information science, information technology, information services, information retrieval, library science, management information systems, and libraries, among others. The core terms with which KM can be defined include information, resources, technology, libraries, systems, services, retrieval, data and computers. The paper concludes by offering LIS professionals' general perceptions of KM based on their use of terms through which KM can be defined within the context of LIS.
Keywords: *Knowledge management, information science, library science, bibliometrics, content analysis*

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1.   Introduction

Although there is no single universally accepted definition of the term (to date), "knowledge management" (KM) has grown increasingly popular in a variety of disciplines (business administration, computer science, library and information science/studies, etc) and institutions/organizations (universities, business enterprises, governments, etc). Within the discipline or field of Library and Information Studies, we've noted that the classification of knowledge management is still problematic. For example, in the influential ALISE's [Association for Library and Information Science Education's] LIS Research Areas Classification Scheme (see: http://www.alise.org/mc/page.do?sitePageId=55727), which captures 90 research sub-themes within eight (8) broad research categories, KM is classified under "Information Organization" instead of "Management/ Administration". We also noted the absence of the concept 'knowledge' in the "Information Organization" category. Previous studies [e.g. Onyancha & Ocholla, 2006a; Jacobs, 2004; Ponzi, 2002:268] have already noted that the term is multidisciplinary in nature. These studies identified the following disciplines as the greatest contributors to or users of the theories and methods of KM: 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 towards the development of KM or use its theories and methods have, in our view, greatly contributed to the many definitions and perspectives of KM.

From a business point of view, Wiig (1999) defines KM as the systematic, explicit and deliberate building, renewal and application of knowledge to maximize an enterprise's knowledge-related effectiveness and returns from its knowledge assets. The following definition provides a comprehensive summary of the business community's perception of KM:

> "Knowledge management is concerned with the exploitation and development of the knowledge assets of an organization with a view to furthering the organization's objectives. The knowledge to be managed includes both explicit, documented knowledge, and tacit, subjective knowledge. Management entails all of these processes associated with the

identification, sharing and creation of knowledge. This requires systems for the creation and maintenance of knowledge repositories, and to cultivate and facilitate the sharing of knowledge and organizational learning" (Rowley, 2000:9).

In the same vein, Kim (2000:3) explains that knowledge management is a "discipline that promotes an integrated approach to identifying, managing and sharing all of an organization'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 organizational objectives".

To the library and information scientists, KM includes but is not limited to information management. According to Read-Smith, Ginn, & Kallaus et al (2002:317), KM is: "An interdisciplinary field that is concerned with systematic, effective management and utilization of an organization's knowledge resources … it encompasses creation, storage, retrieval, and distribution of an organization's knowledge – similar to records and information management". Read-Smith, Ginn, & Kallaus et al (2002) therefore consider 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, organizing 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 knowledge management. This explains, to some extent, why ALISE would classify KM under information organization (as alluded to earlier).

As such, LIS professionals and scholars view KM as an extension of what they have always done – managing information. The following excerpts provide examples of LIS professionals' views of KM as cited in DiMattia & Order (1997):

"What is needed is someone who combines the skills of a webmaster, technical communicator, librarian, and business analyst, and/or has people with those sorts of skills working for him or her" – Swedish KM authority Karl Eric Sveiby.

"[Librarians] know more about gathering, categorizing, and distributing knowledge more than just about anyone, and they are usually good at eliciting the knowledge requirements of their customers" – KM expert Tom Davenport (University of Texas).

"Information professionals should look for the power brokers and become their allies, exhibiting management skills, even though it is not our traditional expertise" – Joanne Marshall, Associate Professor Faculty of Information Studies, University of Toronto.

"There are editors and abstracters, people involved in managing our corporate intranet, many jobs that are parts of the KM piece. I think there are lots of opportunities for information professionals" – Lois Remeikis, Director of knowledge and Information Management at Booz, Allen & Hamilton.

"[KM represents] a huge opportunity [for librarians]. But it means that many librarians have to be willing to do different things than they may have in the past. Many are capable, but you may have to sell yourself differently, you may have to learn presentation skills, you may have to take very different responsibilities" – Trish Foy, Director of Coopers and Lybrand's Knowledge Strategies Group

These statements reveal that even within the LIS profession, there are different views on the scope and exact meaning of KM.

This study is therefore an attempt 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?

2.   Overview of related studies

The concept of knowledge management is relatively new, having been introduced in the early 90s. However, the practice of knowledge management

(we will discover) is an old activity in the LIS profession. The term's recent introduction perhaps explains why few bibliometric or informetric studies have been conducted in the domain. As Jacobs (2004) implies in her article, "*Growth and development of knowledge management research: a bibliometric study*", a 'critical mass' of published literature on a subject or field is a prerequisite for bibliometric studies. In other words, a subject can only be bibliometrically studied after it has been published in a representative amount of literature.

Reviewing related literature reveals that only a handful of informetric studies have been conducted on KM research. Ponzi (2002) conducted a study entitled "*The intellectual structure and interdisciplinary breadth of knowledge management: a bibliometric study of its early stages of development*", and concluded that while KM is interdisciplinary in nature, its interdisciplinary breadth is mainly covered in the discipline of management. Upon applying the principal component analysis on the author co-citation frequency matrix, Ponzi observed that contrary to his hypothesis, the discipline of computer science is not the key contributor to KM theories and methods. The author also noted that the subject or field of information technology is not a major contributor. A critical review of Ponzi's study demonstrates that KM is largely associated with the field or discipline of management science as opposed to fields/disciplines such as management information systems (or computer science), library and information science, and organizational psychology and sociology. In other words, KM is largely management science-oriented but can be applied to other disciplines. The term's definition, according to Ponzi, takes into consideration aspects drawn from four main disciplines or subjects, namely: management science, library and information science, management information systems, and organizational psychology and sociology.

Jacobs (2004) conducted a bibliometric analysis focusing on the KM literature published between 1994 and 2003 in order to describe the emergence of and contributors to KM research. She likewise established that KM is a "multidisciplinary theory that has its roots in the discipline of organizational science" (Jacobs, 2004:211). Other findings were that: the popularity of KM has continued to grow since 1994; most publications on KM are produced by the USA; and most cited authors include those who have contributed greatly to the development of KM theories (Nonaka, Davenport, Senge, Hendricks, Leonard-Barton and Polanyi, etc). The study also identified two patterns in the growth of KM literature, as follows:
  (a)   KM gained popularity around 1996.

(b)   Beyond 1996, KM literature grew at an exponential rate up until 2001, in which year the author suggests that KM was redefined.

Onyancha & Ocholla (2006a) assessed KM research in South Africa as reflected in the Current and Completed Research (C&CR) Index (which covers theses, dissertations and projects) and the Index to South African Periodicals (ISAP), both normally hosted by the South African Bibliographic and Information Network (SABINET), in order to measure its growth patterns; identify the publishers KM research; identify the institutions behind KM research; report on the interdisciplinary nature of KM; and identify the researchers who are engaged in KM research. Apart from identifying the disciplines that have greatly contributed to the development of KM, Onyancha & Ocholla also identified the various sources that publish KM literature, which constitutes additional proof of the interdisciplinary nature of knowledge management. The subject is published in a variety of periodicals that span and cover a wide range of disciplines or fields. The most popular periodicals include *Knowledge Management*, which contributed a total of 39 records, followed by *Computing SA* (31), *Convergence* (26), *South African Journal of Libraries and Information Science* (26), *Management Today* (21), *Financial Mail* (17), *BusinessIT Africa* (15) and *Intelligence* (15), among others. A subject content analysis of the periodicals in which KM research is published, as provided by Onyancha & Ocholla (2006a), 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 complicates efforts that aim to find 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 divergent views held by different people. For example, in a study conducted by Chaudhry & Higgins (2001) in order 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 word 'management'.

3.   Methodology

Broadly speaking, this study employs informetric approaches to examine the terms that can be used to describe KM. Specifically, a content analysis of KM literature as indexed in the Library and Information Science and Technology Abstracts (LISTA) was conducted to find the growth pattern of KM literature, 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 contextualize KM within the broader field/discipline of library and information science/studies.

As mentioned, the source of data was the LISTA database, hosted by EBSCOHost. LISTA is one of the largest LIS-specific e-databases in the world. The database indexes more than 600 periodicals, including books, research reports and proceedings. Its subject coverage includes librarianship, classification, cataloguing, bibliometrics, online information retrieval, information management, and much more. The database offers both simple and advanced search options, and caters for searches that focus on specific subjects or topics. In order to extract relevant data from the database, a search of DE "Knowledge Management" was conducted within the subject field, where DE denotes the subject descriptor. The search was limited to the years 1981 to 2007, split into 5 five-year and 1 two-year periods. This division was necessary because the University of South Africa's library, which was used to access data, has set a limit on the number of records that one can download at a time from the database - one cannot exceed a maximum of 1200 records per download. Another limitation was that only articles were extracted from the database. We considered only two types of articles, namely magazine and journal articles. 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 and saved the variables in *.txt (text) format, different computer-aided software was used to analyze the data. Notepad was used to clean the data of irrelevant information and duplicates and to prepare the data for analysis using Bibexcel Software. 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 terms most commonly used to describe KM literature. Partly, these subject terms provided a picture of how LIS professionals view 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 subject terms, there was a need to measure the strength of their relationships as well as identify the terms with which KM is defined by LIS professionals. To achieve this, a simple core/periphery model analysis was applied. 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. TextSTAT is concordance freeware available online. The terms that had high frequency counts were saved in a file named *words.txt*, while the subject terms that were previously saved as *.txt files and arranged one per line (as shown above) were re-arranged in 'title-like' format (see example on the next page). These were saved in a *.txt file named *text.txt* as required by TI software, which was then used to prepare both the raw and normalized co-occurrence matrices named COOCC.DBF and COSINE.DBF respectively.
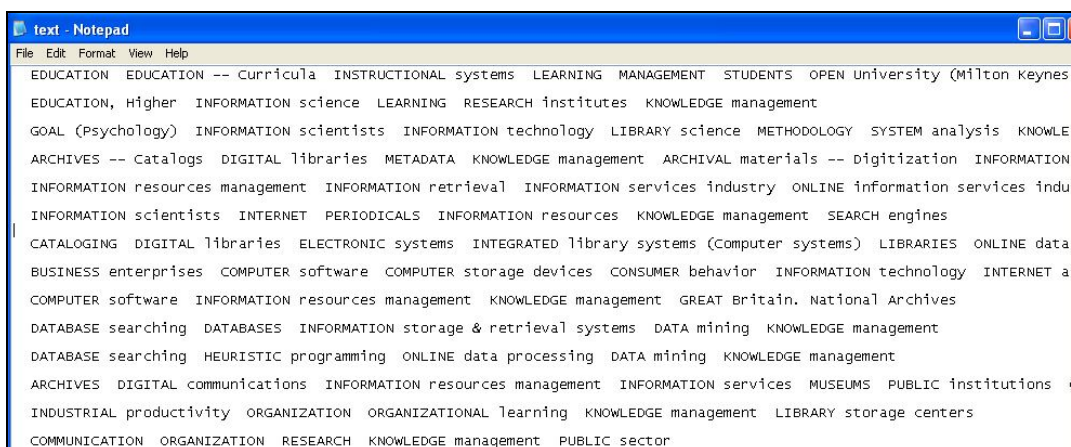
Fig 1: Subject terms arranged in title format, ready for analysis by TI software

Finally, the data contained in the COSINE.DBF file was imported into Windows' (version 6) UCINET 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 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 4 to 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 analyzing 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.*

4.   Results and discussion

This section presents and discusses the findings under the following sub-headings:
- The growth of KM literature
- Growth of the subject terms describing KM literature
- The subject terms most commonly used to describe KM literature
- Distribution of the subject terms according to frequency counts
- The core and periphery subject terms used to describe KM literature under three periodicals
  - 1981-1990

- o 1991-2000
- o 2001-2007

4.1 Growth of KM literature

Table 1 provides the growth patterns of KM literature between 1981 and 2007. Generally, there has been a continued increase in the number of published articles on KM. From just 3 articles in 1981, the number increased to a total of 303 articles in 2006, a growth rate of 10000%. Column 3 in Table 1 reveals that there were instances when the number of articles dropped. This pattern was witnessed between 1981 and 1997, beyond which there was a continued rise in the number of articles until 2007 when the number of articles dropped by 54 articles from the previous year's contribution. The drop in the number of articles between 1981 and 1997 could perhaps be attributed to the fact that KM was not a popular subject then, or it was hidden within other broader/popular subjects such as management, information resource management, information management or organization of information. However, the drop witnessed between 2006 and 2007 may not necessarily be a result of low productivity; rather it could perhaps be attributed to the delays associated with indexing articles. There is usually a long time lag between the time an article is published and the time it is actually entered into a database. For instance, Onyancha & Ocholla (2006b) found that HIV/AIDS research articles took an average of 3½ years after their publication to be included in the AIDSEARCH database. This may vary from one database to next and in different fields.

Year	Articles	Change	% Change	Cumulative change	Cumulative % change	Change in cumulative %
1981	3			3		
1982	1	-2	-66.67	4	33.33	33.33
1983	1	0	0.00	5	25.00	-8.33
1984	3	2	200.00	8	60.00	35.00
1985	2	-1	-33.33	10	25.00	-35.00
1986	0	-2	-100.00	10	0.00	-25.00
1987	3	3	-	13	30.00	30.00
1988	13	10	333.33	26	100.00	70.00
1989	12	-1	-7.69	38	46.15	-53.85
1990	7	-5	-41.67	45	18.42	-27.73
1991	11	4	57.14	56	24.44	6.02

1992	13	2	18.18	69	23.21	-1.23
1993	9	-4	-30.77	78	13.04	-10.17
1994	0	-9	-100.00	78	0.00	-13.04
1995	3	3	-	81	3.85	3.85
1996	10	7	233.33	91	12.35	8.50
1997	4	-6	-60.00	95	4.40	-7.95
1998	17	13	325.00	112	17.89	13.50
1999	37	20	117.65	149	33.04	15.14
2000	80	43	116.22	229	53.69	20.66
2001	129	49	61.25	358	56.33	2.64
2002	169	40	31.01	527	47.21	-9.13
2003	182	13	7.69	709	34.54	-12.67
2004	277	95	52.20	986	39.07	4.53
2005	288	11	3.97	1274	29.21	-9.86
2006	303	15	5.21	1577	23.78	-5.43
2007	249	-54	-17.82	1826	15.79	-7.99

Table 1: Growth of KM literature, 1981-2007

There is confusion around when the concept of KM came into existence. According to Jacobs (2004:212), KM was born in the mid-90s. However, Ponzi (2002:259) opines that KM "became of interest" in the early 90s as a new management paradigm. Ponzi traces the beginning of this interest to 1993 when Drucker published a book "*The Post-Capitalist Society*" in which he "described how our society is being transformed into one whose primary resource will be knowledge" (Ponzi 2002:259). Jacobs' (2004) view runs contrary to the findings presented in Table 1, which suggests that the term KM was used as a subject term to index articles that were published way back in 1981. Although Ponzi's statements may seem to suggest that the concept was born in the early 90s, the author's emphasis is not so much on when the concept came into being but when scholars began to perceive knowledge management as an independent management discipline. Indeed, Table 1 reveals that KM literature began a steep climb in 1997 when the total productivity stood at 17 articles. It is not possible to explain the database's use of the subject KM as an indexing term for articles published as early as 1981, a situation that contradicts various scholars' views regarding the exact year of the concept's emergence. We observed elsewhere in our informetric study on HIV/AIDs that the date of the emergence of the disease and the dates of the announcement of the disease were contradictory as well.

Whether this scenario is due to retrospective indexing was difficult to confirm from the data obtained from the database. But we believe that KM existed in other disciplines and therefore could have been indexed within the tag of the broader/host discipline.

4.2   *Growth of the subject terms describing KM literature*

The number of subject terms that describe literature in any given field or subject may be indicative of the breadth of its 'interdisciplinarity'. According to Bierbaum & Brooks (1995:533), the changing frequency of the occurrence of subject terms may be used to "track the introduction of new terms that reflect innovations and discoveries in the knowledge base" of a given field". Macias-Chapula, Sotolongo-Aguilar, Magde & Solorio-Lagunas [1999:565] argue that the subject content analysis of relevant literature would mirror "not only the construction of [a] field by specific institutions, but also what happens to subject access as the knowledge base and environment of a discipline grows or changes".

Figure 2 illustrates the growth of the subject terms that are used to describe or index KM literature. As with the number of articles, the number of subject terms has continued to grow. There were only 25 terms between 1981 and 1985. The following year-period produced a total of 56 terms, while 64 terms were used to describe KM literature from 1991-1995. The number of terms rose by a huge margin (92) to reach 156 between 1996 and 2000, and thereafter by 777 terms to reach a new height of 933 terms between 2001 and 2005. There was a lesser percentage increment (12%) from 933 terms between 2001 and 2005 to 1046 between 2006 and 2007, probably because this last year-period consisted of only two years of publication (i.e. 2006 and 2007).

	No. of subject terms	Increase	% increase
1981-1985	25	25	
1986-1990	56	31	124
1991-1995	64	8	14
1996-2000	156	92	144
2001-2005	933	777	498
2006-2007	1046	113	12
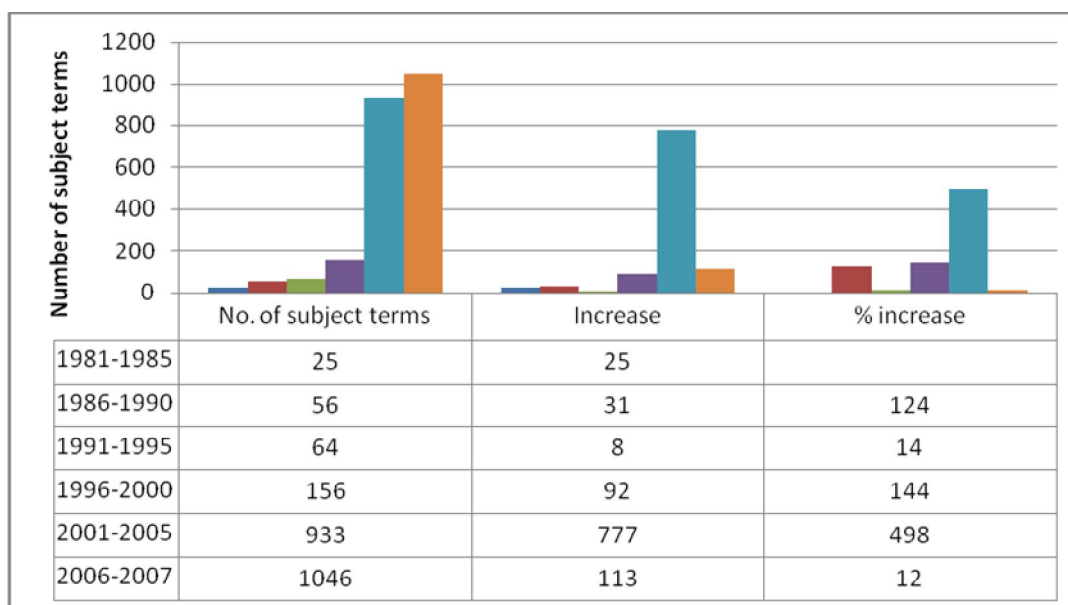
Fig 2: Growth of subject terms used to describe KM literature

4.3   Subject terms used to describe KM literature

An analysis of the terms that appear the most in KM literature may give an indication of the 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(s) or document(s), the stronger their relationship (Krsul, 2002). Table 2 provides the top 100 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 (385), information technology (368), information services (179), information retrieval (153), library science (125), management information systems (124), libraries (113), management (109), and information resources (99) [this list only includes the top 10].

If we classify the top 100 terms into various categories describing different aspects, the terms that describe the management function would comprise: information resources management (547); management (109); industrial management (59); records management (29); information services management (19); database management (19); personnel management (19); document management (18); resource management (16); and library administration (16).

The list of terms also includes activities or processes associated with KM as perceived by LIS professionals, e.g.: information retrieval (153); organizational learning (77); data mining (76); electronic data processing (57); database searching (28); knowledge acquisition [expert systems] (27); information organization (25); documentation (24); knowledge representation [information theory] (22); libraries – automation (19); information sharing (17); library cooperation (17); classification (17); and website development (15).

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 organization	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	Organizational 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	Organizational 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	Organization	38	83	Resource management	16
34	Technological innovations	37	84	Communication	16
35	Information literacy	37	85	Library administration	16
36	Internet	35	86	Organizational 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 2: Top 100 subject terms used to describe KM literature

Resources or systems or services that are managed by knowledge management include: information technology (368); information services (179); management information systems (124); libraries (113); information resources (99); intellectual capital (73); information storage & retrieval systems (71); business enterprises (65); digital libraries (55); websites (54); electronic information resources (48); computer software (39); Internet (35); computer network resources (33); Intranets (computer networks) (30); databases (29); online information services (28); expert systems (28); computer systems (25); academic libraries (23); human capital (18);

computer networks (18); web portals (17); the World Wide Web (17); electronic systems (15); business information services (14); and archives (13).

Knowledge managers are variously referred to in the Table as: knowledge workers (69), information professionals (66), librarians (58), executives (19), employees (19), information scientists (19), and library employees (17).

The Table also provides the disciplines or fields that are contributors to or users of theories and methods of KM. These include: information science (385); information technology (368); library science (125); business (30); management science (29); education (20); and computer science (17).

4.4   *Distribution of subject terms according to frequency of occurrence*

This analysis was meant to identify the number of subject terms that constitute the core terms that describe KM literature, and therefore KM as a concept. Table 3 reveals that most (i.e. 1498, 92.58%) of the subject terms co-occurred less than 10 times with KM. The sum total of their occurrences was 2912, thereby generating an average frequency count of 1.94 per term. There were 60 (3.71%) terms that co-occurred between 11 and 20 times with KM. On average, this category of terms co-appeared with KM 14.92 times per term. A total of 16 terms co-appeared with KM 21 - 30 times, thus producing an average of 26.69 frequency counts per term. Thirteen (0.80%) subject terms co-occurred with KM between 31 and 40 times, generating a total frequency count of 450 and an average co-occurrence count of 34.62 per term. The 41-50 frequency range produced 4 (0.25%) subject terms which yielded a total of 175 co-appearances with KM and an average frequency count of 43.75. Other distributions are shown in Table 3.

An examination of columns 2 and 5 show that there is a negative correlation between the number of subject terms and the average frequency of co-occurrence with KM. A simple correlation test using Pearson's correlation formula returned a negative correlation coefficient of -0.16873. This value only indicates a negative correlation and is not large enough for us to conclude on the strength of the relationship. However, it can be intimated that the number of subject terms that describe a particular subject falls as the average frequency of co-occurrence with the subject in a text or document rises. There is therefore an inverse relationship between the two variables. Finally, Table 3 shows that the core terms that are used to describe KM literature by LIS scholars are approximately 9 - identified because they co-occurred more than 90 times with

KM and constituted approximately 79% of the co-occurrence frequency counts per term.

Frequency range	No. of subject terms (x)	%	Total frequency (f)	f count per term (f/x)
1-10	1498	92.58	2912	1.94
11-20	60	3.71	895	14.92
21-30	16	0.99	427	26.69
31-40	13	0.80	450	34.62
41-50	4	0.25	175	43.75
51-60	8	0.49	442	55.25
61-70	5	0.31	333	66.60
71-80	4	0.25	297	74.25
81-90	0	0.00	0	0.00
91-100	1	0.06	99	99.00
101-110	1	0.06	109	109.00
111-120	1	0.06	113	113.00
121-130	2	0.12	249	124.50
131-140	0	0.00	0	0.00
141-150	0	0.00	0	0.00
151-160	1	0.06	153	153.00
161-170	0	0.00	0	0.00
171-180	1	0.06	179	179.00
181-190	0	0.00	0	0.00
191-200	0	0.00	0	0.00
201+	3	0.19	1300	433.33

Table 3: Distribution of subject terms by frequency of occurrence (N=1618)

```
Core/Periphery Class Memberships:

   1:  MANAGEMENT INFORMATION KNOWLEDGE RESOURCES TECHNOLOGY LIBRARY SYSTEMS SERVICES RETRIEVAL COMPUTER ELECTRONIC DATA
   2:  LIBRARIES LEARNING RESEARCH WEB ASSOCIATIONS LIBRARIAN CAPITAL INTELLECTUAL INTERNET PROFESSIONALS STORAGE EXPERT INDUSTRIAL WORKERS ARCHITECTURE BUS

Blocked Adjacency Matrix

                    1     2     3     4     5     6     7     8    22    10    11    21       9    14    15    16    17    18    19    20    12    13
                 MANAG INFOR KNOWL RESOU TECHN LIBRA SYSTE SERVI  DATA RETRI COMPU ELECT   LIBRA   WEB ASSOC LIBRA CAPIT INTEL INTER PROFE LEARN RESEA ST
                 -----------------------------------------------------------------------  ------------------------------------------------------------
  1  MANAGEMENT  |       0.599 0.837 0.676 0.279 0.316 0.459 0.342 0.342 0.316 0.483 0.293 | 0.276             0.120                                 0.
  2  INFORMATION | 0.599       0.538 0.490 0.693 0.357 0.141 0.810 0.579 0.821 0.218 0.617 | 0.273             0.189                                 0.
  3  KNOWLEDGE   | 0.837 0.538       0.344 0.340 0.276 0.653 0.357 0.357 0.386 0.590 0.357 | 0.253             0.146                                 0.
  4  RESOURCES   | 0.676 0.490 0.344       0.178 0.151 0.192 0.096 0.089 0.136 0.192       | 0.272
  5  TECHNOLOGY  | 0.279 0.693 0.340       0.252 0.142 0.544 0.680 0.882 0.192 0.680       |                                                       0.
  6  LIBRARY     | 0.316 0.357 0.276 0.178 0.252       0.161 0.309 0.154 0.143       0.154 | 0.218             0.756                                 0.
  7  SYSTEMS     | 0.459 0.141 0.653 0.151 0.142 0.161             0.174 0.161 0.615 0.174 |
  8  SERVICES    | 0.342 0.810 0.357 0.192 0.544 0.309             0.333 0.617 0.118 0.333 | 0.236             0.408
 22  DATA        | 0.342 0.579 0.357 0.096 0.680 0.154 0.174 0.333       0.772 0.236 0.833 |                                                       0.
 10  RETRIEVAL   | 0.316 0.821 0.386 0.089 0.882 0.143 0.161 0.617 0.772       0.218 0.772 |                                                       0.
 11  COMPUTER    | 0.483 0.218 0.590 0.136 0.192       0.615 0.118 0.236 0.218       0.118 |
 21  ELECTRONIC  | 0.293 0.617 0.357 0.192 0.680 0.154 0.174 0.333 0.833 0.772 0.118       |                                                       0.
                 -----------------------------------------------------------------------  --------------------------------------------------------
  9  LIBRARIES   | 0.276 0.273 0.253 0.272       0.218       0.236                         |
 14  WEB
 15  ASSOCIATIONS
 16  LIBRARIAN   | 0.120 0.189 0.146             0.756       0.408                         |
 17  CAPITAL
 18  INTELLECTUAL
 19  INTERNET
 20  PROFESSIONALS
 12  LEARNING
 13  RESEARCH
 23  STORAGE     | 0.169 0.134 0.206             0.471 0.267 0.151       0.289 0.267       0.289 |
 24  EXPERT      | 0.339       0.603                   0.826                   0.745       |
 25  INDUSTRIAL
 26  WORKERS
 27  ARCHITECTURE| 0.169       0.206                                                        |
 28  BUSINESS    | 0.120       0.146                                                        |
 29  NETWORK     | 0.239 0.189 0.146 0.471                               0.289             |
 30  EMPLOYEES
 31  ORGANIZATION
 32  MINING
 33  PLANNING
 34  ACQUISITION | 0.239       0.511             0.533                   0.289       0.289 |
 35  LITERACY    | 0.120 0.189 0.146             0.756       0.408                         |     1.000
 36  ONLINE
 37  SOFTWARE    | 0.120 0.094 0.146 0.236                                           0.408 |
 38  COMMUNICATION| 0.239 0.189 0.146 0.471                              0.289             |
 39  CONGRESSES
 40  INTELLIGENCE| 0.316 0.036 0.441 0.089             0.403             0.436 0.154       |
 41  RECORD
 42  ADMINISTRATION|                                                                        |
```

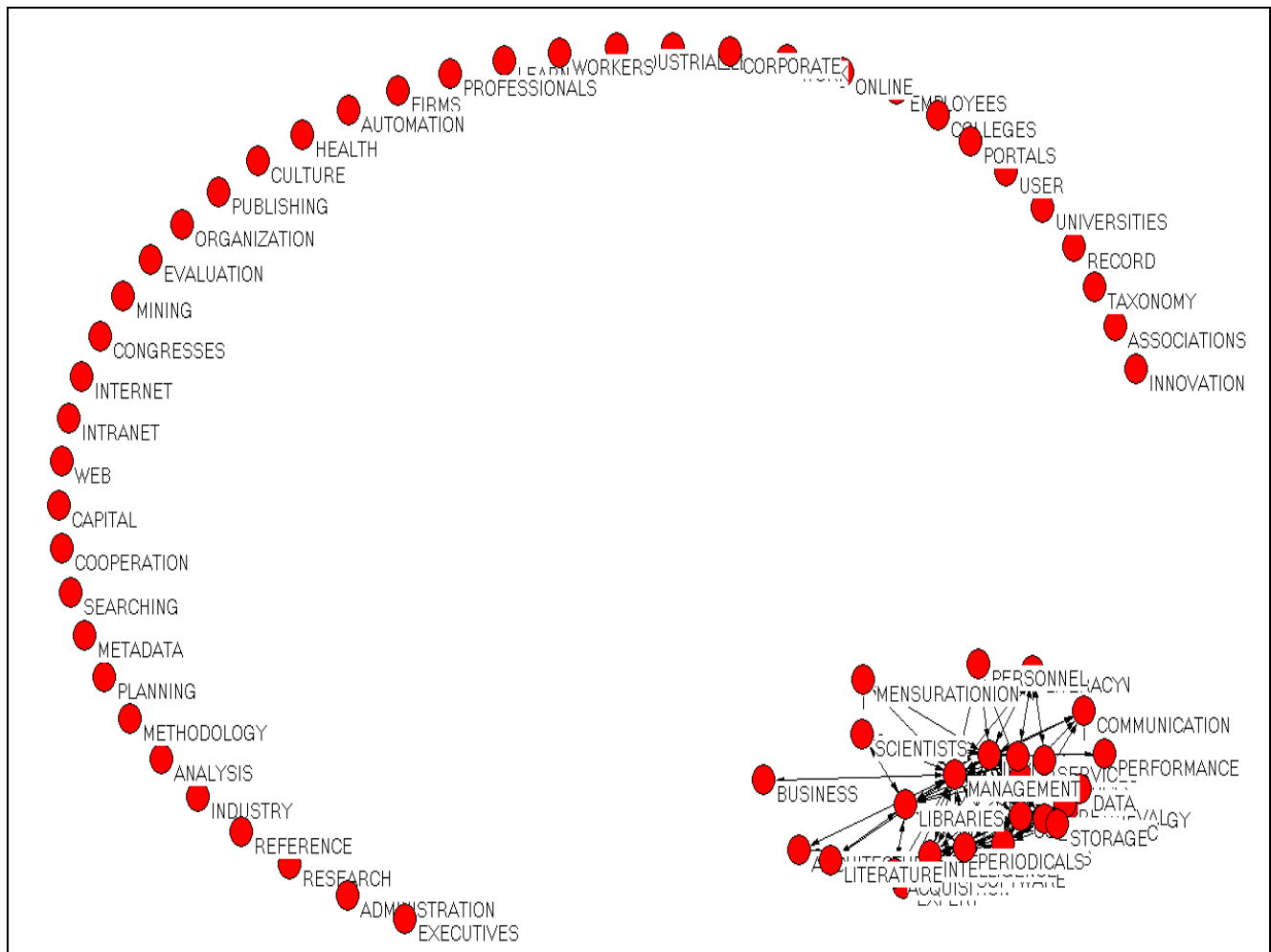Fig 3: Core/periphery model of terms describing KM literature, 1981-1990

Fig 4: Visual map of core/periphery terms describing KM literature, 1981-1990

4.5   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 3 to 8. This section discusses the findings under three sub-headings so as to illustrate (emerging) terms that are increasingly becoming associated with KM.

4.5.1   Core terms between 1981 and 1990

During this period, eleven keywords emerged as the core terms describing KM literature. These were: *management, information, knowledge, resources, technology, library, systems, services, data, retrieval, computer,* and *electronic.* 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 normalized count of 0.882, followed by *electronic* and *data* (0.833), *information* and *retrieval* (0.821), *retrieval* and *electronic* (0.772), *information* and *technology* (0.693), *technology* and *data* (0.680), *electronic* and *technology* (0.680), and *resources* and *management* (0.676), to name a few. Evidently, the areas of research focus between 1981 and 1990 were the use of technology in information retrieval and resource (including data and information) management. Essentially therefore, KM was largely associated with the use of information technology in the retrieval of information and organization of data. Of the 75 unique terms that were selected to conduct the core/periphery analysis, 41 did not have any links to any other words as shown in Fig 4, implying that they were not used to describe KM literature. This further implies that they were not associated with the concept of KM from 1981 - 1990. The terms referred to here are outside the cluster of words situated in the bottom right corner of Fig 4. Their disassociation with KM (either directly or by proxy) is probably because they were introduced into KM literature after 1990, or they were simply not associated with the term KM then.

4.5.2   Core terms between 1991 and 2000

1991-2000 is widely perceived to be a period during which there was a lot of emerging interest in KM (Ponzi, 2002). It is in this period that the number of KM articles began their steep climb, as shown in Table 1. The number of terms also rose remarkably between 1991 and 2000 compared to 1981-1990. The number of the core terms with which KM was described from 1991-2000 remained more or less the same as in the previous year-period. The only exception was the movement of the term 'library' from cluster 1 (which is considered to be the core) to cluster 2 (which is considered to be the periphery). This, however, does not mean that the term was not associated with KM as shown in Fig 6.

```
Core/Periphery Class Memberships:

  1:  MANAGEMENT INFORMATION KNOWLEDGE RESOURCES TECHNOLOGY SYSTEMS SERVICES RETRIEVAL COMPUTER ELECTRONIC DATA
  2:  LIBRARY LIBRARIES LEARNING RESEARCH WEB ASSOCIATION LIBRARIAN CAPITAL INTELLECTUAL INTERNET PROFESSIONALS STORAGE EXPERTS INDUSTRIAL WORKERS ARCHITEC

Blocked Adjacency Matrix

                        1     2     3     4     5    10     7     8    22    21    11     6     9    14    15    16    17    18    19    20    12    13
                      MANAG INFOR KNOWL RESOU TECHN RETRI SYSTE SERVI  DATA ELECT COMPU LIBRA LIBRA  WEB  ASSOC LIBRA CAPIT INTEL INTER PROFE LEARN RESEA ST
  --------------------------------------------------------------------------------------------------------------------------------------------------------
   1    MANAGEMENT |        0.567 0.886 0.491 0.296 0.251 0.294 0.230 0.187 0.242 0.313 | 0.191 0.255 0.152 0.284 0.154 0.183 0.173 0.166 0.057 0.211 0.122 0.
   2   INFORMATION | 0.567       0.585 0.364 0.541 0.586 0.233 0.554 0.386 0.486 0.172 | 0.201 0.112 0.076 0.111 0.090 0.024 0.020 0.136 0.067 0.068       0.
   3     KNOWLEDGE | 0.886 0.585       0.258 0.324 0.241 0.368 0.261 0.163 0.216 0.313 | 0.217 0.199 0.172 0.292 0.146 0.184 0.177 0.169 0.065 0.306 0.092 0.
   4     RESOURCES | 0.491 0.364 0.258             0.137 0.076 0.049       0.126 0.067 |       0.173             0.093                   0.060             0.
   5    TECHNOLOGY | 0.296 0.541 0.324                   0.075       0.243 0.214 0.155 0.110 | 0.057 0.048 0.065 0.040       0.061 0.052 0.149       0.105
  10     RETRIEVAL | 0.251 0.586 0.241 0.137 0.075             0.359 0.309 0.382 0.526 0.140 | 0.073       0.082 0.103                   0.063             0.
   7       SYSTEMS | 0.294 0.233 0.368 0.076             0.359       0.043 0.046 0.165 0.555 | 0.061             0.043                               0.037 0.
   8      SERVICES | 0.230 0.554 0.261 0.049 0.243 0.309 0.043       0.295 0.355 0.113 | 0.236 0.065 0.089       0.211                               0.
  22          DATA | 0.187 0.386 0.163             0.214 0.382 0.046 0.295       0.678 0.040 | 0.083             0.059                               0.
  21    ELECTRONIC | 0.242 0.486 0.216 0.126 0.155 0.526 0.165 0.355 0.678       0.097 | 0.101             0.071                               0.
  11      COMPUTER | 0.313 0.172 0.313 0.067 0.110 0.140 0.555 0.113 0.040 0.097       | 0.214 0.044       0.075 0.072                   0.046       0.098 0.340 0.
  ------------------------------------------------------------------------------------------------------------------------------------------------------
   6       LIBRARY | 0.191 0.201 0.217             0.057 0.073 0.061 0.236 0.083 0.101 0.214 |       0.092                   0.298
   9     LIBRARIES | 0.255 0.112 0.199 0.173 0.048             0.065             0.044 | 0.092       0.105 0.131 0.248
  14           WEB | 0.152 0.076 0.172             0.065 0.061 0.082       0.089 |             0.105                   0.218                         0.289
  15   ASSOCIATION | 0.284 0.111 0.292             0.040 0.103 0.043       0.059 0.071 0.075 |       0.131                   0.167 0.142
  16     LIBRARIAN | 0.154 0.090 0.146 0.093                   0.211             0.072 | 0.298 0.248       0.167 0.959                   0.447 0.091
  17       CAPITAL | 0.183 0.024 0.184       0.061                               |             0.142 0.959
  18  INTELLECTUAL | 0.173 0.020 0.177       0.052                         0.046 |       0.959
  19      INTERNET | 0.166 0.136 0.169 0.060 0.149 0.063                   |       0.218                               0.177
  20 PROFESSIONALS | 0.057 0.067 0.065                         |             0.447
  12      LEARNING | 0.211 0.068 0.306       0.105       0.037             0.098 |       0.289 0.091             0.177
  13      RESEARCH | 0.122       0.092                         0.340 |       0.340
  23       STORAGE | 0.100 0.310 0.113 0.120             0.504 0.316 0.136 0.144 0.348 0.092 | 0.092
  24       EXPERTS | 0.175 0.056 0.307                   0.709             0.489 | 0.092
  25    INDUSTRIAL |
  26       WORKERS |
  27  ARCHITECTURE |
  28      BUSINESS | 0.378 0.184 0.345 0.076 0.188 0.040       0.129 0.137 0.055 | 0.061 0.051 0.069 0.215       0.258 0.275 0.158       0.112
  29       NETWORK | 0.223 0.142 0.184 0.295 0.061       0.129 0.083       0.107 0.340 | 0.118       0.083                               0.072
  30     EMPLOYEES | 0.100 0.039 0.113       0.099                         | 0.192
  31  ORGANIZATION | 0.115 0.034 0.130       0.086                         |             0.236       0.177 0.151
  32        MINING | 0.122 0.095 0.092       0.121             0.707 0.213 |
  33      PLANNING | 0.057       0.065                         |
  34   ACQUISITION | 0.081 0.047 0.065 0.230             0.387             0.113 |
  35      LITERACY | 0.115 0.067 0.065 0.209                   |
  36        ONLINE | 0.094 0.274 0.106             0.070 0.178 0.481 0.204 0.246 |             0.154
  37      SOFTWARE | 0.172 0.101 0.130             0.109 0.091 0.118       0.151 0.480 | 0.167 0.139             0.224                               0.354
  38 COMMUNICATION | 0.081 0.190 0.138                         |
  39    CONGRESSES | 0.164 0.255 0.185             0.271       0.224 | 0.105 0.120             0.183
  40  INTELLIGENCE | 0.207 0.130 0.325             0.152             0.133 |
  41        RECORD | 0.203 0.047 0.092 0.147                   |
  42 ADMINISTRATION| 0.057       0.065                         |
  43      INDUSTRY | 0.154 0.060 0.175 0.093             0.105 |             0.129
```

Fig 5: Core/periphery model of terms describing KM literature, 1991-2000
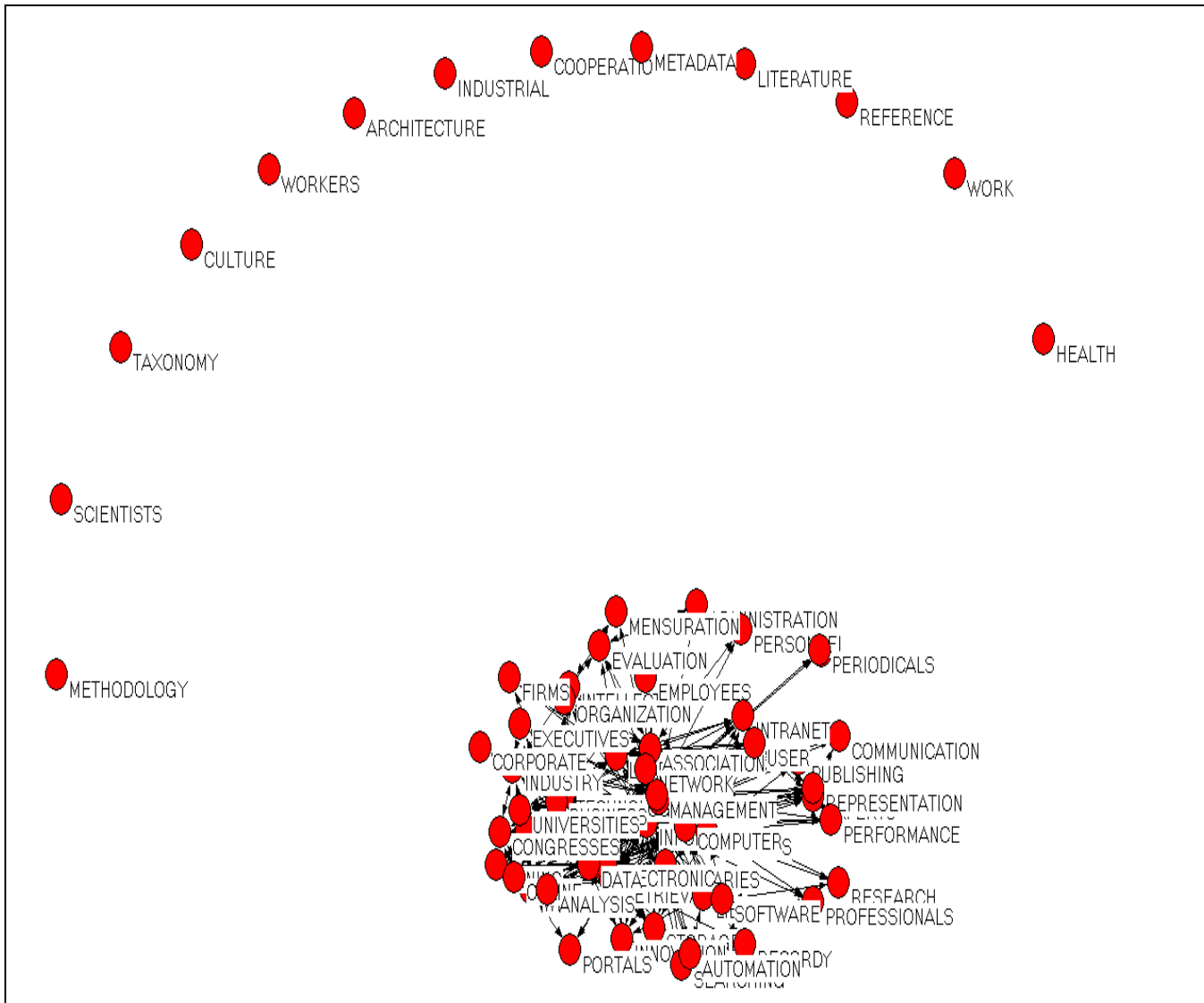
219

Fig 6: Visual map of core/periphery terms describing KM literature, 1991-2000

Fig 6 reveals that the term (library) is among the terms that comprise the social network of terms in the mid-bottom section of the illustration. The terms that formed cluster 1 include *management, information, knowledge, resources, technology, retrieval, systems, data, electronic,* and *computer*. The highest strengths of association (represented by the normalized frequency count) were between *electronic* and *data* (0.678), *information* and *retrieval* (0.586), *information* and *knowledge* (0.585), *information* and *management* (0.567), *computer* and *systems* (0.555), *information* and *services* (0.554), and *information* and *technology* (0.526). It was observed that the strengths of association between these and other terms in the first cluster in the previous year-period recorded lower values between 1991

and 2000. This is contrary to our expectation of higher values, which would have meant greater strengths of association between the terms. This may imply a shift wherein research focus areas began to include more aspects whose terms comprised cluster 2. 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.

Notably, in Fig 6 there are less terms that are outside the social network, placed in the mid-bottom section of the illustration. The number decreased from 41 in 1981-1990 to 13 in 1991-2000. The terms in the periphery in Fig 6 include *methodology, scientists, taxonomy, culture, workers, architecture,* and *industrial.* Others are *cooperation, metadata, literature, reference, work* and *health.* Although some of these terms appeared frequently in the KM subject headings, they were not associated with any of the other terms. For instance, the term *industrial* appeared 82 times in the subject terms that were used to describe KM literature between 1981 and 2007. The frequency counts for other terms were as follows: *methodology* (14), *scientists* (21), *culture* (66), *workers* (70), *architecture* (53), *cooperation* (19), *metadata* (27), *reference* (19), *work* (19) and *health* (17).

These weak relationships notwithstanding, Fig 6 reveals an interesting emerging phenomenon in cluster 2. The almost empty compartment of cluster 2 in Fig 3 was slowly filling up with terms in Fig 5. This implies an increase in the inter-relatedness of the terms, which may have been brought about by interdisciplinary research.

4.5.3   Core terms between 2001 and 2007

In the course of 2001-2007, KM literature was mainly described using the following key terms: *management, information, knowledge, resources, technology, library, systems, services, libraries, retrieval, computers, electronic, data* and *storage.* Most of these terms constituted what may be defined as the core subject terms with which KM was associated in 1981-1990 and 1991-2000 as well. The difference is in the strengths of association between the various terms. In 2001-2007, there were strong links between the following: *information* and *management* (0.776), *resources* and *management* (0.736), *information* and *resources* (0.723), *information* and *knowledge* (0.703), *storage* and *retrieval* (0.664), *information* and *technology* (0.589), *resources* and *knowledge* (0.562), *information* and *retrieval* (0.546), and *information* and *services* (0.511). Apparently, KM was associated with the management of information resources, services and technology. Information

storage and retrieval were one of the key activities associated with KM. Notably, the pattern witnessed in this period (i.e. 2001-2007) resembles that witnessed in 1981-1990, especially with regard to the clusters that consist of the core terms.

```
Core/Periphery Class Memberships:

    1:  MANAGEMENT INFORMATION KNOWLEDGE RESOURCES TECHNOLOGY LIBRARY SYSTEMS SERVICES LIBRARIES RETRIEVAL COMPUTERS ELECTRONIC DATA STORAGE
    2:  LEARNING RESEARCH WEB ASSOCIATIONS LIBRARIAN CAPITAL INTELLECTUAL INTERNET PROFESSION EXPERT INDUSTRIAL WORKERS ARCHITECTURE BUSINESS NETWORK EMPLOYE

Blocked Adjacency Matrix

                     1     2     3     4     5     6     7     8     9    10    11    21    22    23     15    16    17    18    19    20    12    13
                   MANAG INFOR KNOWL RESOU TECHN LIBRA SYSTE SERVI LIBRA RETRI COMPU ELECT DATA  STORA  ASSOC LIBRA CAPIT INTEL INTER PROFE LEARN RESEA
                   ----------------------------------------------------------------------------------------------------------------------------------
  1   MANAGEMENT   |      0.776 0.853 0.736 0.484 0.257 0.478 0.366 0.300 0.316 0.288 0.294 0.278 0.213 | 0.195 0.163 0.222 0.242 0.178 0.103 0.214 0.234 0.
  2   INFORMATION  | 0.776       0.703 0.723 0.589 0.316 0.479 0.511 0.300 0.546 0.235 0.352 0.264 0.333 | 0.096 0.154 0.134 0.157 0.183 0.135 0.147 0.210 0.
  3   KNOWLEDGE    | 0.853 0.703       0.562 0.448 0.303 0.403 0.375 0.309 0.307 0.320 0.285 0.271 0.201 | 0.243 0.202 0.238 0.262 0.196 0.122 0.248 0.259 0.
  4   RESOURCES    | 0.736 0.723 0.562       0.376 0.200 0.332 0.260 0.245 0.280 0.248 0.386 0.180 0.183 | 0.090 0.109 0.094 0.111 0.150 0.079 0.129 0.165 0.
  5   TECHNOLOGY   | 0.484 0.589 0.448 0.376       0.130 0.275 0.229 0.125 0.209 0.238 0.168 0.144 0.145 | 0.043 0.067 0.145 0.161 0.119 0.050 0.141 0.161 0.
  6   LIBRARY      | 0.257 0.316 0.303 0.200 0.130       0.118 0.209 0.357 0.189 0.040 0.168 0.090 0.177 | 0.044 0.224 0.010 0.022 0.071 0.077 0.078 0.098 0.
  7   SYSTEMS      | 0.478 0.479 0.403 0.332 0.275 0.118       0.133 0.175 0.398 0.255 0.202 0.145 0.476 | 0.056 0.038 0.071 0.093 0.084 0.016 0.079 0.098 0.
  8   SERVICES     | 0.366 0.511 0.375 0.260 0.229 0.209 0.133       0.296 0.242 0.140 0.179 0.112 0.083 | 0.031 0.149 0.034 0.056 0.096 0.072 0.030 0.110 0.
  9   LIBRARIES    | 0.300 0.300 0.309 0.245 0.125 0.357 0.175 0.296       0.193 0.075 0.171 0.055 0.165 | 0.063 0.262 0.030 0.040 0.067 0.055 0.064 0.093 0.
 10   RETRIEVAL    | 0.316 0.546 0.307 0.280 0.209 0.189 0.398 0.242 0.193       0.106 0.254 0.200 0.664 | 0.045 0.015 0.024 0.038 0.107 0.011 0.037 0.064 0.
 11   COMPUTERS    | 0.288 0.235 0.320 0.248 0.238 0.040 0.255 0.140 0.075 0.106       0.154 0.135 0.072 | 0.031 0.021 0.025 0.031 0.155 0.031 0.030 0.067 0.
 21   ELECTRONIC   | 0.294 0.352 0.285 0.386 0.168 0.168 0.202 0.179 0.171 0.254 0.154       0.282 0.155 | 0.013 0.031 0.006 0.019 0.123 0.011 0.049 0.061 0.
 22   DATA         | 0.278 0.264 0.271 0.180 0.144 0.090 0.145 0.112 0.055 0.200 0.135 0.282       0.101 | 0.043 0.008 0.068 0.078 0.050       0.036 0.067 0.
 23   STORAGE      | 0.213 0.333 0.201 0.183 0.145 0.177 0.476 0.083 0.165 0.664 0.072 0.155 0.101       | 0.023 0.013 0.021 0.033 0.078       0.029 0.024 0.

 15   ASSOCIATIONS | 0.195 0.096 0.243 0.090 0.043 0.044 0.056 0.031 0.063 0.045 0.031 0.013 0.043 0.023 |       0.037 0.069 0.062 0.031 0.018 0.079 0.045 0.
 16   LIBRARIAN    | 0.163 0.154 0.202 0.109 0.067 0.224 0.038 0.149 0.262 0.015 0.021 0.031 0.008 0.013 | 0.037       0.035 0.036 0.024 0.129 0.041 0.026 0.
 17   CAPITAL      | 0.222 0.134 0.238 0.094 0.145 0.010 0.071 0.034 0.030 0.024 0.025 0.006 0.068 0.021 | 0.069 0.035       0.732             0.108 0.043 0.
 18   INTELLECTUAL | 0.242 0.157 0.262 0.111 0.161 0.022 0.093 0.056 0.040 0.038 0.031 0.019 0.078 0.033 | 0.062 0.036 0.732       0.010       0.078 0.030 0.
 19   INTERNET     | 0.178 0.183 0.196 0.150 0.119 0.071 0.084 0.096 0.067 0.107 0.155 0.123 0.050 0.078 | 0.031 0.024       0.010       0.036 0.009 0.052 0.
 20   PROFESSION   | 0.103 0.135 0.122 0.079 0.050 0.077 0.016 0.072 0.055 0.011 0.031 0.011       0.018 0.129             0.036       0.015 0.026 0.
 12   LEARNING     | 0.214 0.147 0.248 0.129 0.141 0.078 0.079 0.030 0.064 0.037 0.030 0.049 0.036 0.029 | 0.079 0.041 0.108 0.078 0.009 0.015       0.114 0.
 13   RESEARCH     | 0.234 0.210 0.259 0.165 0.161 0.098 0.098 0.110 0.093 0.064 0.067 0.061 0.067 0.024 | 0.045 0.026 0.043 0.030 0.052 0.026 0.114       0.
 14   WEB          | 0.180 0.164 0.211 0.201 0.091 0.099 0.124 0.070 0.058 0.096 0.247 0.119 0.022 0.043 | 0.008 0.018 0.015 0.016 0.251 0.014 0.020 0.040
 24   EXPERT       | 0.115 0.084 0.230 0.048 0.040 0.009 0.326 0.051       0.010 0.155 0.022 0.047       | 0.087                         0.044 0.037
 25   INDUSTRIAL   | 0.323 0.150 0.209 0.151 0.129 0.010 0.103 0.044 0.004 0.018 0.039 0.019 0.027 0.022 | 0.030       0.171 0.178 0.010       0.076 0.093 0.
 26   WORKERS      | 0.153 0.180 0.274 0.094 0.096 0.042 0.080 0.095 0.021 0.039 0.076 0.030 0.022 0.035 | 0.016 0.113 0.138 0.128 0.032 0.085             0.
 27   ARCHITECTURE | 0.209 0.262 0.183 0.141 0.118 0.028 0.097 0.060 0.047 0.066 0.139 0.059 0.093 0.015 |       0.064 0.067 0.108 0.024 0.057 0.029 0.
 28   BUSINESS     | 0.294 0.184 0.262 0.182 0.147 0.015 0.133 0.117 0.052 0.039 0.112 0.055 0.064 0.050 | 0.035 0.007 0.176 0.126 0.058 0.020 0.088 0.071 0.
 29   NETWORK      | 0.189 0.151 0.216 0.197 0.130 0.047 0.080 0.062 0.051 0.036 0.552 0.047 0.026       | 0.015 0.017 0.007       0.118 0.026 0.019 0.021 0.
 30   EMPLOYEES    | 0.139 0.113 0.167 0.055 0.070 0.182 0.012 0.075 0.066 0.017 0.036 0.017 0.019 0.015 | 0.042 0.130 0.039 0.014       0.122 0.047 0.030
 31   ORGANIZATION | 0.194 0.179 0.211 0.103 0.106 0.067 0.062 0.051 0.030 0.063 0.010 0.029 0.040 0.088 | 0.070 0.014 0.011 0.011 0.011 0.041 0.166 0.158 0.
 32   MINING       | 0.239 0.175 0.204 0.160 0.106 0.036 0.119 0.040 0.045 0.063 0.074 0.051 0.713 0.050 | 0.058       0.109 0.103 0.034       0.039 0.017 0.
 33   PLANNING     | 0.177 0.114 0.156 0.138 0.086 0.066 0.146 0.021 0.032 0.025 0.036 0.052 0.036 0.023 | 0.042 0.012 0.119 0.083 0.010 0.018 0.026 0.023
 34   ACQUISITION  | 0.096 0.062 0.220 0.033 0.010 0.011 0.249 0.031       0.013 0.064 0.013 0.044       | 0.128       0.020 0.021
 35   LITERACY     | 0.123 0.261 0.146 0.087 0.065 0.089 0.070 0.125 0.110 0.138 0.024 0.089 0.087 0.077 |       0.083       0.084 0.050 0.042 0.020 0.020 0.
 36   ONLINE       | 0.136 0.210 0.143 0.149 0.094 0.076 0.060 0.332 0.120 0.096 0.078 0.167 0.150 0.013 | 0.024 0.028 0.011 0.024 0.108 0.043 0.010 0.052 0.
 37   SOFTWARE     | 0.192 0.140 0.185 0.142 0.112 0.033 0.130 0.102 0.047 0.077 0.462 0.062 0.093 0.078 | 0.036 0.011 0.034 0.054 0.072       0.015 0.013 0.
 38   COMMUNICATON | 0.197 0.195 0.229 0.111 0.177 0.048 0.079 0.099 0.040 0.041 0.061 0.037 0.063 0.009 | 0.067 0.059 0.040 0.042 0.067       0.149 0.108 0.
 39   CONGRESSES   | 0.155 0.163 0.185 0.100 0.092 0.124 0.039 0.122 0.102 0.061 0.053 0.070 0.043       | 0.063 0.117 0.024 0.025 0.037       0.011 0.045 0.
 40   INTELLIGENCE | 0.167 0.099 0.179 0.084 0.081 0.007 0.098 0.087       0.033 0.053 0.043 0.065 0.044 | 0.014 0.016 0.026 0.027 0.027       0.023       0.
 41   RECORD       | 0.237 0.140 0.115 0.158 0.073 0.019 0.088 0.078 0.046 0.043 0.015 0.100 0.024 0.019 |       0.042             0.035       0.015 0.051 0.
 42   ADMINISTRATION| 0.131 0.102 0.117 0.097 0.072 0.294 0.047 0.069 0.166 0.043 0.015 0.044 0.024 0.057 | 0.018 0.082 0.017 0.035 0.122 0.031 0.074 0.013 0.
 43   INDUSTRY     | 0.112 0.100 0.130 0.062 0.146 0.038 0.032 0.170 0.019 0.044 0.124 0.036       0.016 | 0.015       0.027 0.029 0.086             0.031 0.
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Fig 7: Core/periphery model of terms describing KM literature, 2001-2007
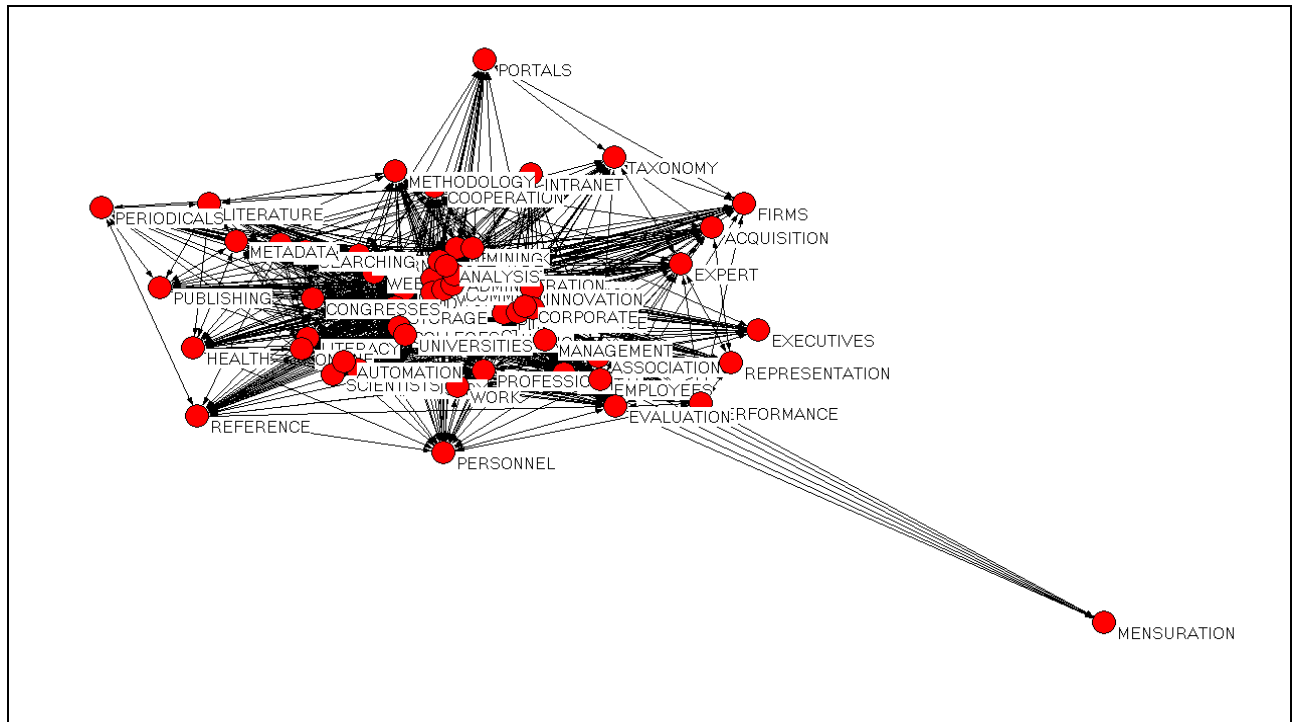
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Fig 8: Visual map of core/periphery terms describing KM literature, 2001-2007

One other emerging trend worth noting is the link between all 75 terms with each other (including knowledge management) either directly or through other terms. There was no term that was on its own, as shown in Fig 8. Fig 7 also reveals this pattern, whereby the terms that constitute the second cluster recorded normalized counts with each other, thereby filling up the empty spaces in Figures 3 and 5. As mentioned earlier on, this implies that most of the terms were introduced between 2001 and 2005 and/or increasingly grew more associated with KM over time

It was noted that during this period, most of the (sum total of) articles were published, bringing on board, we believe, new ideas from a variety of disciplines. This period alone yielded a total of 1597 articles out of the total 1826 that were published between 1981 and 2007. 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 found in Figures 7 and 8, where all the terms were inter-linked. Different technologies and tools (e.g. Intranets, institutional repositories, the 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 utilizers 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.

5.   Conclusion and recommendations

Knowledge management literature has grown remarkably since 1981, showcasing the growth of research and interest in a subject domain that is gradually being transformed into a discipline. Although the data extracted from the LISTA database indicates that KM is an old practice and, perhaps, concept, interest in KM appears to have (specifically) grown more intense in the late 90s. The growth pattern of KM literature seems to follow the pattern suggested by Crane in Jacobs (2004:211), where the growth of publications in any given subject domain would undergo four stages, namely: an initial stage where the number of publications would show signs of increasing; a growth stage wherein the number of publications would increase exponentially; a subsequent stage where there is an increased growth rate with signs of decline in productivity; and a final stage where the growth rate and absolute number of publications drop to zero. KM appears to be enjoying exponential growth at the moment, and therefore seems to be at Crane's second stage of growth.

This pattern is also demonstrated by the growth in the number and type of subject terms that describe KM literature. There are currently a total of 1046 unique subject terms, excluding KM. Each of these terms co-occurred with KM at least once. The terms that frequently co-occurred with KM, in descending order of intensity, include the following: information resources management; information science; information technology; information services; information retrieval; library science; management information systems; organizational learning; and data mining, to name a few. These and several other terms are indicative of the LIS professionals' perception/understanding of KM. It was also observed that LIS professionals view KM's scope as encompassing institutions that practice KM (libraries, information services, universities and colleges, business enterprises, archives, etc); activities or processes (information retrieval, organizational learning, data mining, electronic data processing, database searching, knowledge acquisition, information organization, documentation, knowledge representation, library automation, information sharing, classification, website development, etc); different types of management or

management functions (e.g. information resources management, industrial management, records management, information services management, database management, personnel management, document management, general resource management, and library administration); and people engaged in KM (knowledge workers, information professionals, librarians, executives, information scientists, library employees, etc) in different 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 organization of knowledge/information through services, activities and processes of knowledge-based institutions fulfilled by knowledge workers from 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: *information*, *resources*, *technology*, *library* (or *libraries*), *systems*, *information services*, *retrieval*, *computers*, *electronic*, *data*, and *storage*. All these terms play a big role in KM practices and processes in the information age. It is worth re-iterating that the three inter-related terms of *data*, *information*, and *knowledge* are among the core terms. We assume that the relationship between *data*, *information* and *knowledge* is common knowledge.

In conclusion, LIS scholars view KM as comprising mainly 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). This view is not that different from the view held by Skyrme in Gu (2004:171), who suggests 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) opine that "knowledge organization within library and information science denotes

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classification, indexing, and cataloguing applied to storage, access, and retrieval of documents in information retrieval systems". Indeed, although only 'classification' featured in 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 organization listed above. In a nutshell, KM focuses on IRM; its major functions are people and document/records management oriented; it largely involves IR processes; and the resources and systems managed are overwhelmingly IT (conduit, content, networks, etc.) oriented. We believe that a survey should be done to ascertain whether the observations made in this conclusion about KM practices, activities and processes within library and information science are valid. The findings of this study can perhaps only be validated through such a survey. Still, can informetric methods be applied to define a concept? We think it is possible.

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The development and practice of work integrated learning (WIL) in Universities of Technology (UoT's) in South Africa and Australia: a comparative study

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Abstract

The Council on Higher Education in South Africa has stated that higher education has an important role to play in the development of the country's economy. Higher education in South Africa consists of universities of technology (formerly known as technikons), comprehensive universities and traditional universities. Before technikons became universities of technology, they focused on cooperative education, which was a programme that offered students exposure to the working environment before they graduated. The terms "cooperative education" and "work integrated learning" (WIL) are often used interchangeably; this paper has opted to use "work integrated learning". Universities of technology (UoTs) are obliged by legislation (HEQF) to offer work integrated learning (WIL). The higher education qualifications framework (HEQF) also recognizes prior learning and work integrated learning. Work integrated learning has been the strong point of technikons in South Africa because it helps students when entering the job market. The study aims to investigate the development and practice of WIL in South African and Australian universities of technology (UoTs). A survey of all UoTs in South Africa and Australia will be conducted. Interviews and questionnaires (print and electronic) will be used to collect data. Because the population is large, sampling techniques will be used to select a sample for the study.

1. Introduction and Background

South African higher education institutions previously consisted of colleges, later renamed universities, and technical colleges, which were later upgraded to Colleges of Advanced Technical Education (CATEs). CATEs were eventually renamed technikons (Kraak, 2006:132). Technikons provided "skilled personnel to meet the intermediate skill needs of the national economy" (Kraak, 2006:135).

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This was possible because technikons offered curricula at National Certificate and National Diploma levels.

Following the first democratic elections in South Africa in 1994, dramatic changes were initiated in the country, and these included changes in the higher education sector. During this period South Africa needed "a single, nationally coordinated system" for higher education (Kraak, 2006:138). After many policies were formulated (e.g. National Plan for Higher Education), discussions around technikons and universities arose, leading to mergers in higher education to reduce the number of higher education institutions. Thus technikons merged with each other (such as the former ML Sultan Technikon and Natal Technikon) or with universities to form comprehensive universities (for example the University of South Africa merging with Technikon South Africa), and a number of universities merged to become traditional universities (e.g. Natal University and the University of Durban-Westville).

Prior to 1993, technikons were not allowed to offer degrees and were restricted to diploma programmes; degrees were only offered at universities. The Technikon Act of 1993 allowed technikons to award degrees, specifically Bachelors degrees, and Masters and Doctoral degrees (Winberg, 2005:193). Because technikons were increasing their degree offerings, the Committee of Technikon Principals (CTP) requested a change in status to universities of technology (National Plan for Higher Education, 2001:53). The CTP argued that: "Technikons were seen as inferior to universities; membership to international associations was denied" (Kraak, 2006:145). Technikons were officially changed to UoT's by the Ministry of Education in October 2003.

Originally, technikons provided students with an opportunity to "enter the job running". This was possible because most technikon programmes had an element of cooperative education (co-op), in other words "an apprenticeship, usually in a company for a period of up to one year" (Winberg, 2005:192). Du Pre (2009:7) confirms that experiential learning (or work integrated learning) was regarded as one of the key strengths of technikons.

Du Pré et al (2001:3), as cited by Winberg (2005:197), state the strong position of technikons with regard to work integrated learning thus:
> "Technikons have acknowledged and valued experiential learning; and have understood that students develop important knowledge and skills in workplaces. There are many good reasons to maintain experiential learning in the new universities of technology…"

It is this historical good practice of technikons with respect to work integrated learning that this project aims to investigate. If technikons were strong in cooperative education, does the same apply in the case of universities of technology?

Defining a University of Technology

Following the above, the first question would be what, then, is a university of technology? Is a university of technology the same as a technikon? What are the similarities or differences between the two? Du Pré (2009:15) states that: "It is not the use of technology within a university which classifies it as a technological university, but rather the interweaving focus and interrelation between technology and the nature of a university." Du Pré (2009:11) goes on to outline a few characteristics of a university of technology, such as: a strong corporate-orientation/focus; service to industry and the community; relevance of programmes; and the transfer of technology. Winberg (2005:198) touches on similar characteristics, arguing that: "Universities of technology have a responsibility to analyse, debate and deconstruct technology. They also need to make a contribution to the ability of society to control and manage the development of technology".

Work Integrated Learning/Cooperative Education

Cooperative education (co-op) has been part and parcel of South African higher education institutions since the 1960's (Wessels, 2006:2). The term was still in use during the researcher's tertiary education days in the 90s. Upon going back to the university in 2001, the terminology had changed to work integrated learning (WIL). Cooperative education in South Africa consists of "practicals, apprenticeship, in-service training, internships, experiential training, work-based learning and work integrated learning" (Wessels, 2006:2). Wessels (2006:3) notes that internationally, terms used to describe WIL include: "Professional practice, apprenticeship, articles, candidature, co-op, field based learning, internships or interns, job shadowing, project based learning and school-to-work". Co-op, work integrated learning (WIL) or experiential learning all seem to mean one and the same thing, although there are in fact some differences in the terminology. These differences are highlighted below under the definition of terms. The terms 'cooperative education' and 'work integrated learning' are mostly used in higher academic institutions. Most literature also uses cooperative education and work integrated learning interchangeably; in this paper, work integrated learning will be used to refer to both cooperative education and experiential learning.

Definition of Terms (Notes: should perhaps be at end of doc)

- **Co-operative education**: a philosophy of learning that promotes the concept of enhanced learning based on co-operation between education institutions and industry, commerce and the public sector (HEQC, 2004).

- **Experiential learning** (EL): defined by the Southern African Society for Co-operative Education (SASCE) as: "A component of a learning programme that focuses on the application of institutional academic learning in an authentic work-based context".

- **Work integrated learning** (WIL): defined by Groenewald (2003:350), as cited by Dhliwayo (2008:330), as: "A structured educational strategy that progressively integrates academic study with learning productive work experiences in a field related to a student's academic or career goals".

Higher Education Legislation for Work Integrated Learning
The Higher Education Qualifications Framework, Higher Education Act, 1997 (Act No. 101 of 1997) (Oct 2007)
The Education White Paper 3, "A Programme for the Transformation of Higher Education" (1997), proposed a single qualifications framework for a single coordinated higher education sector. The Higher Education Qualifications Framework (HEQF) is part of the National Qualifications Framework (NQF) and provides the basis for integrating all higher education qualifications into the NQF. HEQF (2007:9) states that:

> "Some qualifications will be designed to incorporate periods of required work that integrate with classroom study. Where work integrated learning (WIL) is a structured part of a qualification the volume of learning allocated to WIL should be appropriate to the purpose of the qualification and to the cognitive demands of the learning outcome and assessment criteria contained in the appropriate level descriptors. It is the responsibility of institutions which offer programmes requiring WIL to place students. The work integrated learning programme must be appropriately structured, properly supervised and assessed".

In light of the above, the study will also investigate the structure of WIL programmes with regard to placements, assessments and monitoring.

CHE 2004 (Nov 2004) Criteria for Programme Accreditation
The Higher Education Quality Committee's criteria for programme accreditation (2004:21) states, as criterion 15, that: "The coordination of work-based learning is done effectively in all components of applicable programmes. This includes an adequate infrastructure, effective communication, recording of progress made, monitoring and mentoring". In order for this to happen, the following (minimum) requirements must be met (a summary is provided):
- Learning contracts or agreements between the student, the higher education institution and the employer;
- Regular effective communication between the institution, students, mentors and employers involved in WIL;
- An operational system that records and monitors the regular systematic progress of students' learning; and
- A mentoring system that enables the student to recognize the strengths and weaknesses in his/her work.

The Case of Australia
Higher education in Australia is characterized by universities, self-accrediting providers and non self-accrediting providers (www.dest.gov.au). The Department of

Education, Employment and Workplace Relations (www.dest.gov.au) explains that a university is: "A body that is established as a university or recognized as a university by or under a law of the Commonwealth, a State, the Australian Capital Territory or the Northern Territory and meets nationally agreed criteria for a university". A non self-accrediting provider is: "Recognized under relevant State or Territory legislation and offers at least one course of study that is accredited as a higher education award". And a self-accrediting provider is: "A body, other than a university, whose name is included in the Australian Qualifications Framework Register as the name of a higher education institution empowered to issue its own qualifications".

Australia was chosen because UoTs have been in existence in that country since the 90s (www.curtin.edu.au). In South Africa, UoTs have only been around since 2003. Work integrated learning in Australia is followed in both universities and universities of technology, with collaborations across either set of institutions. (Notes: check interpretation) The Australian Collaborative Education Network (ACEN) was established in 2006 to fill the need for a support network for work integrated learning staff. The network is co-managed by the Australian Learning and Teaching Council (ALTC) through the Discipline Based Initiatives Scheme. This network contributes to the learning and teaching agenda in relation to work integrated learning in Australia.

Higher Education Legislation: Australia
Two main legislative documents that govern higher education in Australia will be looked into in this study, namely The Higher Education Support Act of 2003 and the Australian Qualifications Framework (AQF).
2. **The Research Problem**
Although UoTs are allowed to include work integrated learning in their programmes (HEQF, 1997:21), some programmes do not have a WIL component and there is no uniformity in terms of when WIL is offered and the length thereof. The HEQF states that it is the responsibility of the institution to place students in a work environment and to monitor their progress. There is no clear distinction as to where the monitoring needs to happen, that is, inside or outside the classroom. The researcher assumes that monitoring should be in both places.

Since 2007, the researcher has been employed as a lecturer at the Durban University of Technology (DUT) in the Department of Information and Corporate Management (Library and Information Studies Programme). The researcher also acts as the WIL Co-ordinator for third year students. This portfolio requires lecturers (Notes: or the coordinator?) to develop students' skills before placements, liaise with potential host institutions, conduct placements, and assess the students.

Reasons for this study are listed as follows:

- The researcher has encountered challenges when placing students for WIL (for example the amount of time spent securing placements, number of students to be placed, visits, etc.) and would like to investigate whether similar situations occur with other WIL coordinators in South African and Australian UoT's.

- Co-operative education provided technikon graduates with an opportunity to immediately enter the job market because of exposure to the work environment prior to graduation in their programmes. When technikons achieved university status in 2003, some kept WIL in their programmes, while others discarded it. It is this difference (WIL inclusion or exclusion) within programmes and academic departments that the researcher aims to investigate.

- The study will also investigate assessment strategies used for WIL and the role of cooperative education departments in higher education institutions with regard to WIL. Furthermore, the investigation will compare what is being done in other universities of technology in SA and in Australia in order to document best practices for South African UoT's.

Ultimately, the study will propose a WIL model for South African UoT's and make recommendations that would hopefully change the Department of Education's approach. Work integrated learning is not funded by the Department of Education, even with the extra responsibilities put on institutions to place students for WIL. The study will also provide implementation guidelines for programmes within UoT's that still do not have WIL.

3. Objectives of the study

The study's objectives are as follows:

- To check the extent to which universities of technology in South Africa comply with legislation (the HEQF) with regard to WIL.
- To investigate WIL practices in terms of placements, monitoring, assessments, documents and challenges in South African and Australian UoT's.
- To ascertain the role of cooperative education departments with regard to WIL.
- To identify and document best practices in South African and Australian UoT's.

4. Research questions

- What percentage of academic programmes in South African and Australian UoT's have a WIL component?
- How many programmes in South African UoT's comply with the HEQF?

- What is the practice of work integrated learning with regard to placements, monitoring and assessments of WIL?
- What is the role of cooperative education departments in WIL?
- What are the best practices for WIL in South African and Australian UoT's?

5. Research Methods and Data Collection

5.1. Population

According to Welman, Kruger and Mitchell (2005:52), a population is the main object of study and can consist of individuals, groups, organisations, human products and events or conditions to which they are exposed. The authors also define a population as: "A full set of cases from which a sample is taken". The population will consist of all the academic departments in South African and Australian UoTs, cooperative education departments, and the academic heads of all the programmes.

The South African Technology Network (SATN), which is the umbrella body for UoT's, lists the following as founder institutions: the Cape Peninsula University of Technology (CPUT), the Central University of Technology (CUT), the Durban University of Technology (DUT), Tshwane University of Technology (TUT), Vaal University of Technology (VUT), and Mangosuthu University Technology (MUT); these will form the population of the study. The Australian Technology Network of Universities (ATN) was consulted to find Australian UoT's. ATN lists both universities and universities of technology, but the researcher will concentrate on UoT's only, specifically the Curtin University of Technology, University of Technology Sydney, and the Queensland University of Technology.

5.2. Sampling

Sampling is divided into probability sampling and non probability sampling. Probability sampling includes simple random sampling, stratified random sampling, systematic sampling and cluster sampling, while non-probability sampling includes accidental sampling, quota sampling and purposive sampling (Welman, Kruger and Mitchell, 2005:52).

Because the study aims to gather data from UoTs in both South Africa and Australia, and because it will cover all the academic departments in all the selected institutions, sampling is necessary to adequately represent this large population and allow for the subsequent generalization of the findings. (Notes: check interpretation) In research, it is important to ensure that the sample is representative of the entire population and that everyone stands an equal chance of inclusion. This study will use probability sampling.

5.3. Data Collection Instruments

There is a wide range of data collection techniques that a researcher can use for his/her research. In this instance, the researcher will employ questionnaires and interviews as data collection techniques.

5.3.1. Questionnaires

Self-administered questionnaires will be posted or e-mailed to all the Heads of Departments (HoDs) in the six UoTs in South Africa as well as in Australia to gather information on the status of WIL within their academic departments. Other questionnaires will be posted or e-mailed to people who are responsible for co-ordinating WIL in their programmes. Both open-ended and closed/scaled questions will be used in the questionnaire. A brief background of the study and clear instructions on how to respond to the questionnaire will also be provided.

5.3.2. Structured interviews

Directors of the co-operative education departments in the six institutions will also be interviewed using an interview schedule. These interviews will solicit views and opinions on the role and function of co-operative education and also determine the extent to which academic programmes are requesting or getting assistance from these departments. Structured interviews will also be conducted at the Australian UoT's when they are visited for this study.

5.3.4. Pre-testing the Questionnaire

There is always room for error when designing a questionnaire, and pre-testing allows the researcher to administer the questionnaires before the actual survey to gain comments, test how the questions are structured, and test the length of the questionnaire. Babbie (2001:244) cautions that pre-testing "can be to a group of friends, but rather it should be given to people who will find it relevant and be able to provide the researcher with adequate information".

5.4. Analysis of Data

The Statistical Package for the Social Sciences (SPSS) will be used to analyse data. Data will be presented in tables and graphs.

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