

**AN INVESTIGATION INTO THE EFFECT OF
THE WORLD WIDE WEB ON THE CITATION
BEHAVIOUR OF MASTER OF INFORMATION
STUDIES STUDENTS AT THE UNIVERSITY OF
NATAL DURING THE PERIOD 1996 TO 2002**

by

Elizabeth Conceição Garça Thompson
BA. HDLS (AUDIS)

Supervisor: Dr Patrick Ngulube

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Work), in the Information Studies Programme, School of
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DECLARATION OF ORIGINALITY

The author hereby declares that the contents of this dissertation, unless specifically indicated to the contrary, are her own work, and that the dissertation has not been submitted simultaneously or, at any other time, for another degree.

Elizabeth Conceição Garçia Thompson

Signature:

A handwritten signature in black ink, appearing to read 'E. Thompson', is written over a horizontal line.

Date:

15.12.03

ABSTRACT

Described as accommodating both traditional and new information spaces (Fourie 2002: 53), the Web has significantly changed the milieu of research and study. The study determined how this changing research and study environment has affected the research behaviour of students in African higher education environments, specifically at the research entry level of master's degree programmes.

The study examined both explicit examples of the affect of the Web on students' citation behaviour and tacit influences that may have determined the extent of this affect. Explicit examples of the affect of the Web were drawn from analysing changes in the citation patterns of Master of Information Studies (MIS) theses during a period of access to the Web, and specifically in the years 1996, 1999 and 2002. Tacit influences on students' citation behaviour were inferred from an investigation of the level and nature of MIS supervisors' use and support of the Web for research and of a background study of the facilities, resources and services supporting student access to the Web at the University of Natal, Pietermaritzburg.

Findings of this study concluded that the use of the Web medium has grown and in 2002 accounted for 17.5% of all citations included in MIS bibliographies. However use of this medium is disparate with a few bibliographies accounting for much of this growth. Findings indicated that the Web medium was mostly utilised for the delivery of sources that do not meet the traditional description of a scholarly source. The study also found that the Web was used as an alternative medium for the delivery of informal and grey literature sources without necessarily increasing the level of use of these sources. The study revealed greater support for this medium from the masters programme's supervisors than was evidenced from a citation analysis of the bibliographies of theses. Disparities in the support of this medium for research, within the

University of Natal, Pietermaritzburg's supporting infrastructure was also observed.

Recommendations drawn from these conclusions include the need for greater intervention from teaching faculty, librarians and the institution in the provision of clear guidelines of expectations, relevant instruction and sufficient physical access at points of expertise, to effectively support the use of Web resources.

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A special thank you to young Calvin and Ashleigh Koster for undertaking the very tedious task, of photocopying the bibliographies of forty-six theses for their aunt.

A special thank you to my family, who have encouraged and supported me throughout the year and have tried to help make the load less heavy; and an apology to my sons who have had to watch a lot more television than was altogether healthy.

DEDICATION

This thesis is dedicated to my husband Dean and to our sons.

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LIST OF ACRONYMS AND ABBREVIATIONS

.ac	Academic (WWW generic domain name)
ACRL	Association of College and Research Libraries
ALA	American Library Association
ANL	Australian National Library
ARL	Association of Research Libraries
ASGF	Australian Subject Gateways Forum (ANL)
AUDIS	Advanced University Diploma in Library and Information Studies
CD-ROM	Compact Disk with Read Only Memory
CLIR	Council on Library and Information Resources
.com	Commercial (WWW generic domain name)
CTP	Committee of Technikon Principals
DoE	Department of Education, Republic of South Africa
DLF	Digital Library Federation
.edu	Education (WWW generic domain name)
EIS	Electronic information services
ESAL	Eastern Seaboard Association of Libraries
ESATI	Eastern Seaboard Association of Tertiary Institutions
FHMS	Faculty of Human and Management Sciences (UNP)
.gov	Government (WWW generic domain name)

HEFC	Higher Education Funding Council (UK)
HBI	Historically Black institutions
HBU	Historically Black university
HEFC	Higher Education Funding Councils (UK)
HEIST	Higher Education Inter-Networking Solution with Telkom (TENET)
HWI	Historically White institutions
HWU	Historically White university
IADP	Internet Access Development Program (TENET)
ICT	Information and Communications Technology
IFLA	International Federation of Library Associations and Institutions
IS	Information Studies (Department of FHMS, UNP)
ISP	Information Studies Programme (FHMS, UNP)
ITD	Information and Technology Division (UN)
JANET	Joint Academic Network (UK)
JISC	Joint Information Systems Committee (UK)
LIS	Library and information science or service
LISA	Library and Information Science Abstracts
LTSN	Learning and Teaching Support Network (University of Bristol, UK)
MIS/M.I.S.	Master of Information Studies (offered by UNP)
NCHE	National Commission on Higher Education

OPAC	Online Public Access Catalogue
.org	Organisation (WWW generic domain name)
RSA	Republic of South Africa
SABINET	South African Bibliographic and Information Network
SAUVCA	South African Universities' Vice Chancellors' Association
SPARC	Scholarly Publishing and Academic Resource Coalition
SPSS	Statistical Package for the Social Sciences
TENET	Tertiary Education Network (RSA)
UCT	University of Cape Town
UN	University of Natal
UNLP	University of Natal Library, Pietermaritzburg
UNP	University of Natal, Pietermaritzburg
UK	United Kingdom
URL(s)	Uniform Resource Locator(s)
USA	United States of America
VAT	Value added tax
VCR	Vice Chancellor's Report (UN)
WGLIT	Working Group on Library and Information Technology (NCHE, RSA)
WWW	World Wide Web

CHAPTER ONE:INTRODUCTION TO THE STUDY

Through research and the production of knowledge, higher education provides a society with the capacity to innovate, adapt and advance (DoE 1996).

That the Internet facilitates an increasingly important information resource and research tool in the form of the World Wide Web (WWW) is not contested and has rather been met with enthusiasm. Some have gone so far as to describe it as a "repository of human knowledge and culture," (Baeza-Yates and Rebeiro-Neto 2000). Local academics have recognised the importance of the Web, and Kaniki (1999) ascertains that:

The potential role and use of the Internet in the provision of information services for both research and study in South Africa's tertiary institutions is no longer a highly debatable issue.

Described as accommodating both traditional and new information spaces (Fourie 2002: 53), the Web has significantly changed the milieu of research and study. In addition to providing a new medium to communicate traditional sources of information, the Web has introduced powerful finding aids in the form of search engines, subject directories, guides and gateways. It has and continues to mould new types of information sources, including scholarly and informative Web sites and documents. It has contributed significantly to informal scholarly communication, through the availability of discussion lists and forums, the growth of electronic pre-prints databases and other previously difficult to locate grey sources. Moreover, Web-based services, such as academic library portals that integrate links, references, print and electronic sources, databases and access protocols; redefine the role of the academic library.

Acknowledging this new research environment is the growing body of literature, surveying Internet use amongst different information seeking groups

in academic environments (Mugwisi and Ocholla 2002: 144) and studies that confirm the impact of the Internet on scholarly communication (Thelwall 2002: 413). Particularly indicative, are current initiatives that redefine the concept of a scholarly publication and attempt to absorb the new and emerging formats available on the WWW (Halliday 2001). Moreover, initiatives and projects that provide more affordable and free access to scholarly sources, and attempt to challenge the stranglehold of commercial publishers on scholarship, have been inspired and are based on the Web medium (Cronin 2001b).

In spite of this the Web has serious disadvantages as a research tool and these are well documented in the literature (Wachbroit 2001). Researching on the Web requires some level of computer and information retrieval skills. Intrinsic to the very nature of the Web, is the lack of organisation. There is no universal catalogue to identify and retrieve a particular piece of information and the best search engines only capture a portion of the Web (Baeza-Yates and Rebeiro-Neto 2000). The Web is a self-publishing medium and the usual checks, specifically peer review, that exist between the writer and the reader may be missing. Moreover, and of concern to scholarly communication, the Web lacks stability and continuity with sites changing, moving or disappearing altogether (Wachbroit 2001).

1.1 The problem

1.1.1 Description of the problem

Of interest to the current study is how this changing research and study environment has affected the research behaviour of students in African higher education environments, specifically at the research entry level of master's degree programmes. A point of reference, are bibliometric studies conducted in post-industrial countries that measure changes in students' information seeking behaviour with the advent of, and access to, the Web (Davis 2001, 2003; Oppenheim and Smith 2001; Jenkins 2002; Grimes and Boening 2001). Findings of these studies indicate changing patterns in the level of use of different types of information sources and an increase in the use of online

resources. An accompanying concern, expressed by teaching staff and librarians, and explored by these studies, is that of the subsequent research quality. This is specifically investigated and expressed in terms of students' indiscriminate use of non-scholarly resources.

A significant observation in these and other related studies (Jenkins 2002, Davis 2001; 2003; Rowley 2002; Urquhart 2003) is that students' information behaviour is largely determined by teaching faculty's expressed expectations and interventions. In the absence of this, related studies (Grimes and Boening 2001; Leckie 1996; Herring 2001) have observed the gap between teaching faculty's expectations and students' information behaviour.

While these studies have focussed on undergraduate information behaviour in post-industrial tertiary environments, they nevertheless provide a useful vehicle to measure the impact of the WWW on the information and research behaviour of research-entry students in African higher education environments.

The African context provides an interesting backdrop to this investigation, specifically in light of a perceived importance of the Internet for research and study (Kaniki 1999; Mugwisi and Ocholla 2002; Ehikhamenor 2003) and given the limited physical collections, limited access to the Internet (Rosenberg 2001; Sturges and Neill 1998) and poorer information literacy standards (Walker 2001, De Jager and Nassimbeni 2002). This context should also uniquely inform faculty and librarians' support of the Web for research.

Adopting a bibliometric method, the current study investigated changes and emerging trends in the information seeking behaviour of African postgraduate students, specifically as reflected in the citation patterns of Master of Information Studies (MIS) students at the University of Natal, Pietermaritzburg (UNP). To this end a post facto analysis of the bibliographic citations of MIS

theses, compiled in a period of time in which access to, and use of the WWW was introduced and developed was undertaken.

To contextualise the investigation, external determinants that may have influenced the extent of the Web's affect on students' citation behaviour were also investigated. This included a survey of the Information Studies (IS) faculty responsible for the supervision of the MIS programme, specifically their use and support of the Web for research. In addition, findings of the bibliometric analysis were positioned against a background study of the UNP's facilities, resources and services supporting student access to the Web.

1.1.2 Problem statement

The current study examined both explicit examples of the affect of the Web on students' citation behaviour and tacit influences that may have determined the extent of this affect. Explicit examples of the affect of the Web were drawn from measuring and evaluating changes in citation patterns of MIS theses during a period of access to the Web. Tacit influences were inferred from an investigation of the level and nature of MIS supervisors' use and support of the Web for research and of a background study of the facilities, resources and services supporting student access to the Web.

To this end the study determined specific physical phenomenon in the bibliographies of MIS theses and posed the following research questions:

1. How has the level and range of use of traditional print formats changed in a period of access to the Web?
2. What is the growth in the level of use of the online medium for the delivery of full-text information formats during the period under study?
3. Have bibliographies grown in size during the period under study?
4. Do cited Uniform Resource Locators (URLs) point to the correct document?

5. What proportion of students' online citations may be categorised as non-scholarly?
6. What is the level and nature of MIS supervisors' use of Web resources for their own research?
7. What are the expectations and preferences of MIS supervisors in regards to the use of the Web by their master's degree students for research?
8. What changes have MIS supervisors perceived in the citation behaviour of students under their supervision?

1.2 The study

1.2.1 Objectives of the study

Objectives of the study were:

- To assess whether a period of access to the Web has affected the citation behaviour of postgraduate students in an African higher education environment.
- To determine the extent of the Web's affect on students' citation behaviour by measuring and comparing the level of use of different types of formats and sources; determining the growth in the use of online sources; and determining changes in the overall size of bibliographies.
- To assess the affect of the Web on the quality of research behaviour, specifically in terms of the level of use of non-scholarly online sources and the stability of cited URLs.
- To assess MIS supervisors' support of the Web for research, specifically in terms of their own use and their expectations and preferences for their students' use, of this environment.
- To determine an African educator's perspective of the use and affect of the Web on postgraduate research.
- To isolate possible determinants of MIS students' citation behaviour, specifically their use of the Web, in terms of a survey of MIS supervisors and against a background of the facilities and services offered by the UNP.

- To make recommendations on the basis of information gathered and in light of a review of the relevant literature.

1.2.2 Justification for the study

Local and regional empirical studies investigating Internet use in African academic environments, including the research conducted by Mugwisi and Ocholla (2002), Ehikhamenor (2003) and Kaniki (1999), remain largely at a survey level, identifying perceptions rather than measuring actual use. Factors that affect students' use of electronic information sources including the WWW, have also been surveyed (Davis 2000) and explored at a conceptual level. Of note are the prescriptive theories of information seeking and retrieval behaviour employing a cognitive paradigm approach (Ingwersen 2000; Cosijn 2000; Thompson and Cronje 2001; Nel 2001).

While there is evidence of African scholars and their institutions adopting, either through individual initiatives or through regional and international support, information and communication technologies (Mugwisi and Ocholla 2002: 145) and of academic libraries championing this movement (Rosenberg 2001: 15), and moreover, supporting the assimilation of Web sources in acquisitions policies (Geslin 2002a; b; c), it is apparent that greater quantitative research data determining how students are performing in this new research environment is required (Mugwisi and Ocholla 2002: 144).

While the population of the current study is likely to enjoy a level of information literacy, an assessment of the affect, or lack thereof, of the WWW on citation behaviour, may reveal the existing levels of network literacy. Indeed surveys of librarians in local higher education institutions conducted by Kaniki (1999) and Mugwisi and Ocholla (2002) report a need for greater training in the use of the Internet.

As a method, citation analysis of library users' research output has traditionally been used to assess libraries' collection development policies

(Kelland and Young 1998; Smith 1981). Specifically, citation analysis may indicate information sources not owned by the library but of potential high use (Kelland and Young 1998: 62-63) and accordingly the converse. An analysis of MIS bibliographies during the period under study may help inform the inclusion of the Web medium in the University of Natal, Pietermaritzburg Library's (UNPL) acquisition policy.

Juxtaposing an assessment of MIS supervisors' support of the Web, specifically how they expect their students to use the Web for research, with an analysis of students' citations, may inform future interventions. Likewise, positioning a citation analysis of postgraduate research output, against a background study of the UNP's facilities, resources and services supporting access to the Web, may inform the levels of adequacy of this infrastructure.

Finally the findings of this study, given the context, should deliver a general assessment of the level of diffusion of information and communication technologies, specifically the Internet, in an African learning environment and contribute to the digital divide debate.

1.2.3 Assumptions of the study

The assumption of this study was that, given the nature of the discipline, the analysed citations are compiled by an information and library literate group who have the necessary skills to select and locate information resources and who follow standard citation and referencing styles.

Related to the foregoing assumption was that given the nature of the profession, this group should have greater access to the Internet, through their place of work, or at the very least, through a "historically advantaged" university (Aitchison 1998).

It was also assumed that students took advantage of ICT facilities and resources, first provided by the university library and the Information and Technology Division (ITD) of the University of Natal in 1996.

An overall assumption of the current study was thus, that an analysis of MIS students' thesis citations should have a reasonable potential to reveal the affect of the WWW on the information behaviour of research entry students in an African environment.

A final assumption of the current study was that both the UNPs' infrastructure supporting student access to the Web and MIS supervisors' support of the Web for research, were possible determinants of the extent to which the Web affected students' citation behaviour.

1.2.4 Limits of the study

To minimise the barriers in the use of the Internet, most obviously those of the lack or limited access to Internet facilities and information literacy levels (Kaniki 1999), the bibliographic citations of MIS theses were chosen as the units of analysis for this study.

This is a small and unique population group, and this may compromise the study's general validity. Findings however should contribute to the user studies' knowledge base, specifically literature investigating the effects of new technologies on information seekers and further, may provide comparative data for related research.

The current study adopts a normative approach to an evaluation of students' citation behaviour and limits its investigation of possible external determinants to the following:

- The time-frame 1996 to 2002, in which access to Web facilities and resources was first introduced and developed.
- A survey of MIS supervisors' support of the WWW for research.
- Background study of facilities and resources on the UNP campus that supported access during this period.

The current study does not adopt an interpretive approach in assessing students' citation behaviour, and accordingly does not take into account students' particular circumstances, their academic performance or the subject of their theses, in evaluating the choice and level of use of information sources.

The survey of MIS supervisors' information behaviour was preliminary and limited to determining a perceived use and support of the WWW for research by this group. Further study on the level of actual use and interventions in supporting the Web for research is required.

The background study on facilities and services supporting student access to the Web on the UNP campus was focussed on establishing a context for the bibliometric analysis and more research is required in determining the efficacy of this infrastructure.

The criteria for identifying and categorising formats and sources were based on traditional definitions of a scholarly publication. In terms of online sources, current definitions of a scholarly source, including the stability of URLs was applied.

1.2.5 Definitions of terms used in the study

The following concepts are defined in terms of their importance to the current study and help to set the parameters for the investigation. Terms and concepts relating to methodologies will be further explored in the literature review and in the chapter on research methodology.

Bibliometrics and the derived librmetrics, scientometrics and informetrics, and more recently Webometrics fields, purport to establish the “frequencies with which events of specified types are observed to occur, which (once expressed as ratios of the total number of observed events) may be considered as probabilities of occurrence” (Borgman and Furner 2002:4).

Citation defined as “a reference to a text or part of a text, identifying the document in which it may be found, or the format of such a reference, which typically includes the author, title and bibliographic description of the document” (Prytherch 2000: 70). From a normative point of view, a citation, or reference to another information source, is used to support the citing author’s argument or as an authority for a statement of fact (Garfield cited in Jacobs 1998: 48).

Citation analysis is a method of inquiry “based on the principle that articles citing the same references also have much of their content in common” (Osinga cited in Hertzfel 1987: 190) and that area of bibliometrics that measures the relationship between cited documents and citing documents (Smith 1981). A citation analysis method may employ various techniques and products to determine relationships between documents, including citation counts, as in the case of the current study.

Citation behaviour. A normative approach to citation behaviour determines standard reasons for why citers behave in the way they do. More recent and interpretive approaches attempt to establish and assess through observation or questioning, individuals’ motivations for citing particular documents and to this end attempt to isolate “those factors, influences, reasons, criteria, or sometimes even “determinants” that lead (or that are perceived to lead) linkers to behave, judge, decide, act, and thus link in the ways that they do” (Borgman and Furner 2002: 11).

Grey literature is described as "that which is produced on all levels of government, academics, business and industry in print and electronic formats, but which is not controlled by commercial publishers" and may include the following types of materials:

Reports (pre-prints, preliminary progress and advanced reports, technical reports, statistical reports, memoranda, state-of-the art reports, market research reports, etc.), theses, conference proceedings, technical specifications and standards, non-commercial translations, bibliographies, technical and commercial documentation, and official documents not published commercially (primarily government reports and documents) (NYAM 2003).

Higher education is distinguished as "education at universities or similar educational establishments, especially to degree level" (Pearsall 2002: 670).

Information literacy, described by the American Library Association (ALA 2003) as:

- The ability to access information efficiently and effectively.
- The ability to evaluate information critically and competently.
- The ability to use information accurately and creatively.

Information seeking behaviour is described as "any activity of an individual that is undertaken to identify a message that satisfies a perceived need" (Krikelas cited in Davis 2000: 57).

Network literacy, defined by Savolainen (2002: 223-4), as the mastery of four areas, namely:

- Knowledge of information resources available on the Internet.
- Skilful use of ICT tools to access networked sources.
- Judgement of the relevance of information.

- Use of computer-mediated communication tools.

Non-scholarly sources. For the purpose of this study this refers to sources that do not follow the conventions of scholarship and whose main objective is to inform, advocate, advertise, sell and entertain. Archetypal examples of formats of these sources include magazines and newspapers both in a print and electronic medium.

Non-traditional sources. For the purpose of this study these refer to online documents that may or may not observe the conventions of scholarship but that cannot be described in terms of traditional print formats. Formats of these sources include Web documents and correspondence of scholars, researchers, professionals, institutions and organisations.

Peer review/ Refereed. The “the process by which a learned journal passes a paper received for publication to outside experts for their comments on its suitability and worth” and generally “an examination or review of commercial, professional, or academic efficiency, competence, etc, by others in the same occupation” (Simpson and Weiner 1989: 437).

Pre-prints / e-prints are draft versions usually of a scholarly or scientific article that are made available ostensibly before publication in a journal. The status may be different and some pre-prints are already reviewed and/or accepted for publication while others are being circulated to obtain comments. E-prints refers to electronic versions available online and usually from specialised e-print databases.

Portal. “In the library community, [portals] may be defined as an amalgamation of services to the patron where the amalgamation is achieved through seamless integration of existing services by using binding agents...the result is a personalised service which allows the individual to access the rich content of both print-based and electronic systems” (ASFG 2003).

Postgraduate student described as “a person studying for an award above that of an initial or bachelor’s degree. In South Africa this may take the form of a diploma or a higher degree at honours, masters or doctoral levels.” (Aitchison 1998: 3). This term is used inter-changeably in the literature with the term “graduate.”

Reference. The terms reference(s) and citation(s) and the phrases bibliographic citation(s) and bibliographic reference(s) are used interchangeably in the literature. A useful delineation of the relationship is “a reference is the acknowledgement that one document gives to another; a citation is the acknowledgement that one document receives from another” (Smith cited in Hertzfel 1987: 191).

Scholarly activity is evidenced by “the discussion of relevant literature, an awareness of the history of antecedents of work described, and a format which allows a reader to trace sources of the work through citations, footnotes etc.” (D’Sylva 2003).

Scholarly communication describes the process by which scholars, in any field, “use and disseminate information through formal and informal channels.” (Borgman cited in Halliday 2001). In a traditional print environment formal channel have referred to public and permanent records of information and informal channels, to the sharing of information in more ephemeral ways including face-to-face discussions (Feather and Sturges 1997: 409). The Web as a publishing medium has blurred the distinction and previous examples of informal communication fulfil the description of formal scholarly communication.

Scholarly publishing refers to the communicating of scholarship within a community. This community has been extended and coexists in both print and online environments. Criteria, available in the literature, for identifying sources that fulfil the objective description of a scholarly publication are largely based on traditional print criteria but acknowledge the fluidity of the online environment.

Subject gateway. “A website that provides searchable and browsable access to online resources focused around a specific subject...resource descriptions are usually created manually rather than being generated via an automated process” (ASFG 2003).

Traditional scholarly sources. For the purpose of the current study these are categorised as traditional formats of formal and informal scholarly communication, which observe the conventions of scholarship and that continue to meet the objective criteria of a scholarly publication. Examples of traditional scholarly formats available in either or both print and online environments, include books, chapters in books and journals; and also previously ephemeral and informal outputs of traditional scholarly communication, for example, theses and dissertations, conference proceedings, research reports and papers, and scholarly correspondence.

Thesis. “A product of a scholarly and professional study at master’s degree level by a graduate [post-graduate] student; usually a document in a format and style specified by a particular university” (Mauch and Birch cited in Kaniki 2000: 40).

User studies. “Research projects, surveys or questionnaires carried out to determine what users want from a service, how they seek information, whether existing services provide adequate responses, and how improvements or new services could be targeted (Prytherch 1995: 666).

1.2.6 Structure of the study

The first chapter has described the research problem and identified the purpose and parameters of the study. The second chapter will position the study within a general description of the context, specifically resources, facilities and programmes offered by UNP. Chapter Three includes a review of the relevant literature specifically appertaining to bibliometrics, citation

analysis and behaviour studies. The research methods used for this study are described in Chapter Four and the results are analysed and presented in the fifth chapter. Chapter Six summarises the results, provides conclusions and suggests recommendations. Bibliographic references, including cited works, are followed by appendices and are positioned at the end of the document.

1.3 Summary

The introduction has covered the research area and identified the specific research problem addressed by the study. The purpose, justification and the assumptions as well as the scope of the study have also been presented. Definitions of terms and concepts used by the study and the structure of the study have been provided.

CHAPTER TWO: BACKGROUND AND CONTEXT OF THE STUDY

2.0 Introduction

Central to an investigation of the affect of the Web on students' citation behaviour is obviously the issue of access. Common barriers affecting the level of access, reported in recent surveys investigating Internet use in African academic environments (Ehikhamenor 2002; Ocholla 1999; Mgobozi and Ocholla 2002), include limited physical access, slow connection speeds and poor information and computer literacy skills. Other barriers or enablers that may specifically determine the nature of access, include the availability and promotion of information resources, the responsibilities and interventions of supervisors and the nature and expectations of academic programmes (Ocholla 1999; Davis 2003; Urquhart 2003; Rowley 2002).

Given that the Master of Information Studies (MIS) programmes continue to be based on a contact relationship and accordingly, that supporting resources should be available at the hosting campus, the following background study is limited to the University of Natal's Pietermaritzburg campus, and to a time period in which access to the Web was first introduced and developed.

The following aspects of access are investigated:

- The level and nature of public or in this case, student access to physical resources, including computers and information resources.
- The existence and nature of relevant supportive services, namely, information literacy courses and library instruction programmes.
- The nature and expectations of the Information Studies (IS) master's degree programmes, the responsibilities of supervisors and certain attributes of candidates.

2.1 Physical resources

Davis (2003: 41) attributes the change in students' citation behaviour to the wiring or connecting of the North American college campuses, and concludes a relocation of information gathering behaviour from the library to the computer laboratory and dormitory room. While the latter is yet to be documented, it is evident that in the case of the UN, computer laboratories are accommodating students' research activities and provide the bulk of access to the Web.

2.1.1 Quantity in access

The University of Natal's Information Technology Division (ITD) purports to transform the role of information technology specialists in higher education, from mere "passive providers" to "active partners, enablers, facilitators, and capacity builders" (ITD 2003a). The ITD is responsible for the wiring of the University of Natal's campuses and provides student access to the resulting network, including, and of interest, library databases, Web and e-mail facilities (ITD 2003b).

Fledging access to the Web was initially introduced by the ITD in 1996 and four terminals were available for student use on the Pietermaritzburg campus (Naidoo 2003). In 1999 facilities were upgraded and the number of terminals were increased, at present a total of 358 Personal Computers (PCs) are available and are accessible in the various Personal Computer (PC) laboratories scattered throughout the campus (Naidoo 2003). Two of these laboratories are reserved exclusively for the use of postgraduate students. Most of the computer laboratories are open 24 hours a day and are all equipped with printing facilities (UN 2003). Training or support in the use of Web resources, is not provided for by the staff of these laboratories (ITD 2003b).

Additional, if limited, access to the WWW is provided by the University of Natal Library, Pietermaritzburg (UNLP). The UNLP's Main Library avails four

computers for searching online databases that the Library subscribes to. The workstations are also used for searching CD-ROM databases but no other activity, including searching free Web sources is sanctioned. The two school-based libraries, Life Sciences and Law provide a further two workstations each for access to Web resources. The amount of PC workstations has remained more or less static during the period under study. Use of and access to these facilities is available during the Library's opening hours and is controlled through a manual booking system. The bulk of access to Web resources, both subscription based and free online resources, is thus not positioned at points of expertise.

2.1.2 Quality in access

UNLP annual reports (1996, 1997, 1998, 1999, 2000) describe the sluggish response rates of the Internet as a major barrier in the purchase or promotion of online information resources. These and other issues of Internet connectivity, have, however, received much attention on a local and regional basis, most notably through the UN's membership of the Tertiary Education Network (TENET). An association founded in 2000 by the Committee of Technikon Principals (CTP) and the South African Universities Vice Chancellors' Association (SAUVCA). The purpose of this association is to develop efficient and cost-effective deployment of Internet and IT services at SA universities and technikons (Martin 2003).

Initiatives administered by the TENET include the Higher Education Inter-Networking Solution with Telkom (HEIST) and the funding of additional bandwidth through the Internet Access Development Program (IADP) (Greaves 2003). The UN has benefited on this front and in 2001, the head of the ITD technical services, Farouk Docrat, boasted of ample bandwidth and that the UN was the "only university in South Africa with a 4MB line " (Novell 2001). In addition, faster connecting speeds are offered through a premium Internet service agreement with Telkom (ITD 2003b).

The issue of quantity and quality in access to the Internet was highlighted by the UNLP in 1998, "... poor Internet connections and the problem of student access to computers mean that a radical change to electronic format is not yet feasible" (UNLP 1998: 21). However it appears that the library has benefited from recent improvements, specifically the faster premium service offered by Telkom and the growing list of Web resources available on the UNLP Web site are directly attributed to the improvement in the quality of Internet access (Kühn 2003).

2.2 User education

Despite the current study's assumption that MIS students enjoy some level of information and library literacy, these skills continue to be shaped and determined by available approaches to information literacy and library user education. Moreover with constant changes in the handling and presentation of information the library remains responsible for updating the knowledge and skills of this group of students.

User education is defined as programmes of " information provided to users, to enable them to make more efficient and independent use of the library's stock and services" (Feather and Sturges 1997: 454 cited in Mpendulo, Adams, Pienaar and Rawlins 1999: 36). Related activities may include "library tours, lectures, seminars, programmed learning, audio visual tools, printed material, exercises and other possibilities" (Mpendulo, Adams, Pienaar and Rawlins 1999: 36). Information literacy on the other hand, is not resource or service specific and is defined as the ability to recognize the extent and nature of the information need, and to locate, evaluate, and effectively use information. Issues of copyright and plagiarism are also understood by the information literate (ACRL 2003).

To what extent the role of academic libraries should include teaching information literacy skills is not always clear (Gentil 1999). Some authors on the subject feel that information literacy programmes involve a number of

activities beyond the library's sphere (Mpendulo, Adams, Pienaar and Rawlins 1999). There is however, evidence of a growing support for the library's formal participation in the transfer of information literacy skills (De Jager and Nassimbeni 2002). A possible reason for this may be as Radar (cited in Buchanan, Luck and Jones 2002: 148) ascertains that,

librarians are emerging within the university as leaders in the electronic information environment where new formats of information and knowledge are beginning to have impact on learning, teaching and to some extent research.

In South Africa, a number of library related initiatives, including the Research, Education and Training Interest Group (RETIG) of LIASA, have sought to benchmark information literacy standards at South African tertiary institutions (De Jager and Nassimbeni 2002). Information literacy programmes proposed by the ACRL (2003) and supported locally (De Jager and Nassimbeni 2002) should be context specific, integrated into curricula, have administrative and institutional support, and involve the collaboration of faculty staff and librarians.

Further along the continuum of the required skills for a Web environment is that of network literacy or competency proposed and defined by Savolainen (2002: 223-4) as the mastery of four areas, namely,

- Knowledge of information resources available on the Internet.
- Skilful use of ICT tools to access networked sources.
- Judgement of the relevance of information.
- Use of computer-mediated communication tools.

The UNLP librarians' offer a number of programmes during the course of the academic year, these include: orientation tours; instruction on the use of the computerised catalogue; subject-specific library instruction courses and instruction and demonstration of various electronic and online databases. This latter activity includes demonstrations on the use of the various CD-ROM

databases, SABINET and EBSCOhost online databases, and the Library's Website.

In addition the UNLP boasts two credit-bearing library instruction courses namely, the Information Retrieval Skills AGRI 220 module and the Legal Method II course. The Legal Method programme introduces second-year law students to resources relevant to their area of study (Langley 2002). The AGRI 220 course is directed at second year students in the Faculty of Science and Agriculture (UNLP 2000) and includes the introduction to the Library's computerised catalogues and the use of abstracts and indexes (Krige 2001: 6).

The annual reports of the UNLP continue to express the importance of user education programmes and define the aim of such programmes as making "all students self sufficient in appropriate bibliographic and information retrieval skills dependent on level of study [and] bearing in mind the lifelong learning component of a tertiary education" (UNLP 2000). The need to emphasize a "problem solving" approach in library instruction has also been recognised (Kuhn 2003). The programmes however, offered by the UNLP continue to meet the description of user education activities and are largely limited to acquainting students with resources available in the Library. The library's participation in a campus-wide, context-specific and course-integrated, credit-bearing programme, transferring information literacy competencies, is not in effect. Subject related courses and their content, with the exception of AGRI 220 and Legal Method II, are largely dependant on individual arrangements between faculty staff and the relevant subject librarian. Little collaboration is evident between disciplinary faculty and the librarians and the 1999 UNPL annual report particularly recorded the lack of faculty collaboration in the Library's subject-related instruction. This supports De Jager and Nassimbeni's (2002) observation that, "South African academic librarians have not managed to form productive partnerships required to embed information literacy into curricula."

Network literacy or more specifically, instruction on the use of Web resources, with the exception of a tour of the UNLP's Web site, is generally limited to the demonstration of online databases that the library subscribes to. Moreover, the reported numbers of students attending these various programmes continues to be low (Aitchison 2003).

The Information Literacy course offered by the Information Studies Programme, on the other hand approaches the definition of an information literacy course and includes elements of Savolainen's (2002) network literacy requirements. The course introduced in 1996, includes instruction on the use and evaluation of Web resources and appropriate documenting practices (UN 2003b). This is a credit-bearing course, offered campus-wide at an undergraduate level, and currently is only compulsory for Bachelor of Education undergraduates and certain Access Programme students (Leach 2003). General or mainstream attendance has improved but the total headcount for the current year is reportedly low (Leach 2003).

2.2.1 Library guides

The Library produces numerous guides in leaflet format on various products and services offered by the Library. These are available in the Library and are ostensibly promoted during contact with students. The UNLP's annual reports attribute much importance to these as essential information retrieval aids and as a supplement to the various library instruction programmes (UNLP 2000). However the actual use of these leaflets by students is not documented.

Of interest is a recent leaflet titled "Evaluating Internet Resources" (UNPL 2003a). This provides a general checklist for assessing information available on the Web. This information is further supported by a list of sites available on the Library's Website, which cover the subject of searching and evaluating Web-based resources (UNLP 2003a). Again whether and how students make use of these leaflets has yet to be documented.

2.3 Collection development policies

The UNPL has expressed judicious caution towards the wholesale embracing of electronic information resources (UNLP 2000: 25). While the advantages of electronic resources are well documented research and academic libraries have to take cognisance of the many disadvantages of purchasing or subscribing to electronic resources (Schaffner 2001). High on the list of disadvantages are the high cost of subscriptions and licences and the cost of maintaining the necessary supporting software and hardware.

The question of access versus ownership continues to be pertinent. The purchasing of databases usually in CD-ROM format is an expensive option and the constant changes in technology may deem these databases obsolete with the necessary technology required to access the information, disappearing. The cheaper alternative of paying to access electronic resources online is also fraught with disadvantages. The subscribing library never owns the information and with the culmination of a subscription, the library is left without back copies (Schaffner 2001).

Another negative factor, specifically in subscribing to aggregator databases, which provide access, through indexes, abstracts and full text, to a number of journal titles from different publishers, is that the subscribing library has no individual relationship with publishers and therefore no recourse if the vendors of these databases drop the inclusion of certain journals. Furthermore, vendors may impose restrictions on the use of certain resources, and ultimately affect the library's relationship with its clients. The cost of subscribing to online electronic resources, specifically aggregator databases is particularly prohibitive in South Africa and as Rapp (UCT 2002) ascertains that in:

South Africa the average cost of a journal increased by 203% between 1995 and 2000, while the increase during the same period in the US and Europe was about 35%...regardless of the cause, the impact has been devastating.

In line with this, a recent investigation undertaken by Geslin for the *University of Natal's Libraries Project Committee* recognises and investigates free Web resources, as a possible solution to UN libraries shrinking acquisition budgets and specifically the prohibitive price of scholarly journals (Geslin 2002a). The resulting reports identify free scholarly journals available on the Web, evaluate aggregated databases, explore more affordable resources offered by alternative databases and e-journal collections and finally, investigate the possibility of taking advantage of special initiatives to developing countries that offer free or more affordable access to scholarly resources (Geslin 2002a; b; c).

While acknowledging the cost of maintaining and supporting a collection of free Web resources Geslin (2002b: 9) maintains that the integration of free scholarly Web resources with the library's existing holdings may be a feasible alternative to subscribing to expensive commercial databases. However, missing from the reports is an actual assessment of available facilities and resources offered by the UN campuses and libraries to support such a dependant approach to the Web, specifically the necessary quantity and quality of hardware and software and supporting user instruction.

2.3.1 Electronic information resources

An assumption of this study is that a Historically White University (HWU) such as the University of Natal, should provide its students with the necessary facilities and resources befitting current trends in higher education. Of note and in this regard, is the recognition by the *National Commission on Higher Education Working Group on Libraries and Information Technology* (WGLIT 1996) report that recognises the importance of libraries and IT in higher education. However, an evaluation by Aitchison (1998: 20) conducted in 1998, concluded that the UNLP did not meet the requirements of a well resourced library as outlined by the WGLIT report (1996: 27), specifically in terms of

budget, number of professional staff and the number of required monographs and journals.

While UNLP's annual reports covering the period of study, describe shrinking acquisitions budgets, as early as 1996 the UNLP expressed the need to achieve a balance between the expense of acquiring traditional sources of information and access to electronic information sources (UNLP 1996). In 1997 the intended plan was to replace expensive CD-ROM databases with subscriptions to online databases services (UNLP 1997: 19). A major barrier, however, expressed in 1998, was the continued poor Internet response rate and accordingly the UNLP was forced to continue the less favourable alternative of purchasing expensive CD-ROM databases (UNLP 1998: 21).

Despite persistent problems with Internet connection speeds in 1999 (UNLP 1999) the Library explored, with mixed results, access to online resources, specifically access to journals through aggregated commercial databases and other online databases. Of note in 1999, was the introduction of the EBSCO aggregated database service. Subscription to this database, until very recently, was supported by government funding (Sukram 2003). Online and unmediated access to SABINET databases, specifically the bibliographic databases of monographs and periodicals held by South African libraries is also documented in 1999 (UNLP 1999: 27). FirstSearch services offered through SABINET and providing access to OCLC databases was introduced in 2000 but due to the cost of searching this database and the inexperience of users, all searches were mediated (UNLP 2000: 27).

Use of these databases has grown and statistics, recorded since 2000, show substantial growth, with the SABINET databases and EBSCOhost accounting for most of this use (UNLP 2000: 27; Hoskins 2003). The statistics however do not reveal whether use is widespread or concentrated to a specific group. Access to online databases is controlled and limited in various ways: certain sites allow for only a limited number of users at any one time; a large number of services are restricted to use on the campus's local area network (LAN);

and all subscription based databases are password controlled. Aside from the freely available sites promoted by the Library's Website, a growing number of online databases are accessible off campus. These include SABINET, EBSCOhost, free trials of other aggregator services, and more recently Library and Information Science Abstracts (LISA) and PsycINFO (UNLP 2003b).

2.3.2 University of Natal Library Pietermaritzburg's website

A necessary extension of traditional collection development activities undertaken by the academic library is the development of easy to use, comprehensive and current "Web bibliographies" that provide users with a gateway or portal to appropriate and authoritative information resources (Herring 2001). Indeed, Geslin (2002c: 9) describes a library's Website as a complex entity,

A crucial information retrieval tool, a teaching/learning tool, a marketing tool, and the powerful visual (if virtual) embodiment of some of the decisions a university has made concerning its future development in the scholarly world.

The UNLP's Web site, a comprehensive and current portal, has been in existence during the major part of the period under study but its current format was introduced in 2000 (UNLP 2000: 27). The Website continues to be updated and revised by a team of subject librarians and includes e-books and e-journals, both free or subscription based; e-newspapers; online indexes and abstracts and full-text services, either paid for or available for limited periods through free trials; and subject links to other relevant gateways or portals (Kuhn 2003).

2.4 Information Studies Programme

The Information Studies Programme, housed on the Pietermaritzburg campus, was established in 1973 and currently falls under Human and Management Sciences, a faculty of the School of Human and Social Studies at the University of Natal. The department offers a range of programmes, including an undergraduate course in information literacy; diploma in school librarianship; postgraduate university diplomas in information studies, museology, records and archives management; and the advanced degrees at honours, master and doctoral level.

The Information Studies Programme has of late, received much acknowledgement of its contribution to LIS research. In 1998 Bell (1998: 3) recognised and described the contribution of the department to the LIS sector in terms of the considerable research generated at masters and doctorate levels. Ocholla's (2000) bibliometric study of local LIS research further supports this claim. Ocholla (2000) analysed SABINET's Union Catalogue of Theses and Dissertations in the period 1993 to mid-2000 and concluded that out of the twelve university LIS departments, the UNP's Information Studies department lead both in masters and doctoral research output. However Ocholla (2000) qualifies this output as only a potential contribution to research, and recent comparative and evaluative data on published research emanating from the different LIS academic departments is not available.

2.4.1 Master of Information Studies programmes

Research at the University of Natal is conducted either through the production of a major thesis, or, the completion of a series of courses at master's degree level and the production of a minor or limited length thesis. The masters by coursework programme, introduced by the department in 1994, is structured in such a way that the course work accounts for 40% of the overall mark, the research proposal accounts for another 10%, and the mini thesis makes up the balance. A variation on this is the masters by coursework and internship,

in which case the production of a project report, equal in length and quality to a mini-thesis is expected (UN nd.a). While the masters by coursework route may be considered an inferior approach to that of a master's degree by research (Aitchison 1998: 15), the department's higher degrees brochure (UN nd.a) is clear in stating that the quality of both minor and major theses should be on par.

2.4.2 Supervisors of Master of Information Studies programmes

Both masters' programmes require students to design and conduct independent research with the support of nominated supervisors. According to Kaniki (2000: 39), a pre-requisite for the training and development of competent researchers is a team of equally competent supervisors and examiners who are objective and consistent in their guidance and assessment. The faculty's guidelines (UN nd.b: 8, 9), regulating the relationship between masters' candidates and their supervisors identifies suitable supervisors as active and experienced researchers who understand the area of research and have up-to-date knowledge of the appropriate resources. Accordingly supervisors are required to guide masters' candidates in the selection and location of relevant literature and other resources, including researchers working in related fields. Furthermore, and of interest, supervisors are responsible for imparting the conventions of scholarship to candidates in the drafting of their theses.

A requirement not mentioned in the Guidelines but included in the International Federation of Library Associations and Institutions (IFLA) guidelines for LIS programmes is that academic staff be technologically proficient (IFLA 2000).

2.4.3 Referencing techniques

Kaniki (2000: 40) describes the masters' thesis "as the showpiece for demonstrating mastery of the research process," and accordingly "its preparation and presentation [should] be as flawless as possible." Kaniki's (2000: 48) study of theses submitted by LIS master's degree candidates at eastern and southern African universities, including the University of Natal, found that a prevalent mistake, in 38.78% of the cases examined, included poor or inconsistent referencing techniques. The faculty's guidelines (UN. n.d) for higher degrees candidates do not invoke any particular referencing style but simply require that students acknowledge all their sources. The Information Studies Programme on the other hand, do refer their students to the author-date or name-date, based on the Harvard method of referencing. This method instructs that a brief description of the source be inserted in the appropriate place within the text. The source of information should then be described in full bibliographic detail at the end of the report and arranged in alphabetical order according to the author element.

Guidelines for the author-date method, compiled by the current subject librarian for the Information Studies Programme, Jenny Aitchison, have been made available to students since 1987, and recently updated in 1999 (Aitchison 1999a). Recent guidelines include specific instructions on the composition of online citations. However, within the same referencing methods, preferences and accordingly variations occur, and students may be required to tailor their bibliographic compilations to the requirements of their supervisors. Nevertheless, it is fair to say that the bibliographic referencing quality is not compromised if all the necessary elements of bibliographic information are included and if the rule of consistency is maintained.

2.4.4 Masters candidates

Finally, a probable determinant of citation behaviour and specifically in the use of the Internet for research, may be a student's own background. Oppenheim and Smith (2001: 315) reasoned that the Loughborough students' preference for using the Web was partially influenced by their prior familiarity with it before entering the university. In an African environment the same case in the converse, may be made for university students drawn from disadvantaged backgrounds. This claim is supported by Sayed (1998, cited in De Jager and Nassimbeni 2002) who cautions that information literacy teachers in the South African context should be aware that the majority of students entering tertiary institutions have not had standardised, prior exposure to different types of educational resources.

While the current study does not investigate individual determinants of citation behaviour, for the sake of comprehensiveness the race representation of LIS students in the period of study is presented. From 1996 to 1998 the ratio of black to white master's degree candidates was largely balanced (Bell 1998: 367). A superficial assessment of graduation booklets for the years 1999 to 2002 show a more realistic race representation with African surnames being in the majority. However drawing conclusions from this is not productive and a major assumption of this study is that MIS candidates are more likely to have a favourable level of information and computer literacy.

Moreover, a longitudinal study of undergraduates conducted at 18 tertiary institutions in the United States, found that the relationship between students' background characteristics and library use changed over time (Whitmire 2001). The study investigated students' background characteristics, including gender, race, age, high school library use, initial critical thinking, and compared these to the level and nature of library use, including the use of electronic resources, and found that over time these characteristics had lesser effect. Rather the study found that a persistent problem in library use was one

of access to the physical library, specifically experienced by part-time students employed off campus (Whitmire 2001).

The issue of physical access to library resources has been investigated locally by Aitchison (1998). The study of UNP MIS students, determined their level of access to resources housed by the UNLP and required for the MIS programme's coursework component. Physical access of MIS students in the period 1994 to 1996 was determined in terms of students' place of employment and residence and the amount of study leave and time spent on the UNP campus. The population of this study was found to be largely employed in various library environments and the need for the UNLP to cater more adequately for off campus students was underscored. While the study is limited to materials set aside by the library for the coursework component, the current LAN limitation in access to many online databases extends the study's significance to all components of the MIS programmes.

Aitchison (1999b) explores possible solutions to providing on-campus and off-campus students with equitable access to library resources, these include the dissemination of required information resources online. However, a pertinent pre-requisite remains the need to develop the necessary information and computer literacy skills to make this access effective.

2.5 Summary

The background study has described the nature and availability of facilities, services and resources provided by the UNLP and the ITD in the time period of the study, and included a brief review of the responsibilities of MIS supervisors and of the nature of the MIS programmes and candidates. These elements should inform the context of the study and possibly identify the environmental determinants of students' citation behaviour.

CHAPTER THREE: LITERATURE REVIEW

3.0 Introduction

Descriptions and assertions of the importance of the WWW in research abound in the relevant literature but the recent “dodgy” dossier fiasco in the United Kingdom serves to spectacularly reveal the pervasiveness of the WWW as a research tool and resource. The plagiarism of a Californian PhD student’s work, allegedly lifted from the World Wide Web by Downing Street (BBC News 2003), supports Thelwall’s (2002) assertion that the WWW brings research to a wider audience that besides scholars, educators and students, also includes journalists, customers interested in research expertise, government departments and the general public.

A growing body of research investigates and evaluates the many dimensions of the Internet and more specifically, and of interest to the current study, how it affects information seeking, scholarly communication and learning and research environments.

3.1 Information seeking and the World Wide Web

Fourie (2002: 51), building on a previous investigation, reviews and categorises recent projects on information seeking on the WWW. Projects included in the review target and study a range of user groups and are generally motivated by the need to understand the attributes of information seeking on this medium and to assist and improve the design of Web information retrieval systems. Traditionally, information retrieval studies focussed on the use of OPACs, CD-ROMs and online commercial databases, more recently this area includes research on Web searching and specifically the use of search engines (Fourie 2002: 51).

Indicative of the change that the Web has brought to the academic environment is the availability of multiple platforms including those purchased or sanctioned by an academic institution. Examples include online databases, networked CD-ROMs, commercial online databases, including aggregator

services; and other Web based resources that may be freely available or that allow for payment on an individual basis (Schwartz 2002). Authors on the subject indicate gaps in the research, specifically of users' movement between commercial databases and other available Web sites (Schwartz 2002: 254), and on users' use of traditional services offered through a Web medium (Fourie 2002: 53).

Of interest, and of benefit to a more behavioural approach, is the move away from an exclusive systems approach in investigating information seeking to a user-centred approach. Accordingly data collection methods include questionnaires, interviews, and think aloud protocols (Fourie 2002: 60). Of particular interest is the growth in user-centred research projects that emphasize a cognitive paradigm in the study of information seeking on the WWW (Fourie 2002: 49; Wang, Hawk and Tenopir 2000: 230).

Of note is Savolainen's (2002: 224) theoretically derived social cognitive model of information seeking on the Internet that defines and extends an information literacy concept to include network literacy or competence. Savolainen (2002) explores the social cognitive concept of an individual's perception of self-efficacy in the context of information seeking on the Web. An individual's ability or competency in any task is affected by their belief in their ability to accomplish that task and furthermore in their interest or motivation to acquire the necessary skill or knowledge to become competent of efficient in performing the required task.

Similarly an individual's perception of self-efficacy in the use of the Web is affected by their belief in their ability to properly utilise this medium to fulfil a particular information need and accordingly "the lower the perceived efficacy in Web searching, the less the interest in acquiring competence in this field" (2002: 220). Savolainen (2002) goes on to contend that, outside physical and social constraints, the issue of self-efficacy is particularly pertinent to people who are interested in using the Internet but have no experience in the use of this medium. In this case the use of the Web may be disabled by feelings of

uncertainty and the perception that the medium is too complicated. Self-perceived barriers however, may be overcome by external incentives and rewards, motivating individuals or providing them with an interest in obtaining the required skills, specifically computers skills, to perform competently in this medium (Savolainen 2002).

Local authors Nel (2001) and Cosijn (2001) have also explored online information seeking and retrieval from cognitive perspectives. According to Nel (2001: 31) "there are certain emotions with which the user has to deal with when finding himself in the online environment...from doubt and fear, confusion and a lot of uncertainty in the beginning stages, through more intense feelings of frustration, worries and being pressured" to feeling "relaxed and more positive..." Nel (2001: 32) concludes that in searching the Web users must develop "a sixth sense." All these studies, including Savolainen's (2002) research however, remain on a theoretical level.

An exception is the Wang, Hawk and Tenopir (2000) study, which attempted to measure the cognitive and affective aspects of the study's target group's interaction with the WWW, specifically their interaction with search engines. The authors were not able to generalise their findings and arrive at a cognitive model for Web searching behaviour. Rather the authors make a correlation between user behaviour and the deficiencies in the design of interfaces on the Web (Wang, Hawk and Tenopir 2000: 247).

A determinant of information seeking behaviour on the Web is obviously the convenience this environment affords the researcher. Indeed a common concern expressed by various studies, specifically on student information seeking behaviour, is that quality sources are overlooked given the quantity of information, speed of delivery and overall convenience of finding information on the Web (Schwartz 2002; Herring 2001; Grimes and Boening 2001; Davis 2001; 2003; Jenkins 2002). This is consistent with the "Principle of Least Effort" as reworked by Mann (cited in Schwartz 2002: 254) that states that,

most researchers (even "serious" scholars) will tend to choose easily available information sources, even when they are objectively of low quality and, further, will tend to be satisfied with whatever can be found easily in preference to pursuing higher-quality sources whose use would require a greater expenditure of effort.

Changing this behaviour may be difficult given the evidence found in various studies that users increasingly feel comfortable searching a Web environment, perceive their skills to be adequate and do not necessarily solicit instruction from librarians or information specialists (Schwartz 2002: 260; Tenopir and Ennis 2002: 270; Grimes and Boening 2001: 20).

3.2 Scholarly communication and the World Wide Web

Studies investigating the impact of the WWW on scholarship describe how Internet and Web technologies are fuelling changes in the scholarly communication environment and accordingly changing the learning, teaching and research environments within which academics, librarians and students operate. Despite early empirical studies that established a negligible impact of electronic journals and resources on scholarly communication, the potential for change was always anticipated (Harter 1996; Harter and Kim 1996; Zhang 1998). A recent citation study by Herring (2002) reports a growing reliance by scholars on electronic resources that include non-traditional types of scholarly resources and interdisciplinary references. Thelwall (2002: 413) lists studies that confirm the Web as a primary means of disseminating research findings through electronic documents, including electronic journals, e-print archives and online conference proceedings. Moreover a citation analysis methodology traditionally used to evaluate the subject relationships and influence of a scholar in a traditional print environment is extended to a Web environment, and to this end Webometric studies analyse links, non-links invocations and server access logs (Thelwall 2002: 415).

Implicit to this subject area is the idea that the WWW is changing or rather extending the infrastructures of scholarship. Scholarship is defined as the "creation, development and maintenance of the intellectual infrastructure of subjects and disciplines, in forms such as dictionaries, scholarly editions, catalogues and contributions to major databases" (HEFC 2001). The advent of electronic information and communication has extended the end products of scholarship beyond traditional formats, such as books and journals. In addition to providing access to previously ephemeral print sources in electronic format, such as conference papers, proceedings and theses, and pre-prints, the WWW has introduced new electronic media that cannot be described in terms of traditional print formats (Halliday 2001).

Hibbits (1997, quoted in Hammes 2001: 51) argues that,

If print facilitated the creation of the journal format, why should we presume that the Internet, now beginning to challenge print as the academic medium of choice, will not facilitate the creation of another format of scholarly publishing which is different from the journal as the journal was from the scholarly letter.

Accordingly the concept of a scholarly publication is being reassessed and attempts to absorb the traditional and new and emerging formats available on the WWW within a definition of scholarly publishing are being explored (Halliday 2001). The Web has blurred the traditional distinction between a formal and informal scholarly source. Informal scholarly sources were distinguished by their limited access and availability, by this definition any scholarly source available on the Web constitute a scholarly publication (Halliday 2001).

Scholarly communication involves the process by which the end-products of scholarship or "research is produced, reviewed for quality, published, disseminated and made available to scholars over time" (English 2003). Traditionally this process has implied the relationship among authors,

publishers, libraries and readers (Hammes 2001). This relationship is described by O'Connor (quoted in Hammes 2001: 51) where the end-products of scholarship or "knowledge products" are created, described and used by scholars; evaluated, packaged and distributed by publishers; and collected and organised by librarians.

This process has been both enhanced and short-circuited through the ease of publishing on the Web. While commercial databases and library and scholarly portals, sites and databases conveniently and efficiently identify and deliver traditional formats of scholarly information in electronic form, other forms of information are equally accessible that may not have undergone the usual process of peer verification (Cronin 2001b; Wachbroit 2001). Cronin (2001b), commenting on Web-based publishing, states that "opening the floodgates puts a premium on quality control," however he also argues that publishers are not a pre-requisite for the system of peer review and that some type of peer-review will evolve or persist. Another particular problem in accepting sources available on the Web as examples of scholarly publication is the lack of stability of URLs (Halliday 2001; Davis 2001; 2003; Zhang 1998).

Despite problems of peer review and the instability of URLs there is evidence of scholars, academics and librarians using the new Web technology to challenge the stranglehold commercial publishers have exacted on the products of scholarly communication (Cronin 2001b). Initiatives like *Scholarly Publishing and Academic Resource Coalition* (SPARC) sponsor the launching of reasonably priced quality journals, and alternative electronic journal databases like *BioMedCentral* and *HighWire Press* provide cheaper alternatives to commercial aggregator databases (Geslin 2002b).

Indeed and according to Odlyzko (2001: 5) the electronic scholarly environment will shortly eclipse a print one:

Usage of electronic forms of scholarly information has typically been growing at 50 to 100 % per year...On the other hand print usage has shown little change...a decade is about

the length of time we should expect for new modes of electronic communication to become dominant, if current growth rates continue.

3.3 Academic environments and the World Wide Web

Studies conducted by the ARL (Schwartz 2002) and HEFC (Rowley 2002) confirm that academic environments, specifically higher education libraries, offer a growing range of electronic resources through the Web, and supporting access to the Web. Local studies however, indicate the lack of sufficient ICT facilities in African academic institutions and accordingly limited physical access to Web resources (Ehikhamenor 2003; Mgobozi and Ocholla 2002; Kaniki 1999). A near-sufficient range of electronic resources, are nevertheless available in some African academic libraries (Mugwisi and Ocholla 2002: 163). However the cost of purchasing or subscribing to electronic resources in a South African academic environment may be particularly prohibitive given unfavourable exchange rates and the VAT imposed on these resources (UCT 2002). Possible solutions for alternative and more affordable access to electronic resources, recently investigated by the University of Natal, are local consortiums and initiatives offered to developing countries (Geslin 2002a).

Electronic resources offered by academic libraries generally include locally loaded databases, specifically, OPACs, bibliographic databases including indexes and abstracts sources; CD-ROM stand-alone or networked databases; online databases requiring mediated searches; online databases allowing for end-user searching; and finally access to the public Web. All services continue to be offered at some level but surveys conducted of reference services offered by ARL member libraries indicate a shift away from CD-ROM use and mediated searching to a preference for self-searching on online commercial databases and public Web resources (Tenopir and Ennis 2002: 267).

Thorin (2001) anticipates a reverse in the current ratio of print to electronic resources supported by academic libraries and ascertains that:

It is possible and even probable that in a decade or less, smaller university and college libraries will be able to support their users in a nearly total electronic environment and will share responsibility with other libraries when buying or retaining print materials.

In South African academic libraries, the same shift from a “stable book environment” to “dynamic evolving information centres with an increasing focus on electronic resources” is anticipated (UCT 2002).

3.3.1 Internet-use studies

According to Mugwisi and Ocholla (2002:144) and extending a previous review by Lazinger (cited in Mugwisi and Ocholla 2002:144), research studies focussing specifically on the use of the Internet in support of research may be categorised as those that target four distinct groups, namely, the general public, college and university faculty, information professionals and students. Of interest are studies that address perceptions towards the Internet, Internet services utilized and changes in the selection and location of information sources. Internet services investigated include WWW resources, including electronic journals and library databases, e-mail, discussion lists and news groups; and services such as Telnet, and File Transfer Protocol (FTP). Data collection methods employed, include surveys, interviews, web log analysis and citation analysis.

A recent multileveled survey (Rowley 2002), commissioned by the Higher Education Funding Councils (HEFC), investigated the information seeking behaviour of academics and students and specifically their the use of information technology and services in higher education institutions of the United Kingdom. The overall purpose of the research was to develop a longitudinal profile of the use of electronic information services (EIS) and investigate the barriers to this use (Rowley 2002). Electronic information services assessed included, search engines, gateways, organisational Web sites, bibliographic databases, OPAC, e-mail, newsgroups, electronic journals

and services (Urquhart 2003). Data collection methods included questionnaires, interviews, focus groups, electronic communication and case study reports. In addition, and of interest, was the development and use of benchmarks to monitor and measure the use or penetration of EIS at various educational institutions (Rowley 2002).

Cumulative findings of the report indicate that undergraduates use EIS mostly for academic purposes, with some research postgraduates making more use of these resources and specifically of electronic journal services. The study contends that search engines are the predominant service used and of an upward trend in the use of electronic journals (Rowley 2002).

Recent surveys conducted in African university environments indicate a disappointingly low use of Internet facilities and resources (Ehikhamenor 2002; Ocholla 1999; Mgobozi and Ocholla 2002; Ojedokun 2001; van Zijl and Gericke 2001). A common finding, evident in these studies, is that despite poor use, the user groups targeted are aware of the benefits of the Internet for research. Common barriers that affect use and discussed by these surveys include: limited physical access, slow connection speeds, a lack in the ease of use, poor information literacy skills and the cost of access.

In terms of academics use of the Internet, tentative correlations are also made between disciplines and the type of Internet facilities and resources used but no universal patterns are discernable (Ehikhamenor 2002: 43; Rowley 2002; Ocholla 1999). Rather as Ocholla (1999: 137) maintains the reasons for disparate use of information resources are more complex and involve the,

nature of the programmes, resources available to staff, the vision, mission and goal of the faculty/discipline, the nature of the staff and the requirements for growth in the career.

Tenopir and Ennis (2002) surveys of changes in the reference services provided by member libraries of the Association of Research Libraries (ARL) indicate a reliance on the WWW for routine tasks, dissemination of

information, user education and answering reference queries. Kaniki's (1999) survey of Internet use by staff of the Eastern Seaboard Association of Tertiary Institutions (esAL) consortium libraries, indicate an under-utilisation of the Internet. This is attributed to a lack of skills and knowledge in the use of the Internet. Findings of a later survey conducted by Mugwisi and Ocholla (2002), comparing Internet usage of academic librarians of the Universities of Zululand and Zimbabwe, record better perceived computer and Internet skills and utilisation of the Internet, with WWW and e-mail being used daily by all respondents. In addition both libraries investigated offered a range of electronic information services.

3.3.2 The World Wide Web as a bibliographic tool

The Internet is increasingly used to identify or source information and the WWW offers an seemingly inexhaustible list of tools, including Web based resources such as subject directories, subject guides, subject gateways, Web portals, home pages and search engines. Traditional tools including catalogues, bibliographies, abstracts and indexes and citation indexes, journal content pages are enhanced and equally available in digital format.

Studies investigating academic librarians use of the Internet (Tenopir and Ennis 2002; Mugwisi and Ocholla's 2002: 163) indicate a preference for consulting Internet resources as opposed to printed sources in answering reference queries. Ocholla's (1999: 137) earlier survey of information gathering behaviour at the University of Zululand indicated that overall, 41% of academics found out about information resources from the Internet. The DLF and CLIR (Friedlander 2002) survey of academics and students of North American tertiary institutions, while indicating a preference for both print and electronic information formats, found that the overwhelming majority (87%) of the targeted group went first online to find relevant information sources, using a range of resources including online library catalogues, indexing and abstracting services, Web subject directories and guides. Librarians also prefer a digital reference medium and Tenopir and Ennis's (2002: 272) survey of reference services offered by academic libraries in USA and Canada, found

that print sources are used considerably less than electronic resources such as online commercial databases OPACs and the Web to answer reference questions.

3.3.3 Level of use and range of information sources

Traditional scholarly formal formats purchased for academic environments are generally categorised broadly as firstly, reference materials, this category includes encyclopaedias, handbooks, manuals, directories, dictionaries; secondly, books or monographs, these formats may emanate from university publishers or commercial publishers of academic materials and thirdly, serials, these are usually scholarly journals that have undergone a peer-review process. A distinction is made between journals and magazines and newspapers, while all are likely to be purchased by academic libraries, journals are considered scholarly in so far as they contain primary research the latter two are considered non-scholarly as they primarily report news, industry information and events (Davis 2001; 2003; Herring 2002).

Other materials supported by academic environments include informal scholarly formats, including unpublished theses and dissertations, conference and seminar papers and proceedings, reports and other ephemeral or grey literature. These formats are also available in full-text, either in parallel versions or electronic-only versions, on the Web. Of note is the category of "grey literature" which has become far more widely available and accessible in an electronic environment than it was in a traditional print environment (Halliday 2001).

More unique Web-based formats containing content of interest for academic research and that cannot be described in terms of traditional print formats, include Web documents emanating from companies, institutions, organisations, governments, specialists, peers etc; discussion lists; teaching and instructional materials; software materials, etc. This is not an exhaustive list and it is generally accepted that new formats or versions of traditional print formats will continue to evolve (Halliday 2001).

Current research on the use of the online medium for the delivery of full-text information in an academic environment, indicate a preference for a combined use of both a print and online media (Herring 2001; Geslin 2002c). Preliminary results of a survey commissioned by the Digital Library Federation (DLF) and the Council on Library and Information Resources (CLIR) (Friedlander 2002), investigating the information seeking practices of academic and students from different disciplines and in different tertiary institutions of the United State, indicate that targeted user groups meet their information needs from a mix of both print and online sources. Friedlander (2002) concludes that,

Most faculty, graduate students and undergraduates seem to prefer a hybrid information environment in which information in electronic form does not supplant information in print but adds to the range of equipment, resources and services available.

Overall patterns in the use of different formats for research indicate overwhelming use of journals (97% of respondents) followed by books (96% of respondents) and 74.9% of respondents use electronic journals. However at discipline level the use and nature of preferred formats is different and the study establishes correlations between level of use of scientific and technical reports by the pure and applied sciences as opposed to the social sciences, arts and humanities which tended to use more interdisciplinary information in different formats (Friedlander 2002).

Oppenheim and Smith (2001), employing a citation analysis methodology, investigated the citation practices of final year undergraduate Information Science students at Loughborough University and attempted to establish the growth of the WWW as an information source in a three year period, specifically, 1997 to 1999. Findings indicated a growing reliance on the use of the Internet, from 1.9 % in 1997 to 17.2% in 1999 (Oppenheim and Smith 2001: 303). An Internet resource was identified as any citation that included a URL, and in practice a WWW URL (Oppenheim and Smith 2001: 303). Overall the authors uncovered a pattern of increase in the citations to books and

Internet resources and a decrease in citations to journals. However a limitation in this synopsis is that the authors included electronic journals within the Internet/WWW category and restricted the journal category to citations that indicated a print format (Oppenheim and Smith 2001: 303).

Herring's (2002: 336) citation analysis of sources cited by scholarly articles in electronic journals during 1999 to 2000, found that 55% of the sample of 175 articles cited electronic resources. The typical pattern of print sources cited included monographs (45% of print sources), journals (43.2 %), conference papers (6%), reports (3%) and unpublished documents, mostly theses and dissertations (1.1%) (Herring 2001: 337). However, over 50% of the electronic sources citations represented grey literature, and defined by Herring (2001: 338) as working papers, unpublished reports and studies and government papers.

3.3.4 The use of journal literature

According to Harter and Kim (1996) the journal "for more than three centuries ... has played a pivotal role in the creation and transmission of knowledge by serving as the primary medium of scholarly communication..." To this end, Harter (1996) and Harter and Kim (1996) carried out one of the first investigations assessing the impact of electronic journals on scholarly communication (Bar-Ilan and Peritz 2002: 376). The study measured the extent to which electronic journals were cited in Institute for Scientific Information citation indexes (Harter and Kim 1996). Journals investigated included those published only in electronic format and those published both in print and electronic formats. The impact, at that period (1995) was considered negligible but the authors anticipated that the affect of the Internet on scholarly communication would very likely change in the years to follow.

According to Mgobozi and Ocholla (2002) the proliferation of the electronic journal is indicative of its popularity for scholarly communication (2002: 29). Attempts to provide more affordable alternatives to prohibitively expensive journal aggregator databases continue to prefer the journal format (Geslin

2002a; b; c; Cronin 2001b). Electronic journals and their databases have certain enhanced features that make them particularly useful for scholarly communication, these include: the faster transmission of research results; powerful searching facilities that allow for large collections of materials to be searched simultaneously; and the immediate access to required information (Mgobozi and Ocholla 2002: 30, 31). Added to this is that the identification and acquisition of journals, both in print and electronic format, has been made easier through electronic facilities including the WWW. Accordingly Lynch (cited in Odlyzko 2001: 7) says,

There's a sense in which journal articles prior to the inception of electronic and abstracting and indexing database may as well not exist, because they are so difficult to find.

Despite these attributes research projects investigating patterns in journal use report conflicting findings. Common to all these studies is the finding that journal literature, and specifically electronic journals, is perceived by the targeted groups, as important for research and scholarly communication. Despite recording academic staffs' perception of the importance of journal literature for teaching and research, results of usage at the University of Ghana Library measured less than one issue used per student, per annum (Rosenberg, Alemna and Chifwepa 1999). Similarly, a local survey by Mgobozi and Ocholla (2002) investigating the use of electronic journals by academics, librarians and postgraduates of the universities of Zululand and Natal, found poor use of these resources at both institutions, despite past resource disparities. Again, evident from the findings of the study was that the current use of electronic journal literature was not a reflection of its lack of importance, and indeed seventy-two percent (72%) of the respondents felt that this medium had a strong impact on the dissemination of scholarly information (Mgobozi and Ocholla 2002: 43). A possible problem identified by the two authors was the need to properly market and instruct users of the use of these resources (Mgobozi and Ocholla 2002: 44).

Oppenheim and Smith's (2001) analysis of undergraduate students' citations of journal literature, indicated a drop in usage over the period, 1997 to 1999. These findings contradict Buttlar's (1999) citation analysis of doctoral theses in LIS studies written between 1994 and 1997 and Davis study (2003) of Macroeconomic undergraduate students, both indicate growth in the use of journal literature. Moreover the findings of a recent survey of UK students (Urquhart 2003) indicates a growing awareness and a growing use of electronic journals, this is attributed to students use of Web sites that conveniently identify and provide access to periodical publications.

3.4 Effect of the World Wide Web on students' citation patterns and behaviour

Related research projects specifically employing citation analyses methods, also investigate students' choice of information sources but respond to, and explore a particular concern with the use of non-scholarly sources, specifically Web sources. Types of sources are described and evaluated according to standard criteria or definitions of scholarly publications, changes in size of bibliographies and the mercurial nature of Web addresses or URLs are also investigated. Studies are restricted to undergraduate students and make common recommendations; including the integration of information literacy skills within course curricula (Davis 2001: 3); the provision of guidelines by teaching staff (Davis 2003; Grimes and Boening 2001); improved bibliographic instruction and teaching strategies by librarians (Grimes and Boening 2001); and the creation and maintenance of Web portals guiding users to relevant and quality sites and sources (Herring 2001).

3.4.1 Use of scholarly sources

As an adjective the term scholarly is defined as: "involving or relating to serious academic study" (Pearsall 1998: 1662) and scholarly activity is evidenced by:

The discussion of relevant literature, an awareness of the history of antecedents of work described, and a format which

allows a reader to trace sources of the work through citations, footnotes etc. (D'Sylva 2003).

Scholarly sources available in a traditional print academic environment progress through channels of validation and verification by editors, publishers and faculty-librarian collaboration, before being utilised by students. The Web environment does not afford these gatekeepers the same privilege. Consequently, sources available on the Web and accessible to students may not necessarily meet the standards previously required from a traditional formal scholarly publication (Leckie 1996; Grimes and Boening 2001).

Accordingly citation analysis and content analysis studies have investigated the nature of sources students are using through an online medium. Grimes and Boening (2001) investigated the kind of WWW resources cited by a small group of students in introductory English composition class at two community colleges in the United States. Findings, supported by follow-up interviews, indicated that students used unauthenticated Web resources and cited everything from "junior high school Web sites to publicity sites" (2001: 20). The authors undertook a content analysis of WWW sites cited by students and evaluated quality according to traditional print-based standards and the following criteria were used: "authorship; currency; recommendations; perspective; audience; style and tone; quality of content, organisation of information; publisher; source; host; stability of information" (Grimes and Boening 2001: 14).

Motivated by a concern expressed by academic librarians in the rise in use of Web sources, Jenkins (2002) analysed the citations of student papers from a North American college. Findings indicated that the majority of materials cited continued to be traditional research formats such as books and journals and that some fields of study might be more prone to student use of Web resources, specifically the Humanities and the Social Sciences. The study was preliminary and did not define and tabulate the type and nature of Web sources used by students.

A longitudinal study conducted by Davis (2001; 2003) addressed the effect of the WWW on student research behaviour over a period of five years, 1996 to 2001. The bibliographic references of term papers submitted by Macroeconomic undergraduate students from Cornell University were coded and analysed. Comparisons were made in terms of scholarly sources, defined as books and journals and non-scholarly resources, defined as Web sites and news-type of sources. Web sources were identified as electronic sources with no print counterparts (Davis 2003: 44) and were further coded according to URL generic domain descriptors, namely: edu, gov, com, org.

In the period from 1996 to 2000, findings indicated a growth in the size of bibliographies but a drop in the use of scholarly resources (books and journals), and a lack of accuracy and persistence of Web citations (Davis 2003: 45). The last year of the study, 2001, saw a rise in the use of scholarly resources and greater accuracy and persistence in URLs. Overall Web citations, increased from 9% in 1996, to 21% in 1999 and 22% in 2000. In 2001 Web citations dropped to 13%. The change in the last year was attributed to faculty intervention and the provision of specific guidelines on what type of sources, students were expected to be use (Davis 2003: 47).

A limitation of the study is that Davis (2003) restricts the definition of a scholarly source to the traditional mediums of books and journals. Web-based sources that may have met scholarly communication and publication criteria are not identified (Davis 2001: 10).

3.4.1 Size of bibliographies

Implicit to an interest in growth in the size of bibliographies, is the concern that students are *sacrificing quality for quantity*. Davis's (2003) study indicated an increase in the size of students' bibliographies from 1996 to 1999 and attributed this entirely to the increase in use of non-scholarly sources, specifically Web and newspapers. The author ascertains (Davis 2003: 49) that despite the later increase in the citation of traditional scholarly sources by

students after the introduction of appropriate guidelines by the lecturer for the course, this did not reduce the size of bibliographies. Davis (2003) concludes that this may be the result of greater accessibility to types of information now easily obtained from the WWW including news and company and government information.

3.4.2 Uniform Resource Locator persistence

A pre-requisite of a scholarly publication is that it should be reliably accessible and retrievable over time (Halliday 2001). The issue of the continued accessibility of electronic sources affects the formats "acceptability among scholars as a legitimate medium of formal scholarly communication" (Zhang 1998: 249). Davis (2003: 50) concurs and ascertains that "a viable link – whether in print or electronic form – is absolutely necessary in order to preserve scholarly communication."

Harter and Kim's study (1996), investigating the effect of electronic journals in scholarly communication in 1995, found that online citations were frequently inaccessible and that overall only half were located. Grimes and Boening (2001: 20) found that 30% of URLs cited by students and verified by the researchers within three weeks of use, were no longer available.

Davis's (2003: 48) latest update on a longitudinal study of undergraduate students' citation behaviour, reports an improvement in the persistency of URLs. The study first verified Web URLs in 1999, three and a half years after they were first cited by students, and found that 18 % remained persistent and pointed to the Web document, 26 % of Web documents were found at different URLs and 53 % of the cited Web documents could not be located at all. Subsequent years of the study indicated an increase in persistency and in 1999, 55 % of the URLs pointed to the correct Web document, this increased to 65 % in 2000 and 82% in 2001 (Davis 2003: 48). Davis (2003) attributes this improvement to students being more selective and choosing sites with stable identifiers and the possibility that the submission of student papers in electronic format improved the accuracy of recorded URLs.

3.5 Faculty support of the World Wide Web for research

While it is evident that faculty members and librarians are generally positive about their students' use of the Web for research, studies investigating faculty staffs' perceptions, express a common concern with the quality of sources used and students' ability to evaluate correctly (Grimes and Boening 2001; Herring 2001; Tenopir and Ennis 2002; Davis 2003). Moreover and evident from Herring's study (2001) is the concern with students' over-reliance on Web sources and faculty indicate a preference for a balanced use of both print and electronic resources.

What is apparent however, from interviews with faculty in these studies, is the gap between faculty expectations and students' information behaviour. A possible explanation for this, offered by Leckie (1996) and supported by Grimes and Boening (2001: 12), is that the teaching faculty expect their students to conduct research in the same manner that they do and to demonstrate similar advanced skills in evaluating sources of information. Another possibility, evident from the Grimes and Boening study (2001: 20) is that faculty themselves are not using the Web medium sufficiently to be aware of the benefits and pitfalls of this medium for research, and are not instructing their students accordingly.

Another possible reason for a gap in teaching faculty's expectations and students' use is that faculty have traditionally relied on academic libraries to provide students with the expected scholarly resources. Academic libraries however are unable to control the type of sources students' have access to on the Web. Moreover evidence found in various studies reveal that users are increasingly becoming comfortable searching the Web, and are confident about their skills and accordingly do not necessarily ask librarians or information specialists for help (Schwartz 2002: 260; Tenopir and Ennis 2002: 270; Grimes and Boening 2001: 20).

Findings of the *JISC User Behaviour Monitoring and Evaluation Framework Report* confirms the influence that teaching faculty have on students' information behaviour and found that academic staffs' expectations and assignment guidelines influence students' use of electronic resources (Urquhart 2003; Rowley 2002). Moreover Davis' (2001; 2003) longitudinal study of the affect of the WWW on student citation behaviour attributes a rise in the use of scholarly resources and greater accuracy and persistence in URLs, to the intervention of teaching faculty and the provision of specific guidelines.

A positive response to these concerns has been the recognition of the need for closer collaboration between faculty and library staff. Rader (cited in Buchanan, Luck and Jones 2002: 18) affirms that:

Librarians are emerging within the university as leaders in the electronic information environment where new formats of information and knowledge are beginning to have an impact on learning, teaching and to some extent research, [to this end librarians]...must forge partnerships ... to bring about curricular restructuring and dynamic learning environments for students in the information age.

Leckie (1996) supports this approach and specifically the need for librarians to encourage faculty in recognising their responsibilities in this regard. Moreover and accordingly, current thoughts on appropriate information literacy programmes have emphasized the need for context or subject specific instruction at the point of expertise (Mpendulo, Adams, Pienaar and Rawlins 1999; De Jager and Nassimbeni 2002).

3.6 Bibliometrics

The theory of bibliometrics, its precursor, statistical bibliography, is based on the premise that lists of references may reflect the activities of a discipline and identify its chief protagonists. While the term bibliometrics is associated with studies of printed literature and most frequently, journal literature, and with the description and evaluation of scholarly communication (Hertzal 1987), an

evolving nomenclature has broadened the description of its scope and purpose. Derivatives of bibliometrics include, librametrics, scientometrics, informetrics and Webometrics.

Librametry, proposed by Ranganathan in 1948, attempted to utilise the quantitative aspects of statistical bibliography and later bibliometrics, to analyse library work and services and is defined as the study of “information processes and information handling in libraries and information centres by quantitatively analysing the characteristics and behaviour of documents, library staff, and library users” (Ravichandra Rao 1983: 180). A later derivative scientometrics, specifically monitors the development of physical and biological sciences and technology (Herbel 199?). A more recent term, informetrics, attempts to embrace all derivatives and purports to study the quantitative aspects of information in any form (Bar-Ilan and Peritz 2002: 371). Informetrics complements traditional quantitative bibliometric methods with the advantages of electronic information retrieval and data and text mining techniques and broadens the scope of traditional bibliometric studies by examining information flows in non-scholarly communities (Wormell 2000: 132). A more recent derivative, Webometrics, generally the application of specific quantitative methods in the study of information production and relationships on the Web (Thomas and Willett 2000: 421; Cronin 2001a) may be equally embraced within the area of informetrics.

The defining activity of bibliometrics, and its derivatives, is to count and measure things, and the possible units of analysis are inexhaustible. Units of analysis in bibliometric studies may include publications and citations to articles, books, journals and authors; in inflometrics, acknowledgements (Borgman and Furner 2002: 9); in scientometrics, patents; in librametrics, dissertations of library users and library circulation logs; and in Webometrics, links or “sitations” (Cronin 2001a: 1; Smith 1981: 86).

Rank-frequency distributions may be established and expressed in terms of bibliometric laws, which include Zipf's Law, the occurrence of words in text;

Lotka's Law, authors' productivity; and Bradford's Law, the scattering of articles in journals (Hertzal 1987). The latter law is frequently employed in assessing library journal collections to establish a core list of journals and states that 20% of journals contribute for 80% of articles used within a subject area (Oppenheim and Smith 2001: 300).

In addition to counting and measuring records of communication and establishing rank-frequency distributions, bibliometrics methods, specifically citation analysis, are also employed to examine relationships between citing and cited documents (Hertzal 1987: 190) in different types of environments including a hypertext one (Cronin 2001a: 2).

3.6.1 Citationology

Garfield (1998: 69) coined the term "citationology" in an attempt to embrace the different strands of citation theories, including bibliometric laws of distribution, citation analysis and citation behaviour. Accordingly he defines citationology as the theory and practice of citation. However, given the ongoing evidence that citation practices differ from one discipline to another and the existence of alternative approaches to citation studies, the possible existence of a unified theory of citation, and its practice, continues to be disputed (Martens 2001; Borgman and Furner 2002).

3.6.2 Citation analysis

Osinga (cited in Hertzal 1987: 190) describes citation analysis as a method "based on the principle that articles citing the same references also have much of their content in common." Smith (1981:83) positions and describes citation analysis as that area of bibliometrics that measures the relationship between cited documents and citing documents. Citation analysis has evolved various techniques and products, including citation counts, co-citation and bibliographic coupling and citation indexes (Hertzal 1987: 191).

Citation counts determine the amount of citations received by a given document, or a set of documents, over a period of time, from a particular set

of citing documents (Smith 1981: 85). Counts of citations as a method, and based on the premise that articles most cited are the most valuable for researchers, was first used by Gross and Gross in 1927 to determine a core list of journals for a college library (Hertzal 1987: 160). Accordingly obsolescence of materials, evidenced through a lack of citations, may be equally determined (Hertzal 1987: 192).

Garfield developed this approach and described the influence of an article as its "impact factor" (Hertzal 1987: 162) and accordingly devised a formula for calculating the impact factor of host journals. Simply put the impact factor is a calculation of the number of citations to a journal during a given year divided by the number of citable items published in the journal during the previous two years (Kelland and Young 1998: 63). Similar formulas are evolving to measure the influence of items of scholarly communication on the Web (Thomas and Willet 2000; Cronin 2001a; Thelwall 2002).

3.6.2.1 Applications of citation analysis tools

Citation analysis techniques and products may be used as tools for evaluating and describing research activities of disciplines. This includes its use in historical research for analysing and tracking the influence of an idea, an author and his work or body of works, and in assessing scientific communication, specifically identifying problems such as linguistic isolation and the barriers in the dissemination of ideas between disciplines and groups (Smith 1981: 95). Other subject specific applications include examining the citation patterns of subjects. These studies referred to as "literature of" studies, may describe different characteristics of the citation materials, including the types and age of materials used and may also identify highly cited authors and journals (Smith 1981: 94). "Type of literature" studies assess the use of certain types of sources, such as government documents and dissertations, in the literature of specific disciplines (Smith 1981: 94).

More controversially citation counts have been used to measure and evaluate the influence and thus importance of individuals and their work, and as the

basis for the awarding of resources and scholarly and scientific prizes including the Nobel awards (Baird and Oppenheim 1993: 5; Borgman and Furner 2002: 6). Criticism of this practice generally revolves around the ambiguities of citation behaviour, the problems inherent in equating the quantity of citation counts with the quality of a work, and the various biases inherent in the use of *Institute of Scientific Information's* most-cited lists (Baird and Oppenheim 1993; Kelland and Young 1998: 71; Borgman and Furner 2002: 8).

Citation analysis techniques and products are used for information retrieval in libraries as well as tools for user studies. The essential purpose of employing citation analysis techniques in user studies is to assess and assist with collection development and improving services (Smith 1981: 95). Approaches include analysing bibliographies of library users extracted from term papers, theses and dissertations and determining types and age of cited materials, subject areas and whether materials are locally owned (Smith 1981: 95). A more specific approach is to determine the impact, or lack thereof, of different types of information sources on specific disciplines (Smith 1981: 95). The current study falls into this category.

According to Gooden (2001) citation analysis of library users' research may provide "insight into emerging and obsolescent research areas" and help inform collection management decisions. Decisions for the acquisition of new materials may take into account languages and formats preferred by users as evident from an analysis of their citations (Buttlar 1999: 242). Information for the selection or cancellation of journal titles may be assisted by citation analysis, and housekeeping decisions, specifically, the binding of back issues and the remote storage of titles, can be informed by an analysis of the currency of cited sources or the obsolescence of materials in a discipline (Buttlar 1999: 242). A recognised limitation of the use of citation analysis for collection development is that citation behaviour does not reflect a complete picture of use, other indicators, for example circulation statistics and shelf

check lists, need to be examined as well (Kelland and Young 1998; Smith 1981: 97).

3.6.3 Citation behaviour

Smith (1981: 85) describes citations as,

signposts left behind after information has been utilised and as such provide data by which one may build pictures of user behaviour without ever confronting the user...

This original approach to citation studies supports a normative theory of citation behaviour and that simply put, authors acknowledge all influences on their work and give credit where credit is due (Borgman and Furner 2002: 12). Specific criteria for citing include: paying homage to pioneers; giving credit for related work; identifying methodology, equipment; providing background reading; criticising previous work; substantiating claims; alerting researchers to forthcoming work; identifying the origin of an idea or concept and eponymic citations (Kelland and Young 1998: 66).

Much of the criticism of the use of a citation analysis methodology centres on the normative approach to citer motivation and specifically, its dismissive treatment of complex citation motives (Borgman and Furner 2002; Garfield 1998; Baird and Oppenheim 1993). Specifically, egotistical citation behaviour (Borgman and Furner 2002: 24), in which an author cites in a way she believes will benefit her own personal goals, is often used as an argument against the use of a normative and more altruistic approach. This includes the practise of self-citation, the failure to include, for various reasons, all materials consulted, and citing according to influence of mentors or to please referees (Baird and Oppenheim 1993: 6).

Other concerns may be best described by what Garfield (1998) refers to as deviant citation behaviour and a result of poor or lax scholarship, this may

include the propensity for copying citations to publications that have not been consulted, citing according to a limited knowledge base and errors in transcribing citations (Baird and Oppenheim 1993: 6,7; Kelland and Young 1998: 68). Another objection is the difference in citation practices of disciplines that makes comparison impractical (Baird and Oppenheim 1993: 7).

An analysis of citations, especially at student level, may also be sabotaged by typographical errors and poor documentation styles (Oppenheim and Smith 2001: 300). Indeed Kaniki's (2000: 47) assessment of theses in the LIS discipline, submitted at African universities, including the University of Natal, in the period 1992-2000, found much error in citations and referencing styles. Moreover students are confronted with a multiplicity of styles and versions of documenting or referencing sources and any confusion is further exacerbated with new and emerging electronic formats of information (Freimer and Perry 1986).

An alternative to the normative theory of citation behaviour includes the use of "interpretivist" methods (Borgman and Furner 2002: 21). Studies of this kind, in addition or instead of analysing citations, question or interview citing subjects, to establish their reasons for citing. Borgman and Furner (2002: 20) supporting current thought on citation behaviour, relate it to the work on relevance behaviour, and accordingly describe citer behaviour as "individual and subjective", "complex and multidimensional" and "dynamic and situational." Savolainen's (2002) behavioural model for network literacy may add to this approach in that citation behaviour and specifically the use of online formats may be a reflection of students' perception of self-efficacy in the use of this medium.

A recent survey of LIS undergraduates at Loughborough University however supports a normative approach to citation analysis. A questionnaire administered to assess the citation motivations of LIS undergraduates found that the majority of students conform to normative motivations when citing

(Oppenheim and Smith 2001: 314). Specifically, findings indicate that students tend to cite all their influences and do not, for obvious reason, self-cite, indeed the study suggests that, “information obtained from the citation analyses performed on student work is probably more valid than traditional citation analysis” (Oppenheim and Smith 2001: 315).

The *principle of least effort* is also a factor in citation behaviour as is evident from Grimes and Boening's (2001: 18) analysis of undergraduates' use of Web resources, which included interviews with student authors. A survey of students' information seeking behaviour identified a preference for Internet resources rather than traditional print sources. This preference was influenced by students perceived ease of use of Internet resources, the quantity of sources available online and the convenience of printing full text articles.

Another factor determining student's citation behaviour, specifically the use of non-scholarly Web resources, is the lack of clear instructions or guidelines in the use of information resources from course instructors (Davis 2001; 2003; Herring 2001; Grimes and Boening 2001). A comparative analysis of student citations from different disciplines at a North American college (Jenkins 2002) found that instructors' requirements affected student's citation behaviour significantly, specifically in terms of the use of Web resources.

3.6.4 Citation studies

User studies employing a citation analysis methodology and conducted in a period of access to the WWW, include research on the citation behaviour of undergraduates, postgraduates and academics. These studies generally investigate changes in use and nature of information sources in particular subject areas and accordingly help inform collection development, information literacy, bibliographic and library instruction programmes and library services. Most studies identified, largely follow a normative approach to citation analysis and do not determine individual or situational determinants of subjects' citation behaviour.

Buttlar (1999) analysed sixty-one doctorate dissertations in the LIS field from 1994 to 1997, the purpose of the study was to describe the nature of literature used by scholars in the LIS field and specifically to compare library science and information science dissertations. Dissertations in library science and information science were identified through the Dissertation Abstracts International (DAI) database and represented 17 different American Library Association (ALA) accredited LIS programmes. Doctorate dissertations were chosen for the study on the premise that a analysis of the citations would reflect a comprehensive and up-to-date description of information sources considered necessary for the respective disciplines.

In addition to describing types of information sources cited, Buttlar's (1999) study included an investigation of the gender distribution of the cited authors, different subject literatures used, countries of origin and currency of cited materials. Buttlar (1999) analysed a total of 7 980 citations and established the following counts: the average bibliography was 131 citations, with individual bibliographies citing as low as 40 references to the highest of 439 references. The majority of citations were to journal articles, 46% and secondly to books, 31%. Other categories making up the difference included chapters in books, theses and dissertations, proceedings and reports. Citations identified as Internet pages accounted for a 0.01% of total citations. The impact of the WWW in disseminating journal materials is not discussed given the period of the study, 1994-1997. At this stage the WWW had very little effect on the citation patterns of LIS postgraduates.

Studies examining undergraduate citation patterns include Oppenheim and Smith (2001), Davis (2003), Jenkins (2002) and Grimes and Boening (2001). The purpose of these studies include establishing the affect the WWW has had on the citation patterns of students as observed from the analyses of term papers' citations. Much of this research is motivated by a common concern that students are moving away from using scholarly type of sources. A shortcoming of these studies however, is the restrictive and anachronistic definition of a scholarly source as a book or a journal. Moreover studies,

including those listed above, that restrict analysis to the information provided by a bibliographic reference, and specifically to a source's format and its medium of delivery, cannot infer the quality of that source.

Grimes and Boening (2001) did however attempt to evaluate Web-based documents in terms of scholarly criteria and analysed the content of documents cited by students in an English composition course. The manifest and latent or underlining meaning of the online documents was determined using evaluation criteria traditionally employed in a print based environment, namely authorship, currency, perspective, audience, style and tone, quality of content, *organisation of information, publisher*; and included criteria specific to an online environment, namely, source, host and stability of information (Grimes and Boening 2001: 14). In this way the two authors found that students were largely using unauthenticated sources.

Another approach that may be of benefit to a content analysis study of online documents may be that offered by Halliday's research on evolving criteria required to recognise a scholarly publication online. This study remains on a theoretical level but arrives at the following framework for the definition of a scholarly source (Halliday 2001):

Trustworthiness

- It is essential that publications should not be changed and different versions should be indicated.
- It is "highly desirable" that trustworthiness be based on validation through peer review, but may also be determined by other indicators such as the reputation of the publisher, or of the researcher's institution, or, in the case of a journal article, the reputation of the journal title. In the absence of these indicators, trustworthiness may also be determined on a personal knowledge of the researcher.
- It is preferred that each publication should have at least one identifiable author.

Accessibility

- It is essential that a publication be reliably accessible, retrievable over time and publicly available whether for a fee or free. Stable accessibility is better met by "institutionalised stewardship" (Kling and McKim 1999, cited in Halliday 2001) and accordingly it is important that a publication have stable identifiers.

Publicity

- This is measured by the degree to which relevant audiences are made aware of a publication. This is usually met through institutionalised practices such as current awareness services and indexing and abstracting services and specifically, in an online environment, subject gateways and portals and hyperlinks from related documents. Publicity of scholarly sources are much improved in a Web environment.
- It is preferable that a publication should include a bibliographic record (metadata), and this should also indicate any different versions of the publication. The added advantage of this is that it allows for better search and retrieval practices.

Another limitation of citation analysis is that the affect of the Web is reduced to the presence of Web-based documents encountered in bibliographies. Indeed this is a limitation of citation analysis methodology itself, in that the researcher cannot infer or correct the source of materials. A response to this is the additional and more interpretivist approach adopted by the Oppenheim and Smith (2001) and Grimes and Boening (2001) studies, which interview subjects on their choice of information sources. Both studies do record a growing dependence on the use of the Web as a bibliographic tool and as a source of full-text information.

However despite the obvious limitations a citation count does allow for describing physical changes in students citation behaviour and in the case of the above studies, during a period of access to the Web. Oppenheim and Smith (2001) analysed the citations of 60 final year undergraduate

assignments from the Department of Information Science of Loughborough University, submitted in the years 1997, 1998 and 2000. Findings of the study provide support for local collection management, in addition the study makes recommendations for effective teaching strategies and in terms of journal usage, compares student citation patterns to that of LIS scholars. A total of 2 095 citations were analysed and material types coded and counted according to the following categories: monographs, journals, Internet, newspapers, reports and lastly an "other" category for all other types. In addition, trends in patterns of citation behaviour during the period under study, were followed. Findings of the study contradict Buttler's (1999) study, indicating a dependence on books (40% of all citations) with journals cited much less (29.5% of all citations). Other categories identified include newspapers and reports for which the study indicates a drop in use (Oppenheim and Smith 2001: 303). Citations to the Internet are described, by the study, as any citation that includes a URL (Oppenheim and Smith 2001: 303), these increased from 1.9% in 1997 to 17.2% in 1999. However a major concern in accepting the findings of the above study is the lack of distinction made between different Internet sources, indeed the poor performance of journal literature may be indicative of this practice.

Davis's (2001; 2003) study of student citation practices followed over a six year period, in the years, 1996, 1999, 2000 and 2001, focuses particularly on the use of Web based sources at the expense of more traditional scholarly types of materials. The study defines scholarly in terms of the use of specific material types, namely monographs and journals. Non-scholarly materials types defined by the study include Web sites and news sources in the form of newspapers and magazines (Davis 2003). Bibliographies extracted from 268 term papers and submitted by students of an undergraduate course in Microeconomics at the Cornell University were examined. Citations were coded according to material type, namely: books, journals, magazines, newspapers, Web and other. Of note is that Web sources were identified as electronic only resources with no print counterpart and all traditional print materials were coded as such even if they were accessed electronically. Web

sites were further categorised according to domain type and persistency of Web documents was tested during the period of study.

The study confirmed a significant drop in the use of monographs, from 30% in 1996 to 16% in 2001. The number of journal citations remained relatively stable but rose dramatically in the last year of study, 2001, to over 30% of all citations. Indeed, as is evident from tabulated findings, a return to more scholarly bibliographies in the year 2001 can be attributed to a significant increase in the use of journals and not monographs (Davis 2003). Citations to magazines remained constant but newspaper citations increased in number after 1997, this is attributed to the introduction and availability of an online full-text news resource in the same year. In 2001 the "other" category included a significant number of citations to government sources of information. The number of citations to Web sources increased significantly from 1996 (9%) to 2000 (22%) but dropped in 2001 (13%). The most heavily cited Web domain remained the dot.coms. Changes in citation patterns in 2001 are attributed to the introduction of minimum requirements for scholarly resources that specifically identified monographs and journals as scholarly resources (Davis 2003).

Davis's (2003) study also investigated the affect of the WWW in terms of the growth in size of bibliographies and found that between 1996 and 2001 there was a significant increase in the number of citations per bibliography (Davis 2003: 12). This increase was maintained after the introduction of minimum guidelines and while use of scholarly resources (monographs and journals) returned to acceptable levels in 2001, students continued to supplement these sources with previously difficult to access sources now conveniently available on the Web, these include news, government and business sources of information.

Davis's (2003) longitudinal study also tested the persistency of Web sources. Persistency was tested six months after term papers were submitted and were initially evaluated in terms of whether the URL lead to the cited document or

not. Subsequent evaluations of non-persistent documents determined if the URLs had changed, if there were errors in the transcribing of the address or if the document could not be found at all. Results of the study indicate that only 18% of Web citations submitted in 1996 and tested in 1999 pointed to the correct document, 26% were found at different URLs, 3% contained typographical errors and over 53% could not be traced at all. However the study traces a significant increase in persistency with 82% of URLs cited in 2001, pointing to the correct document. Nevertheless the study confirms that a significant percentage (11%-19%) of Internet documents continue to change locations (Davis 2003).

A preliminary comparative analysis of students' citations from different disciplines of a private North American college, Mt St Joseph College investigated a concern with a perceived increase in the use of non-scholarly resources (Jenkins 2002) again quantified in terms of a count of formats of sources cited with journals and books constituting scholarly sources. Jenkins (2002) analysed a total of 854 citations from 116 student undergraduate papers, and found that traditional scholarly resources, namely, journals and monographs accounted for 76% of all citations. However, and of interest, Jenkins (2002) noted a difference in citation patterns of student papers representing the disciplines of sociology and the humanities, with Web sites being the predominately cited material type. Jenkins (2002) concludes that the difference in distribution is rather a reflection of the leniency towards the use of Web resources by course instructors' in those disciplines.

3.7 Summary

The first part of this chapter reviewed theoretical and empirical studies describing and assessing the utility and current level of use of the WWW, specifically, as a tool to assist in the research process and as a resource for scholarly materials. The purpose of this part of the review was to provide an overview of studies addressing changes in academic and student research behaviour and the supporting scholarly communication infrastructure, in a period of use and access to Internet facilities and specifically the WWW. The

second part of the chapter reviewed the utility of citation analysis for user studies and specifically in mapping changes in students' citation behaviour, and identified and described relevant citation studies.

CHAPTER FOUR: RESEARCH METHODOLOGY

4.0 Introduction

The following chapter reviews the research methods chosen to investigate the impact of the WWW on entry-level research students in an African higher education environment, specifically through an analysis of the citation behaviour of MIS students and an investigation of possible external determinants.

4.1 Choice of methods

The primary method of research was a citation analysis of the bibliographies of MIS theses. Supporting methods of research included a retrospective study of facilities and services supporting access to the Web on the UNP campus and a survey of MIS supervisors' information gathering practices and attitudes towards the Web as a research tool.

4.2 Citation analysis of Master of Information Studies bibliographies

Defining the nature of unobtrusive research, Webb (1966) cited in Babbie (1994: 306) contended that the best way to learn about human behaviour was by observing what people left behind. The advantage of unobtrusive research is that it avoids the reactive relationship between a researcher and the elements of a population under study. Another definitive characteristic is that the artifacts to be analysed have an independent existence outside the manipulation of the researcher and thus remain uncontaminated. A citation analysis methodology falls comfortably within the parameters of unobtrusive research and Smith (1981: 85) describes citations as: "signposts left behind after information has been utilised and as such provide data by which one may build pictures of user behaviour without ever confronting the user..."

Smith (1981:83) positions and describes citation analysis as that area of bibliometrics that measures the relationship between cited documents and citing documents. The defining activity of bibliometrics is to count and

measure things, and the possible units of analysis are inexhaustible. Bibliometrics may be descriptive and involve a “productivity count” in terms of geography, time and discipline to establish the amount of research in a country and/or the amount produced in specific fields. It may also be evaluative and undertake a count of the literature used in a specific field of study and involve the counting of citations included in researchers’ papers (Hertzal 1987: 156).

Citation counts as a technique specifically measures the amount of citations received by a given document, or a set of documents, over a period of time, from a particular set of citing documents (Smith 1981: 85). Counts of citations were first used by Gross and Gross in 1927 to determine a core list of journals for a college library and was based on the premise that articles most cited are the most valuable for researchers (Hertzal 1987: 160). The obsolescence of materials, evidenced through a lack of citations, may be equally determined by this method (Hertzal 1987: 192). In the mid 1950s Garfield also employed the technique of citation counts to quantify the influence of journals and developed the concept of the “impact factor” (Hertzal 1987: 162). Similar formulas are evolving to measure the influence of items of scholarly communication on the Web (Thomas and Willet 2000; Thelwall 2002).

The essential purpose of employing citation analysis techniques in user studies is to assess and assist with collection development and improve user services (Smith 1981: 95). A citation analysis of library users’ research may provide information on new or obsolete research areas and it may inform the preferred formats and languages of users (Gooden 2001; Buttlar 1999). It may also be used to determine the impact, or lack thereof, of different types of information formats on specific disciplines (Smith 1981: 95). Treatments include analysing bibliographies of library users extracted from term papers, theses and dissertations and determining formats, age of cited materials, subject areas and whether materials are locally owned (Smith 1981: 95).

In order to facilitate a count, citation analysis methodology employs elements of content analysis. Content analysis is well suited to the coding of recorded communication (Babbie 1994: 308) and was employed by the current study to code and count the visible content or manifest content of the visible elements of citations and to determine the scholarly attributes of the online documents themselves.

4.2.1 Population

Bibliographies of MIS theses, composed in a period of time in which access to the Web was first introduced and developed, made up the population of this study. Based on the background study the time frame 1996 to 2002 was chosen as best reflecting this period. Data capturing involved the photocopying of bibliographies of MIS theses available at the UNPL, for the years 1996 to 2002. A total of 46 bibliographies were identified and photocopied for analysis. Given that the date of a thesis reflects the year in which the degree was conferred and not the year in which the research was undertaken, in practice the extracted bibliographies were from theses dated 1997 to 2003.

Research at master's degree level is conducted either through the production of a major thesis, or, through the completion of a series of courses in addition to the production of a minor or limited length thesis. The current study made no distinction between mini and major theses and this was supported by the fact that the IS department indicates equivalent standards for all masters' programmes and moreover, that all masters' students are required to design and conduct independent research. It is feasible that the length of a bibliography may have reflected the difference between a mini and major theses.

All personal details of MIS students, including the topic of their theses, were excluded from an analysis of the citations. However for the sake of comprehensiveness the subjects covered in the period may be categorised as following: user studies and education, library staff development and

assessment, library education and history, collection assessment, records management and preservation, electronic information mediums and networks and ICT topics. In addition the study period included a single thesis on knowledge management and another on authoring and information seeking on the Web (see Appendix I for more detail).

4.2.2 Sample

Given the constraints in time, the current study focussed on determining changing trends in patterns of information use rather than absolute numbers. To best achieve this, MIS bibliographies composed at three-year intervals were identified for analysis. This was a purposive sample and was based on the assumption that theses at the beginning, middle and end of the time frame would be most useful in reflecting changes. Accordingly all bibliographies of theses for the years 1996, 1999 and 2002 were chosen.

A non-probability sampling method was chosen on the basis of the knowledge yielded from the background study of the problem. Student access to Web resources on campus was first introduced in 1996 (Naidoo 2003b) and while only fledgling facilities were available, an analysis of the bibliographies compiled during this period provided a point of departure for assessing future trends and comparing subsequent changes. The second year of the period, 1999, was chosen on the basis, that the ITD had significantly improved the quantity of access to the Web in the preceding years (Naidoo 2003). The UNPL also introduced the popular aggregated online database EBSCOhost in this period and was exploring access to other online resources (UNLP 1999). The last year of the study, 2002, besides being an obvious choice also represented the potential to best reflect changes with the improvement of the campus' Internet connection (ITD 2003b), the upgrading of the Library's Web portal (UNLP 2001) and the recorded popular use of the EBSCOhost database (Hoskins 2003).

A total of 24 MIS theses were examined, six for 1996 and nine for both 1999 and 2002. The highest number of theses for any year of this period was nine,

the break down is as follows: 1996 (six theses), 1997 (seven theses), 1998 (four theses), 1999 (nine theses), 2000 (five theses), 2001 (six theses) and 2002 (nine theses) (see Appendix I). The 24 theses represented 52% of the total population of 46 MIS theses for the period. Altogether a total of 2 096 bibliographic citations were analysed, 579 for 1996, 836 for 1999 and 681 for 2002.

A content analysis of the scholarly attributes of online citations was purposely based on the last year of the study, namely, 2002. As above the most current year was chosen on the basis that it would have had the best potential to reflect the affect of the Web on students' research behaviour. Again given the constraints of time and based on a pre-test of a single bibliography with the highest occurrence of online citations, a manageable sample was sought and identified as half or 50% of all online citations for 2002. Every online citation (in reality every citation that included a URL) was listed as it occurred in each of the nine bibliographies for 2002. The nine bibliographies had initially been given chronological case numbers and the same chronology was followed in compiling a list of online citations. A probabilistic approach was applied and a systematic sampling method used to pick every second online citation, starting with the second online citation listed. A total of 60 online citations were chosen in this fashion, representing 50.4 % of the total population of online citations for the year (a total of 119 online citations).

4.2.3 Instrumentation

The validity of the current study was dependant on tailoring instruments to adequately measure existing data, namely citations of MIS theses. This is consistent with the nature of unobtrusive research where "everything you see represents the answer to some important social scientific question-all you have to do is think of the question" (Babbie 1994: 307). Imperative to the current research was constructing indicators, operational definitions and code categories that best answered the research questions and suited the data available.

4.2.4 Constructing indicators to measure the affect of the World Wide Web

It was the assumption of the current study that the affect of the Web on students' citation behaviour could be observed from a measurement of explicit and tacit changes in citation patterns. While explicit examples of the affect of the WWW were drawn from measuring and evaluating online citations, tacit influences, were inferred from changes in the overall composition of bibliographies during a period of access to the Web. To this end the following indicators of affect were constructed:

- *Changes in the level of use and range of traditional print formats*

The current study coded, counted and determined changes in the level of use of different types of traditional print formats, delivered in different mediums and conveyed through both print and online citations. The construction of this indicator was based on the findings observed in related studies (Herring 2001; Davis 2001, 2003; Halliday 2001) that the Web has increased access specifically, through finding aids and full-text, to journal, informal sources of scholarly communication, grey literature and other non-scholarly sources.

- *Increases in the level of use of the online medium for the delivery of full-text information sources*

The current study determined whether, and in light of previous studies (Davis 2001; 2003; Oppenheim and Smith 2001), a growing trend in the use of online full-text information sources by students could be equally determined in the African higher education context. This was an explicit indicator of the affect of the Web on citation behaviour and involved the coding and counting of citations that indicated an online medium of delivery.

- *Growth in the overall size of bibliographies*

Another tacit indicator was based on the findings of Davis's longitudinal study (2001; 2003), namely, that bibliographies have grown in size with the use of the WWW, both as a finding aid and in providing access to full-text sources. Accordingly the current study totalled and compared overall size of MIS bibliographies in the three years identified by the study.

□ *The scholarly attributes of online citations*

The affect of the Web on the quality of research behaviour, and specifically in the choice of online sources is a focus of related studies examining students' citation behaviour (Davis 2001; 2003; Grimes and Boening 2001; Herring 2001). To evaluate whether access to the Web has had a similar effect in an African higher education environment a content analysis of online citations according to the current study's operational definitions was undertaken.

4.2.5 Operational definitions

Three operational definitions were devised to encompass the term scholarly as a source and as a format and facilitate the coding and counting of students' citations.

□ *Traditional scholarly sources*

For the purpose of the study these were categorised as traditional formats of formal and informal scholarly communication, which observe the conventions of scholarship and that continue to meet the objective criteria of a scholarly publication.

The criteria for evaluating scholarly sources available in the literature, beyond exhibiting scholarly activity, determine that a source should be trustworthy, accessible and known to a given scholarly community (Halliday 2001). The study selected the following evident or manifest criteria to identify a scholarly source:

- Evidence of accessibility through the stability of the URL.
- Evidence of scholarly activity through the provision of references.
- Evidence of trustworthiness through the availability of a statement of peer review and/ or academic or research affiliation.

Examples of formats of traditional scholarly sources were based on traditional print formats now available both in print and an online medium. Examples of traditional formal scholarly formats, as in the case of similar studies (Davis 2001; 2003; Herring 2002) were limited to books and journals. Examples of informal scholarly sources included ephemeral or grey and informal outputs of

traditional scholarly communication, for example, pre-prints, theses and dissertations, unpublished conference proceedings and papers, research and technical reports (Halliday 2001).

□ *Other traditional formats*

The term non-scholarly is employed without prejudice to describe sources that generally do not follow the conventions of scholarship and whose main objective is to inform, advocate, advertise, sell and entertain. Archetypal examples of formats of these sources are magazines and newspapers (Davis 2001; 2003; Herring 2002).

Included in this category and for the purpose of this study were other formats also referred to as grey literature. These formats were distinguished as those that communicate the activities, news, procedures, policies, laws and correspondence of governments and organisations but that do not necessarily follow scholarly conventions. This category also included primary sources such as government acts, notices, policy documents and organisations' different type of reports.

□ *Non-traditional sources*

For the purpose of this study these refer to online documents that may or may not observe the conventions of scholarship and/or fulfil the objective criteria of a scholarly publication as described above, but cannot be described in terms of traditional print sources. Formats of these sources include Web pages, discussion forums and other Web media of scholars, researchers, professionals, institutions, governments, organisations and companies.

4.2.6 Code categories

Citation counts are used to measure the frequency of occurrence of a chosen unit of analysis. This method was suited to measure and compare the level of use or frequency of occurrence of different types of formats, of the manifest attributes of online citations, and to determine growth in the overall size of bibliographies of MIS theses during the period of the study. Implicit to a

citation count is the assumption that the units to be counted are observable from a study of the composition of a citation. Accordingly the instrument used for a count should adequately facilitate the identification and coding of these units. The codes for the citation count were the formats of the information sources expressed by each citation and the attributes identified in the cited online documents.

The type and status of formats were identified by the choice of style and the information provided in the citation. Titles that were italicised, highlighted or underlined were treated as published sources. Formats were recognised from the consistent use of versions of the Harvard or name-year referencing style method. When provided, the inclusion of International Standard Book Numbers (ISBNs) and International Standard Serials Numbers (ISSNs) was also used to identify a format. Online sources were identified by the inclusions of URLs.

The following code categories were used to identify and group citations delivered in both print and online mediums. A pre-test of this instrument found these categories sufficient to cover the range of information formats used by MIS students.

- *Formats traditionally associated with the formal communication of scholarship:*
 - Books / Chapters of books

The ALA defines a scholarly book as that which is:

Written in a scholarly style, 2) about a specialized subject, 3) aimed at relatively narrow clearly-defined market segment, 4) sold primarily within that market, 5) often purchased on the basis of imprint, 6) not price-sensitive, 7) not highly profitable for the publisher, 8) usually published by a university press or the publishing arm of a scholarly society, 9) reviewed mainly in scholarly journals, and 10) indexed, with

a bibliography or list of references for further reading at the end (Reitz 2002).

This definition includes a monograph, specifically defined as a scholarly treatise of limited length (Reitz 2002). In practise this category included academic, pedagogical and prescriptive sources, published conference proceedings and research reports both in print and online.

□ Journals

Defined as “a periodical devoted to disseminating original research and commentary on current developments within a specific discipline, sub-discipline, or field,” and published periodically, either quarterly, bimonthly, or monthly (Reitz 2002). Journal articles are usually authored by the original researcher and include a bibliography or list of works cited at the end (Reitz 2002). Scholarly journals generally exclude trade or professional journals whose purpose is to inform members of a profession or trade and may not necessarily follow strict scholarly conventions (Swain 2001). This distinction was not always clear from an analysis of the citations and in practice this category included citations to all journal titles described as print or online. In addition, no inferences were made as to whether journal articles had been downloaded from the Web.

• *Formats traditionally associated with the informal communication of scholarship:*

The following formats describe the initial parts of the cycle of scholarship that traditionally pre-empted the formal publishing of a scholar’s work:

- Theses and dissertations
- Conference papers and proceedings
- Research and technical reports
- Pre-prints

In practice no pre-prints could be adequately identified from an analysis of citations. Research reports and conference papers and proceedings published in book or journal formats were included within those categories.

- *Other formats based on traditional print formats*

The purpose of this category was to group formats that are used in scholarly research but do not necessarily follow scholarly conventions and included the following in both print and online versions:

- Newspapers. This is defined as a serial publication generally issued daily, on certain days of the week, or weekly and that contains news, editorial comment, regular columns, letters to the editor, cartoons, advertising, and other information of interest to a general readership (Reitz 2002). In practise these were identified by their titles and the inclusion of the day of the week in the citation as prescribed by style manuals (Aitchison 1999b).
- Magazines. These are defined as popular interest periodicals usually containing articles on a variety of topics, and written by various authors in a non-scholarly style (Reitz 2002). In practise these were also identified by their titles and the inclusion of the day of the month in the citation as prescribed by style manuals (Aitchison 1999b).
- Government documents and publications. The definition for grey literature was utilised to identify these documents, specifically “that which is produced at all levels of government... not controlled by commercial publishers” (NYAM 2003). Government publications cover the spectrum of different print formats (UCT 2001), and may include publications that have followed scholarly conventions. However this information is not available from the analysis of a citation and in the interest of consistency all formats expressing a government body as the corporate author were included in this category. In practise this included acts, policy papers, information papers, guidelines documents, technical, research, investigative and planning reports.

- Organisation documents. This category was used to describe grey literature produced by all types of organisations (excluding government bodies) and whose purpose was to describe in-house activities. In practice this included annual reports, guidelines and procedures papers and manuals and in-house newsletters or bulletins. Documents published by organisations in book, journal or conference proceedings format, were excluded.
- Miscellaneous. This category was created to describe other traditional print formats not catered for by the above descriptions. In practice this included lecture notes and student papers and other print documents not adequately described to enable identification.

- *Personal communications*

All oral, print and electronic correspondences in the form of interviews, letters, e-mail and telephonic communication between individuals were included in this category.

- *Non-traditional formats*

This included Web based documents that could not be described in terms of traditional print formats. An anticipated problem with these citations was the lack of information available from an analysis of the citation to adequately identify a format. Accordingly formats that may have fulfilled the description of a traditional print format in an electronic medium may have been included in this category. In practice this included all online sources that did not indicate a similarity to a traditional print format.

- *Scholarly attributes of online citations*

The following manifest attributes were constructed to code the content of online citations:

- Evidence of accessibility through the stability of the URL.
- Evidence of scholarly activity through the provision of references.
- Evidence or statement of peer review.

- Evidence of academic or research affiliation.
- Format type.
- Domain type.

The domain type was included for the sake of comprehensiveness and as a basis for comparison with findings of related studies investigating the quality of online sources (Davis 2001; 2003; Grimes and Boening 2001).

4.2.7 Pre-testing the instrument

Initial coding categories of the operational definitions were tested on the entire sample to test for their suitability and reliability. From a pre-test it was found that government and organisation documents were too extensive in quantity and nature to identify individually and a single category was made for each. It was not possible to consistently identify a book or journal format as a scholarly source and the decision was made to include all books and journals formats. Magazines and newspapers were infrequently encountered and one category was made to describe both. A pre-test confirmed that online citations did not always include enough information to express a format adequately and in this case were encompassed under a broad Web document category.

Codes for a content analysis of online citations were tested on the bibliography with the most online citations for the year 2002, and were found to be suitable. Locating documents that were no longer at the indicated URLs was time and labour intensive and the decision was made to reduce the search process to the use of a single search engine and to the first page of hits.

4.2.8 Data analysis

The first level of analysis captured the frequency of occurrence of different attributes. This data was transcribed on transfer sheets (see Appendix II and III) and then transferred on to Excel™ spreadsheets for descriptive statistical analysis and graphical representation. Further analysis included frequency

distribution of variables and measuring averages and standard deviations. Tables, bar graphs and pie charts were used to graphically illustrate the analysis of data.

4.2.9 Evaluation of method

The validity of a study refers to its ability to generate findings that approximate reality as closely as possible. Specifically it refers to “the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration” (Babbie 1994: 127). The current study constructed indicators to assess the affect of the Web on students’ citation behaviour and accordingly its validity may be tested on whether these constructs are adequate indicators of the level and nature of the affect of the Web on students’ citation behaviour. It is obvious that there may be different or various reasons for changes or lack thereof, in citation behaviour. This should not compromise the study’s validity if a logical relationship exists between the concepts or constructs of the study and the variables it measured. According to Babbie (1994: 128) definitive proof for a study’s construct validity is not required, merely a weight of evidence.

Another possible threat to this study’s validity is whether the attributes chosen to analyse the content of online sources represented valid indicators for determining their scholarly nature, or lack thereof. The parameters of the assessment should however be clear from the operational definitions. The validity in the case of this study was also strengthened in that only manifest content was coded and measured.

A danger of quantitative research is that it “may ignore the contextual relevance of behaviour and therefore remove its relevance” (Bains 1997) and Babbie (1994: 335) cautions the danger of analysing aggregated data for the purpose of understanding individual behaviour. Indeed a finding of the current study was that drawing general conclusions from the aggregated numerical data yielded by the citation count, revealed patterns at a group level different from those found at an individual level.

The reliability of a study refers to the consistency of measures used and whether if repeated they would yield the same answers. A particular advantage of unobtrusive research and citation counts is that is that the data can be retested and recoded to arrive at consistent tools for measurement.

A particular criticism of citation analysis is that it does not recognise egotistical and deviant citation behaviour. Generally this implies the citing of sources for reasons other than simply acknowledging influences on one's work. The reliability of the data being analysed may be thus questioned. However findings of a related study indicate that students tend to follow normative theories of citation behaviour and cite all their influences (Oppenheim and Smith 2001: 315).

Another threat to reliability in analysing citations is typographical errors and poor documentation styles evidenced in bibliographies. The current study did find that online citations on the most part did not provide adequate information to identify the format of the information source. A number of errors were also present in transcribed URLs of online citations.

4.3 Survey of Master of Information Studies supervisors

The survey method is generally used for descriptive, explanatory and exploratory research (Babbie 1994: 257) and was employed by the current study to help describe MIS supervisors' support of the Web for research. Actual use and interventions on the part of the supervisors was not investigated and this part of the study remained preliminary. A more in-depth analysis of teaching staffs' use of the Web requires further study.

4.3.1 Population

The population of the study consisted of the head of the IS programme, two senior lecturers and two lecturers and was largely representative of the staff

responsible for the MIS programme since 1996¹. Given the size of the population, no sampling was required. A disadvantage of a small population is the possibility of a low response affecting the validity of the survey. This was not considered a problem given the researcher's accessibility to the population under study.

4.3.2 Instrumentation

The current study employed a self-report approach to the survey method. Initially interviews had been considered as a better method for gathering qualitative data from a small population and to accompany the quantitative data yielded by a bibliometric study. However due to constraints in time a self-administered questionnaire was chosen and designed to elicit focussed responses to the relevant research questions. Since the objective was not to question supervisors' support for the Web but to establish the perceived level and nature of the support and to juxtapose these findings with those of the bibliometric study, a self-administered approach was considered adequate.

An obvious disadvantage of this type of approach is that the researcher is not present to explain any ambiguities and to provide clarification on concepts and terms used. This drawback may have been lessened by the fact that both the researcher and the population share a common terminology. A seven-page self-administered questionnaire (see Appendix IV) consisting of 27 close-ended questions and two open-ended questions was designed. Questions were largely inspired by instruments used in similar studies assessing teaching staffs' information gathering behaviour and attitudes towards the Web for research (Herring 2001; Friedlander 2002; Grimes and Boening 2001).

¹ The fifth member of the population was later withdrawn from the analysis due to a self-expressed limited involvement in the supervision of MIS theses for the time period under study.

4.3.3 Constructing indicators to measure support for the Web

A common observation in the literature is that of teachers' role in determining students' information gathering behaviour. The type and quality of information sources used by students is largely attributed to teaching staff's expectations, interventions and own information gathering behaviour (Rowley 2002; Swartz 2002; Uruquart 2003; Davis 2001; 2003; Grimes and Boening 2001). Accordingly a survey of the IS teaching staff responsible for the supervision of master's degree students in the time period under study, was undertaken to investigate their support of the Web for research. The following indicators were constructed to measure potential or perceived support:

- A profile of MIS supervisors as researchers.
- Information gathering behaviour of MIS supervisors.
- Supervisors' expectations and preferences for student use of the Web.
- Supervisors' agreement on the affect of the Web on research behaviour.

4.3.3.1 Characteristics of the supervisors

The Faculty of Human and Management Sciences (UNP) (*FHMS Guidelines for Higher Degrees* (UN nd.b: 8,9) identifies suitable supervisors as active and experienced researchers who understand the area of research and have up-to-date knowledge of the relevant literature and accordingly are able to direct students to appropriate resources. Another requirement included in the *International Federation of Library Associations and Institutions (IFLA) Guidelines for LIS Programmes* is that academic staff be technologically proficient (IFLA 2000). The first set of questions consequently attempted to arrive at a general description of the study's populations' level of involvement in supervision and research activities, including participation in an online invisible college, their areas of research, and the extent of connectivity to the Internet.

4.3.3.2 Information gathering behaviour of supervisors

The second part of the questionnaire attempted to establish supervisors' information gathering behaviour and preferences. Related studies have observed both an expert mode and the lack of it in the gathering of information in an electronic environment (Leckie 1996; Grimes and Boening 2001). The current study investigated the level of use and preference for different locations (physical and virtual) and tools (online and print); the level of use and preference for different types of online facilities, the extent to which traditional scholarly sources are used in their online or print versions; and the location (physical or virtual) that best fulfils their information needs.

4.3.3.3 Supervisors' expectations and preferences

Related studies have indicated a gap between teaching faculty's expectations and students' information gathering behaviour (Leckie 1996; Grimes and Boening 2001; Herring 2001). Accordingly the third part of the questionnaire attempted to establish supervisors' expectations and preferences of MIS students' information gathering behaviour. The questions in this section sought answers on the preferred information locations (online and physical) and preferred online tools. Supervisors' expectations and promotion of traditional sources in both print and online versions were also sought.

4.3.3.4 Supervisors' agreements on the affect of the Web

Relevant studies on the topic of faculty's of the WWW for research indicate a general positive attitude towards students' use of a Web environment for research, however a common concern is that with the quality of sources used and students' ability to evaluate accordingly (Leckie 1996; Grimes and Boening 2001; Herring 2001). The last part of the questionnaire sought to establish supervisors' views on the effects the Web may have had on students' research behaviour. The purpose of these questions was to establish an African educators' perspective on the utility of the Web for research in African higher education environments.

4.3.4 Form of questions

...close questions should be used where alternative replies are known, are limited in number and are clear cut. Open-ended questions are used where the issue is complex, where relevant dimensions are not known, and where a process is being explored (Stacey 1969, cited in LTSN 2003).

The questionnaire construction included closed and open-ended questions. Closed-ended questions schedule all possible responses in advance and respondents are required to choose the most appropriate response category. The advantage of this method is that respondents are obliged to respond according to a previously constructed finite set of responses that are easily coded and quantified. Close-ended questions also require minimal effort from respondents to answer. The disadvantage is that the researcher may have overlooked other possible response categories. An "other" category is usually included in anticipation of this.

Initial closed-ended questions elicited pieces of information that would help describe the respondents' involvement in supervision and research. The subsequent and majority of closed-ended questions were assigned ranked answers. Ranked answer questions provide responses positioned on a scale of alternatives and are useful in assessing degrees of behaviour, satisfaction or agreement (LTSN 2003). These types of questions were used to gather information on the degree of frequency with which supervisors used facilities and sources. A further two ranked answer questions were phrased as statements and Likert type response categories were used to elicit supervisors' agreements on the affect of the Web on students' research behaviour and levels of information literacy.

An advantage of this approach is that overall degrees of satisfaction, agreements and behaviour can be easily gauged. A disadvantage is that respondents do not have an opportunity to elaborate on the choice of a particular degree of behaviour, satisfaction or agreement (LTSN 2003).

As most questions had the same ranked answer categories a large portion of the questionnaire was arranged in a matrix format. The advantage of this approach is that space is used efficiently, respondents find it faster to complete, and it increases the comparability of responses for both the respondent and the researcher (Babbie 1994: 150). The efficient utilisation of space was a particular requirement of this study's questionnaire construction as respondents were expected to print it on receiving it via e-mail. The disadvantages of this approach are that the layout of the matrix questions may encourage a "response-set" among some respondents and they may develop a particular pattern in responding (Babbie 1994: 150). In addition because of the layout and ease in answering, respondents may not necessarily read statements correctly and may indicate the incorrect responses.

Two open-ended questions were included, the first to elicit a description of the areas of research supervisors' represented and the second was attached to the ranked answer question on the affect of the Web on the quality of research. The purpose of this second open-ended question was to facilitate an analysis of supervisors' attitudes towards the Web as a research tool. The advantage of open-ended questions is that they provide the respondent the opportunity to respond at will and they are particularly useful when individuals' opinions on a complex issue are sought. The disadvantages of open-ended questions are that they need to be coded before analysis and this may be time and labour intensive moreover the researcher may misinterpret the information. Another possible drawback is that the answers provided may be irrelevant to the research questions (Babbie 1994: 142).

4.3.5 Pre-testing the questionnaire

It is imperative that questionnaires be pre-tested before being implemented to root out ambiguous and ambivalent questions and to clarify the purpose of the questions (Babbie 1994: 152). To effectively test a questionnaire it should be administered on a similar population (LTSN 2003). The questionnaire in the current study was tested on three academics and two professional librarians. This group was similar to that of the population of the study in nature and size.

As in the case of the final version the questionnaire was e-mailed to respondents with a covering e-mail message explaining the purpose of the questionnaire (see Appendix V).

Respondents of the pre-test provided positive comments and suggestions and these were incorporated in the final version of the questionnaire. Changes to the original questionnaire included the following: revision of the ranked answer questions to describe frequency rather than proportion of time; the provision of examples of sources associated with online and print locations to provide clarity; the redefinition of the location "physical library" as "physical libraries" to encompass all physical collections; the extension of the possible facilities available on the Web to include Web portals and journal content services.

4.3.6 Administering the questionnaire

The revised questionnaire once approved by the investigator's supervisor was attached to an e-mail message and sent to the five respondents that made up the population. A covering e-mail message explained the purpose of the study and provided basic instructions on the completion and return of the questionnaire (see Appendix VI). Respondents were expected to print the attached questionnaire, complete it and submit it to the study's supervisor for later collection by the researcher. Three questionnaires were returned in this manner, the fourth was completed electronically and e-mailed back to the researcher. The latter option should have been preferred as the questionnaire was very long to print. Four questionnaires were returned within a two-week period, the fifth questionnaire was returned later and subsequently withdrawn from the analysis on the basis of the respondent's limited supervision of MIS students for the time period.

4.3.7 Data analysis

Given the limited size of the population and the focus of the research questions, data was largely manually managed and described. A univariate analysis was conducted and cases were accordingly examined one variable at a time. The purpose of univariate analysis is to facilitate description of the

people or other units of analysis (Babbie 1994: 385) and was found suitable for the purpose of the survey. Where appropriate, behaviour and agreement of respondents was transferred to Excel™ spreadsheets for graphic manipulation. A content analysis approach was used to analyse the manifest attributes of responses to the open-ended question that elicited opinions on the affect of the Web on students' research behaviour. The "other" category responses were similarly analysed and organised into concepts, categorised and presented.

4.3.8 Evaluation of the method used

A particular characteristic of surveys is that they cannot measure action and are limited to gathering self-reported data on past, future or intended action (Babbie 1994: 274). The validity of the current study may be tested on whether the concepts or constructs explored, specifically supervisors' own use of the Web, their preferences, expectations and promotion of Web resources for student research, can be used as accurate indicators of their perceived support of the Web for research.

A possible problem with survey research is the danger of over-reporting and respondents may have exaggerated what they perceived to be desirable behaviours. This may have been the case with the current study as the line of questioning employed by the instrument was very direct and the covering e-mail message spelled out the purpose of the survey. Moreover the population targeted are information specialists who would know the value of hybrid information environments whether they utilise them or not. However, since the purpose of the study was to juxtapose findings of the survey with those of the citation analysis a reflection of what was actual behaviour or perceived to be the correct behaviour was still considered important to establish.

A better approach in gathering data from a population of this size and to meet the requirements of the research objectives would have been that of an interview which each member of the population. The researcher attempted to compensate for this by asking a large number of questions in various ways to

allow for a retrospective flexibility in the analysis of the data. The result however was that some questions were unnecessary or poorly structured. This was specifically the case with question 20, which attempted to establish supervisors' level of preference for students' use of online and physical collections. The last item in this matrix attempted to establish whether supervisors had any preferences about the use of either a print or online environment. However the question was too complex to have been treated as a ranked frequency answered question and should have required respondents to provide reasons for their lack of preference.

The Web as a research medium continues to evolve and the survey's future reliability may be threatened by ongoing changes and individual awareness and behaviour. The survey is also very specific to a unique group at a particular period of time and place. The study's reliability may however be extended to other information literate groups involved in research and education in African higher education settings, at this particular time.

4.4 Facilities and services offered by the UNP that support access to the Web

In the absence of an interpretive approach to the study of MIS students' citation behaviour, external determinants were investigated, specifically the facilities and services offered by the UNP that support student access to the Web. Recent Internet surveys conducted in African academic environments, collectively report a positive perception towards the Internet as a tool for research but actual use is disabled by equally common barriers, specifically these include: limited or poor physical access, including slow connection speeds; poor information and computer literacy skills and supporting instruction; meagre information sources and/or little promotion of available resources (Ehikhamenor 2003; Ocholla 1999; Mgobozi and Ocholla 2002; Kaniki 1999). The nature and expectations of the academic programme or department are also a possible determinant of the use of the Internet for research (Ocholla 1999; Ehikhamenor 2003).

A historical research method was employed to piece together data reflecting the supporting infrastructure for Web access on the UNP campus during the period under study. An advantage of this method and significant to this study is that it may indicate or suggest through a study of previous events, “generalizations for guiding behaviour” (Young 1987 cited by Campbell 2002).

According to Mason (1997, cited by Campbell 2002), “the principal product of historical research is context – an understanding of the organizational, individual, social, political, and economic circumstances in which phenomena occur.” While the current study was motivated by creating a context for the bibliometric study of MIS citations, the use of the historical research method was preliminary and limited to describing general barriers and enablers to Web access on the UNP campus during the period of study. The question however of whether the UN has adequately provided for the necessary infrastructure to support the many dimensions of Web access, is valid and requires further study.

Data was largely collected from grey sources and limited to what was documented for public consumption, including reports, bulletins, Web pages, relevant theses, and course and programme information. In addition, personal communication was used as a source of information. The data drawn from different sources was integrated and chronologically arranged to present an interpretation of events in the chosen time frame, 1996 to 2002. A general description on the following aspects of Web access on the UNP campus was achieved:

- The level and nature of student access to physical resources including computers and scholarly information resources.
- The existence and nature of relevant supportive services, namely information literacy and library instruction programmes.
- The nature and expectations of the IS MIS programme.

4.5 Summary

The current study observed changes in MIS students' citation behaviour from an analysis of their citations in a period of access to the Web. The method of enquiry was unobtrusive and employed an overall citation count and a content analysis of online citations composed in a period of access to the Web. Supporting methodologies attempted to provide preliminary information on possible external determinants of changes or lack thereof, in citation behaviour. A preliminary historical research approach was undertaken to establish a context for the study. A survey of MIS supervisors to describe their support of the Web medium for research was also undertaken. The three methodologies have been described in this chapter and the methods used for both the citation analysis and the questionnaire survey evaluated.

CHAPTER FIVE: PRESENTATION AND ANALYSIS OF RESULTS

5.0 Introduction

The purpose of the current study was to investigate whether a period of access to the World Wide Web had influenced the research behaviour of postgraduate students in an African higher education environment. Investigating changes in citation behaviour from an analysis of these bibliographies provided an unobtrusive method to gather data on changes in patterns of information use. This method yielded quantitative data to complement local studies that have investigated Internet use in academic environments at survey level (Mugwisi and Ocholla 2002; Ehikhamenor 2003; and Kaniki 1999) and related information retrieval skills at a conceptual level (Cosijn 2000; Thompson and Cronje 2001; Nel 2001). In addition possible determinants of MIS students' citation behaviour, specifically their use of the Web, were investigated in terms of a survey of MIS supervisors' support of the Web for research and against a background study of the facilities and services offered by the UNP.

The Internet and specifically the Web as an information tool and resource, has received much support in African academic environments (Mugwisi and Ocholla 2002; Rosenberg 2001; Kaniki 1999). Moreover and more recently the University of Natal's libraries have supported an investigation on the use of Web resources to supplement and replace more traditional collection development policies (Geslin 2002a; b; c). An analysis of the University of Natal's MIS students' citation behaviour presented the potential to reflect the utility of the Web at a research entry level in an African higher education environment. The MIS supervisors surveyed were largely responsible for the master's degree level output for the period of the study and are also a fair representation of information specialists in an academic environment.

5.1 Research objectives of the study

The current study examined both explicit and tacit examples of the affect of the Web on students' citation behaviour and external influences that may have determined the extent of this affect. Physical examples of the affect of the Web were drawn from measuring and evaluating changes in citation patterns of MIS theses during a period of access to the Web. External influences were inferred from survey of the level and nature of MIS supervisors' use and support of the Web for research.

To facilitate the objectives of the current study the following research questions were formulated and posed:

- ❖ To determine the extent of the Web's affect on students' citation behaviour by measuring and comparing the level of use of traditional print formats and sources; determining the growth in the use of online sources; and determining changes in the overall size of bibliographies.
 - How has the level and range of use of traditional print formats changed in a period of access to the Web?
 - What is the growth in the level of use of the online medium for the delivery of full-text information sources during the period under study?
 - Have bibliographies grown in size during the period under study?
- ❖ To assess the affect of the Web on the quality of research behaviour, specifically in terms of the level of use of non-scholarly online sources and the stability of cited URLs.
 - Do cited Uniform Resource Locators (URLs) point to the correct document?
 - What proportion of students' online citations may be categorised as non-scholarly?
- ❖ To assess MIS supervisors' support of the Web for research, specifically in terms of their own use and their expectations and preferences for their students' use, of this environment.
 - What is the level and nature of MIS supervisors' use of Web resources for their own research?

- What are the expectations and preferences of MIS supervisors in regards to the use of the Web by their master's degree students for research?
- ❖ To determine an African educator's perspective of the use and affect of the Web on postgraduate research.
 - What changes have MIS supervisors perceived in the citation behaviour of students under their supervision?

5.2 Bibliometric study

A bibliometric method provided the mechanisms to qualify and quantify MIS students' research behaviour. To facilitate the study's research questions all citations of MIS theses for the years 1996, 1999 and 2002 were coded and counted and the content of online documents cited by MIS theses in the year 2002 were analysed and manifest attributes counted.

5.2.1 Changes in the level and range of use of traditional formats

To determine changes in the level and range of use of different types of formats, citations of MIS bibliographies for the years 1996, 1999, 2002 were coded according to the following categories:

- ❖ Formal formats – books, chapters of books and journals,
- ❖ Informal formats - unpublished theses and dissertations, conference papers and proceedings and research reports
- ❖ Other formats:
 - Grey literature - government and organisation documents
 - Non-scholarly – newspapers and magazines
 - Miscellaneous print/hardcopy sources – in practice this included course and lecture notes and student papers
 - Personal communication – correspondence and interviews
 - Non-traditional formats – Web pages, discussion forums. In practice this included unidentified online citations

The following measurements and comparisons were undertaken to investigate changes in the use of traditional scholarly formats for each year of the study. In summary a comparison of all three years of the study was undertaken.

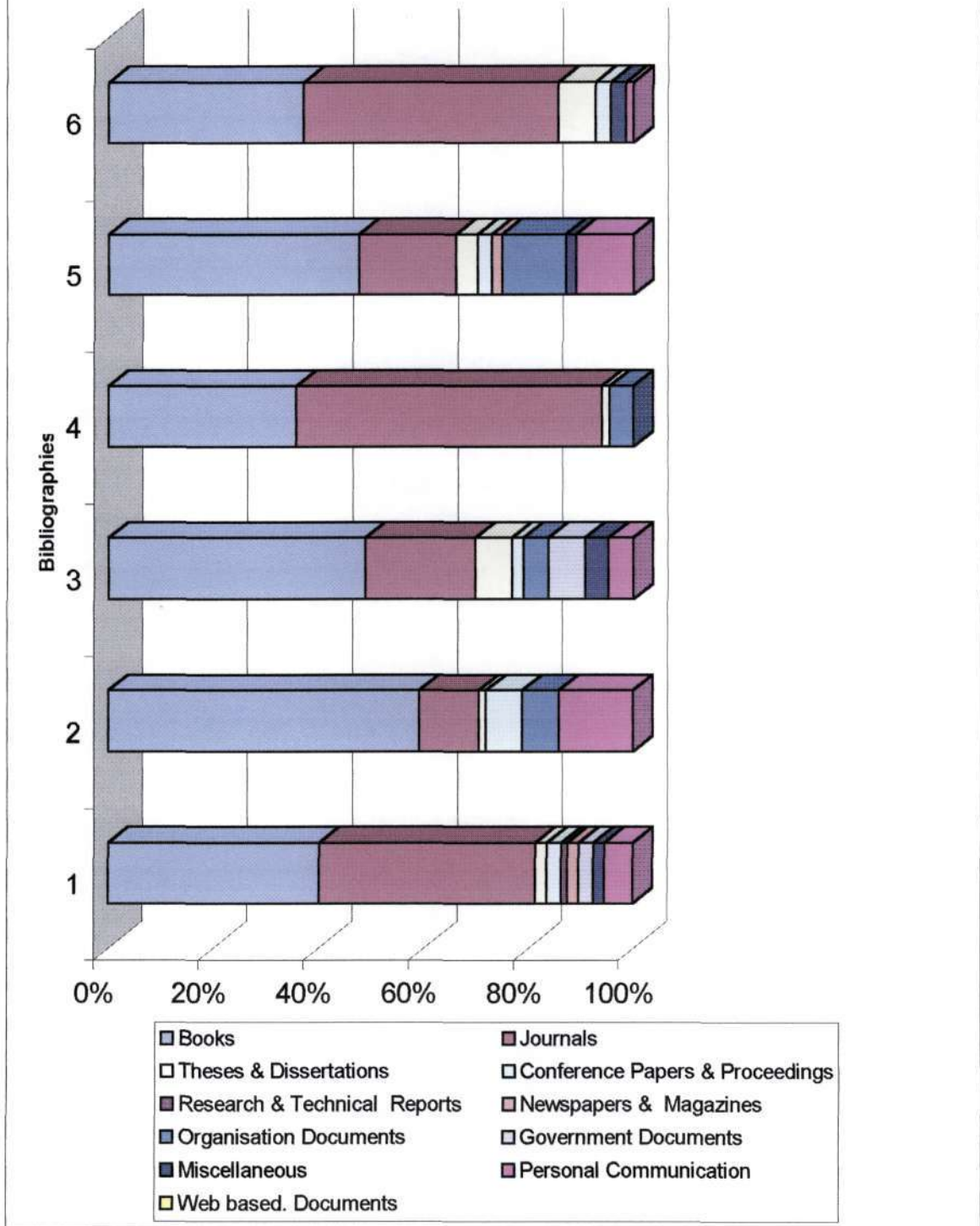
5.2.1.1 Occurrence of different types of formats in theses of 1996

Table 1. Occurrence of formats in bibliographies of theses - 1996

Case numbers:								
1996	1	2	3	4	5	6	Score	% of total
Books	40.3%	59.2%	48.8%	35.8%	47.6%	37.1%	256	44.2%
Journals	41.4%	11.3%	20.9%	58.2%	18.4%	48.6%	192	33.2%
Theses & Dissertations	2.2%	1.4%	7.0%	1.5%	4.1%	7.1%	20	3.5%
Conference Papers & Proceedings	2.8%	7.0%	2.3%	0.0%	2.7%	2.9%	17	2.9%
Research & Technical Reports	1.1%	0.0%	0.0%	0.0%	0.0%	0.0%	2	0.3%
Newspapers & Magazines	2.2%	0.0%	0.0%	0.0%	2.0%	0.0%	7	1.2%
Organisation Documents	0.0%	7.0%	4.7%	4.5%	12.2%	0.0%	28	4.8%
Government Documents	2.8%	0.0%	7.0%	0.0%	0.0%	2.9%	10	1.7%
Miscellaneous	1.7%	0.0%	4.7%	0.0%	2.0%	1.4%	9	1.6%
Personal Communication	5.5%	14.1%	4.7%	0.0%	10.9%	0.0%	38	6.6%
Web based. Documents	0%	0%	0%	0%	0%	0%	0	0%
Size of Bibliography	100%	100%	100%	100%	100%	100%	579	100%

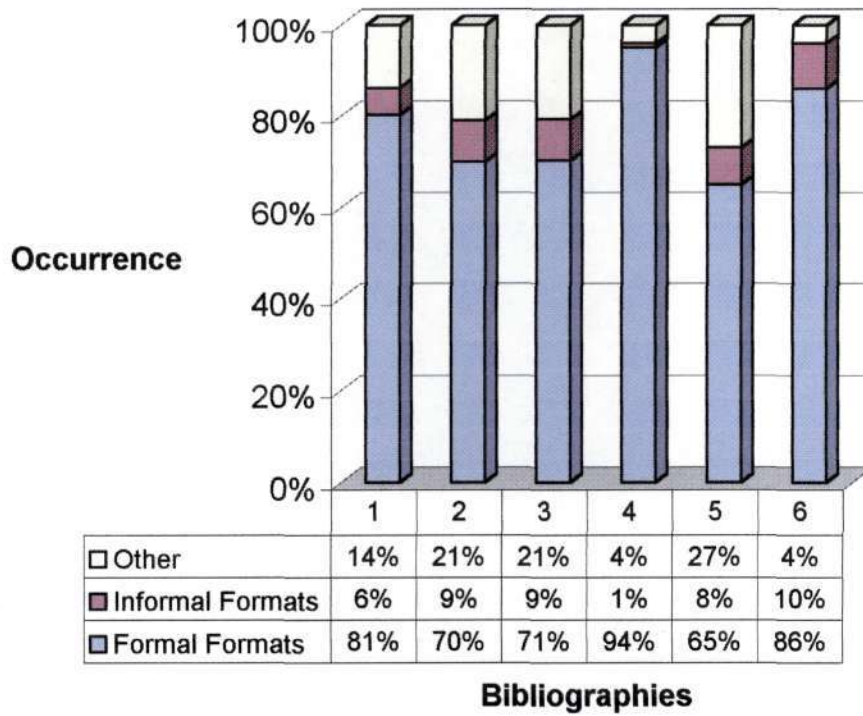
Bibliographies of the six theses submitted in 1996 were analysed and a total of 579 citations were coded, counted and categorised. Counts of formats for each bibliography were converted to percentages of the total size of the individual bibliographies for comparative purposes. The total score for each format was divided by the total score for all citations, and a percentage for the year calculated.

Figure 1. Distribution in the occurrence of different formats - 1996



- The book format predominated in occurrence for theses undertaken in 1996 and accounted for 44.2% of all citations.
- The journal format ranked second and citations to this format accounted for 33.2% of all citations. Disparities in the use of journal sources at an individual level are obvious, with occurrence ranging from as little as 11.3% to 58.2% of the total size of a bibliography (see Table 1). In three of the bibliographies the use of the journal format was between 41.4% and 58.2% of all formats cited.
- Personal communication ranked third highest in occurrence at an average of 6.6% of all citations, this included interviews and correspondence between the authors of the theses and their various informants.
- Citations to documents of organisations ranked fourth highest in use and accounted for 4.8 % of all formats.
- Unpublished theses and dissertations, conference proceedings and papers and research reports accounted for of 6.7% of all citations with unpublished theses and dissertations occurring more (3.5% of all formats). Of this category unpublished research reports were encountered the least and observed in only one bibliography (see Table 1) accounting for of 0.3% of all formats.
- Miscellaneous materials included hardcopy versions of student papers and lectures and accounted for 1.6% of all citations.
- Beside the absence of Web-based formats, the least occurring citations were for magazines and newspapers, these accounted for 1.2% of all citations. Use of these formats was disparate and only encountered in two bibliographies (see Table 1).

Figure 2. Distribution in the occurrence of categories of formats-1996



Altogether formal formats predominated in theses for 1996 and on average accounted for 77.4% of the total size of bibliographies. At an individual level use of formal formats was high and ranged from 66% to 94% of the total size of a bibliography (see Table 1). Informal formats accounted for 6.7% of all citations. The category for other formats accounted for 15.9% of all formats. Of this personal communication ranked highest in use while newspapers and magazines occurred the least.

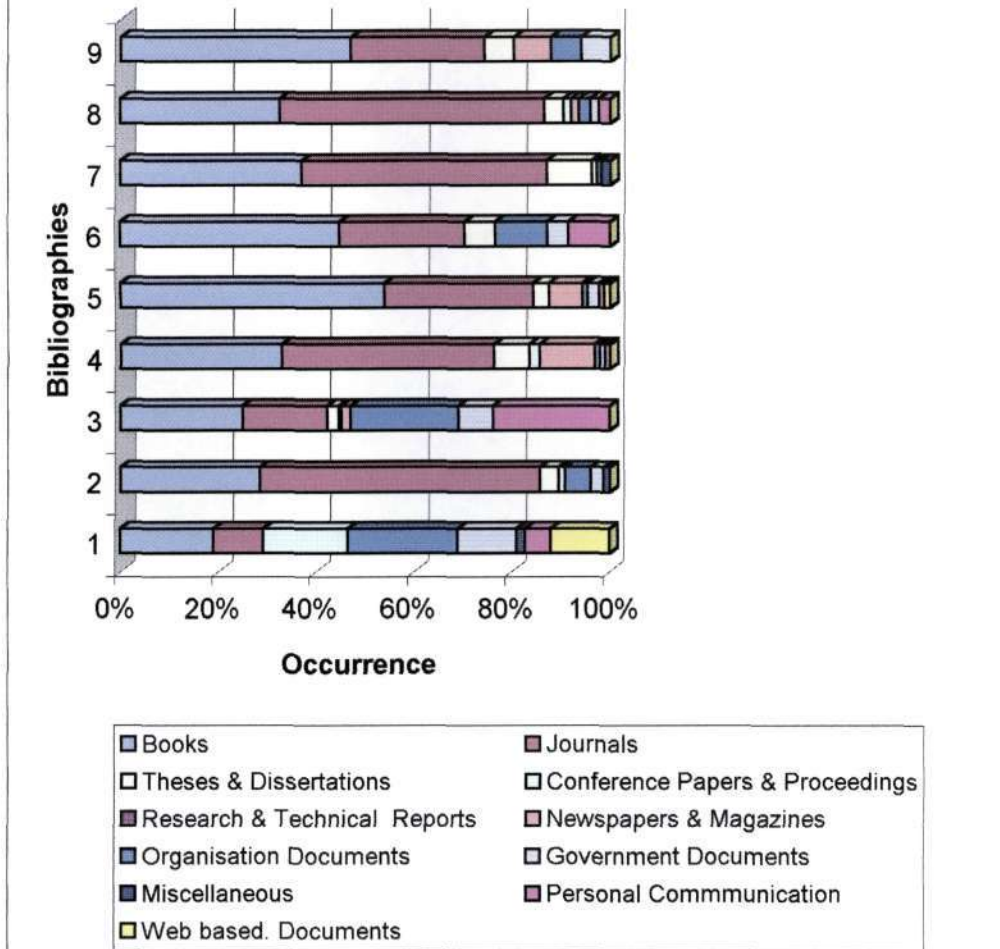
5.2.1.2 Occurrence of different types of formats in theses of 1999

Table 2. Occurrence of formats in bibliographies of theses - 1999

Case numbers:											
1999	1	2	3	4	5	6	7	8	9	Total	% of total score
Books	19.0%	28.6%	25.0%	33.0%	53.9%	44.7%	37.0%	32.5%	47.0%	288	34.4%
Journals	10.3%	57.1%	17.3%	43.3%	30.3%	25.5%	50.0%	54.0%	27.3%	300	35.9%
Theses & Dissertations	0.0%	3.9%	2.4%	7.2%	3.4%	6.4%	9.3%	4.0%	6.1%	39	4.7%
Conference Papers & Proceedings	17.2%	1.3%	0.6%	2.1%	0.0%	0.0%	0.9%	1.6%	0.0%	17	2.0%
Research & Technical Reports	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0	0.0%
Newspapers & Magazines	0.0%	0.0%	1.8%	11.3%	6.7%	0.0%	0.0%	1.6%	7.6%	27	3.2%
Organisation Documents	22.4%	5.2%	22.0%	1.0%	1.1%	10.6%	0.9%	2.4%	6.1%	69	8.3%
Government Documents	12.1%	2.6%	7.1%	1.0%	2.2%	4.3%	0.0%	1.6%	6.1%	32	3.8%
Miscellaneous	1.7%	1.3%	0.0%	0.0%	0.0%	0.0%	1.9%	0.0%	0.0%	4	0.5%
Personal Communication	5.2%	0.0%	23.8%	1.0%	1.1%	8.5%	0.0%	2.4%	0.0%	52	6.2%
Web based. Docs	12.1%	0.0%	0.0%	0.0%	1.1%	0.0%	0.0%	0.0%	0.0%	8	1.0%
Size of Bibliography	100%	100%	100%	100%	100%	100%	100%	100%	100%	836	100%

Bibliographies of the nine MIS theses submitted in 1999 were analysed and a total of 836 citations were coded, counted and categorised. As above counts of formats for each bibliography were converted to percentages of the total size of the individual bibliographies for comparative purposes. The total score for each format was divided by the total score for all citations, and a percentage for the year calculated.

Figure 3. Distribution in occurrence of different formats - 1999

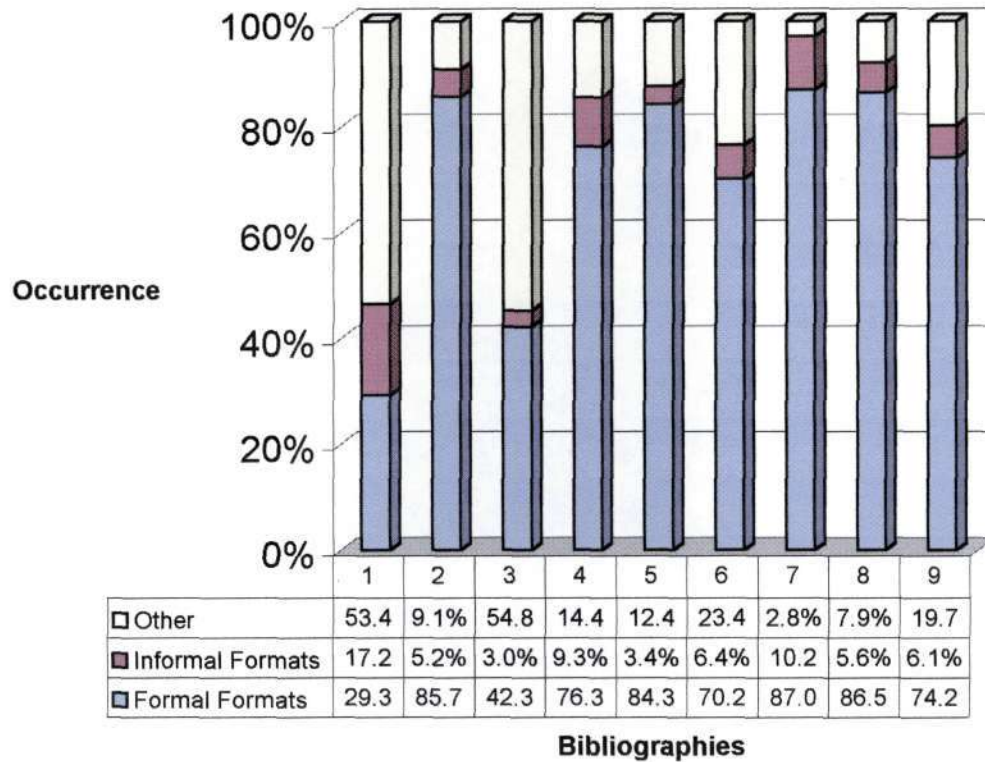


- The journal format ranked first in occurrence and accounted for 35.9% of all citations. Disparities in the use of journal sources at an individual level were observed, with use ranging from as little as 10.3% to 57.1% of the total size of a bibliography (see Table 2). In four of the bibliographies this format occurred less than 30% and in three it accounted for 50 or more percent of all citations.
- The book format ranked second in occurrence for theses undertaken in 1999 and accounted for 34.4% of all citations for the year. Use was less disparate with 75% of bibliographies exhibiting over 30% incidence of this format on average.
- Citations to documents of organisations ranked third and accounted for 8.3% of all citations for this year. The higher level of occurrence can be

attributed to two individual bibliographies that each recorded a use of 22% for organisation formats (see Table 2).

- Personal communication formats ranked fourth highest in occurrence and accounted for 6.2% of all citations. The occurrence of this format was disparate and ranged from an absence of use to up to 23.8% of individual bibliographies (see Table 2).
- Theses and dissertations were found in the majority of the bibliographies in 1999 and ranked fifth in use at 4.7% of all citations. This was the highest occurring format of the informal formats.
- Government documents ranked sixth and rose in use in 1999 to 3.8% of all citations and were found in eight of the nine bibliographies.
- The occurrence of citations for newspapers and magazines rose to 3.2% of all citations and ranked seventh in use but was only observed in five of the nine bibliographies for the year (see Table 2).
- Unpublished conference proceedings and papers accounted for 2% of all formats and occurrence was disparate ranging from no occurrence in three bibliographies to up to 17% of all formats in an individual bibliography.
- Web based documents accounted for 1% of all citations but use was limited to two bibliographies (see Table 2).
- An average of 0.5% of all citations were of a miscellaneous nature in hardcopy medium and again included unpublished student papers and lectures.
- No unpublished research reports were identified in bibliographies for this year.

Figure 4. Distribution in the occurrence of categories of formats - 1999



Altogether formal formats of scholarly communication continued to predominate in 1999 and accounted for 70% of the total size of bibliographies. At an individual level the occurrence of formal formats dropped and ranged from 29% to 87% of the total size of bibliographies as opposed to the lowest occurrence in 1996 of 66%. Informal formats accounted for 6.7% of all citations with unpublished theses and dissertations occurring more at 4.7% of all formats. The category for *other* formats and sources accounted for an average of 23% of all formats. Of this category organisation documents ranked highest in use.

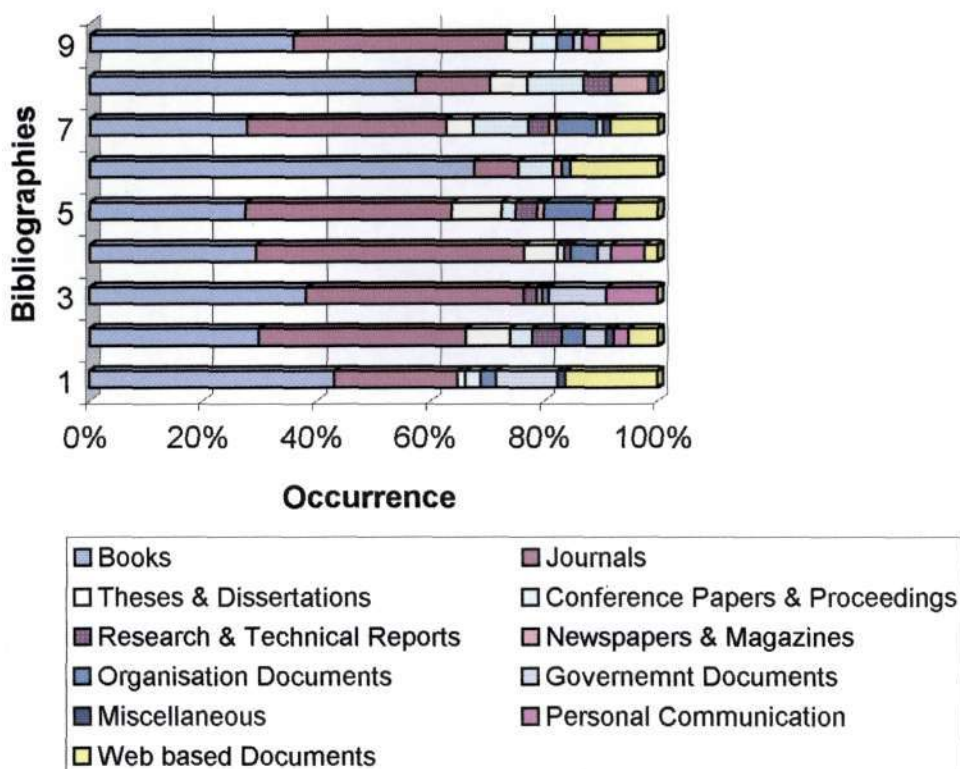
5.2.1.3 Occurrence of different types of formats in theses of 2002

Table 3. Occurrence of formats in bibliographies of theses - 2002

Case numbers:											
2002	1	2	3	4	5	6	7	8	9	Score	% of total score
Books	43.2%	29.9%	38.2%	29.4%	27.5%	67.7%	27.7%	57.4%	35.8%	262	38.5%
Journals	21.6%	36.4%	38.2%	47.1%	36.3%	7.7%	34.9%	13.1%	37.3%	214	31.4%
Theses & Dissertations	1.4%	7.8%	0.0%	5.9%	8.8%	0.0%	4.8%	6.6%	4.5%	30	4.4%
Conference Papers & Proceedings	2.7%	3.9%	0.0%	1.2%	2.5%	6.2%	9.6%	9.8%	4.5%	29	4.3%
Research & Technical Reports	0.0%	5.2%	2.2%	1.2%	3.8%	0.0%	3.6%	4.9%	0.0%	16	2.3%
Newspapers & Magazines	0.0%	0.0%	1.1%	0.0%	1.3%	1.5%	1.2%	6.6%	0.0%	8	1.2%
Organisation Documents	2.7%	3.9%	1.1%	4.7%	8.8%	1.5%	7.2%	0.0%	3.0%	26	3.8%
Government Documents	10.8%	3.9%	10.1%	2.4%	0.0%	0.0%	1.2%	0.0%	1.5%	24	3.5%
Miscellaneous	1.4%	1.3%	0.0%	0.0%	0.0%	0.0%	1.2%	1.6%	0.0%	4	0.6%
Personal Communication	0.0%	2.6%	9.0%	5.9%	3.8%	0.0%	0.0%	0.0%	3.0%	20	2.9%
Web based Documents	16.2%	5.2%	0.0%	2.4%	7.5%	15.4%	8.4%	0.0%	10.4%	48	7.0%
Size of Bibliography	100%	100%	100%	100%	100%	100%	100%	100%	100%	681	100%

Bibliographies of the nine MIS theses submitted in 2002 were analysed and a total of 681 citations were coded, counted and categorised. As above counts of formats for each bibliography were converted to percentages of the total size of the individual bibliographies for comparative purposes. The total score for each format was divided by the total score for all citations, and a percentage for the year calculated.

Figure 5. Distribution in the occurrence of different formats - 2002

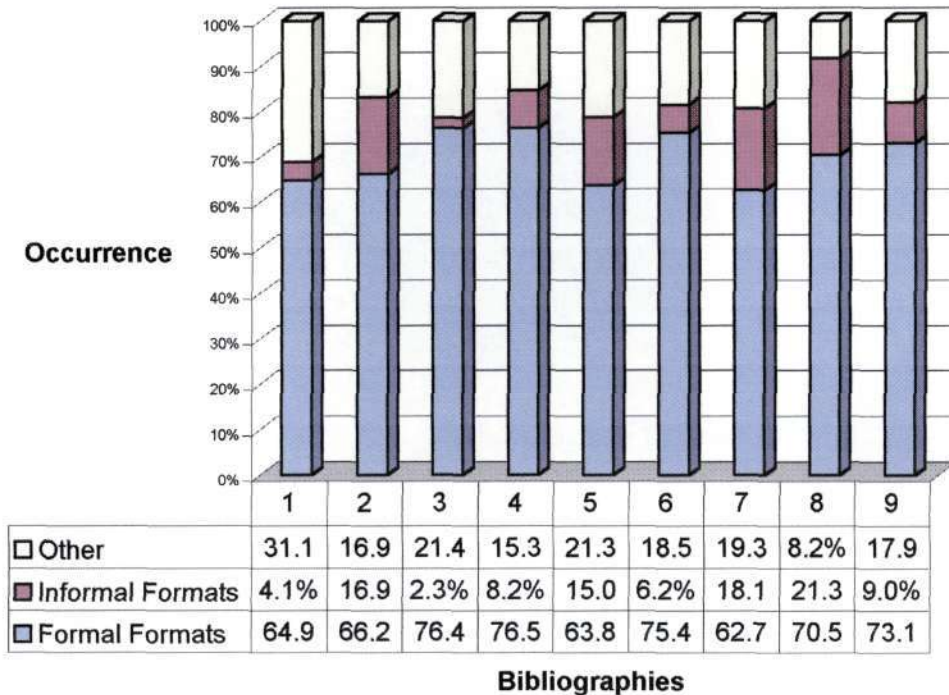


- The book format predominated in occurrence for theses submitted in 2002 and accounted for 38.5% of all citations.
- The journal format ranked second in use and accounted for 31.4% of all citations. Distribution in the use of journal format at an individual level was less extreme and while the difference in occurrence ranged from 7.7% to 47.1%, six of the nine bibliographies recorded an incidence of over 35% (see Table 3).
- Ranked third in occurrence for this year are Web documents (7%). Occurrence for these types of formats ranged from an absence of use in two bibliographies to 16.2% use in one bibliography. Citations included in this category were mostly identified as home pages, discussion forums and various Web pages of individuals that could not be described in terms of traditional print formats.
- Ranked in descending order were theses and dissertations at 4.4% of total citations, conference proceedings and papers at 4.3%, documents of organisations at 3.8% and government documents at 3.5%. The occurrence

of conference proceedings was better distributed than in bibliographies analysed for 1999 and except for the absence of this format in one bibliography, ranged from 1.2% to 9.8% of all citations in the remaining nine bibliographies.

- Unpublished research reports and personal communication accounted for of 2.3% of all citations each.
- Least occurring formats were encountered for newspapers and magazines at 1.17% of total citations, and miscellaneous documents at 0.59% of all citations. This latter category comprised unpublished student papers.

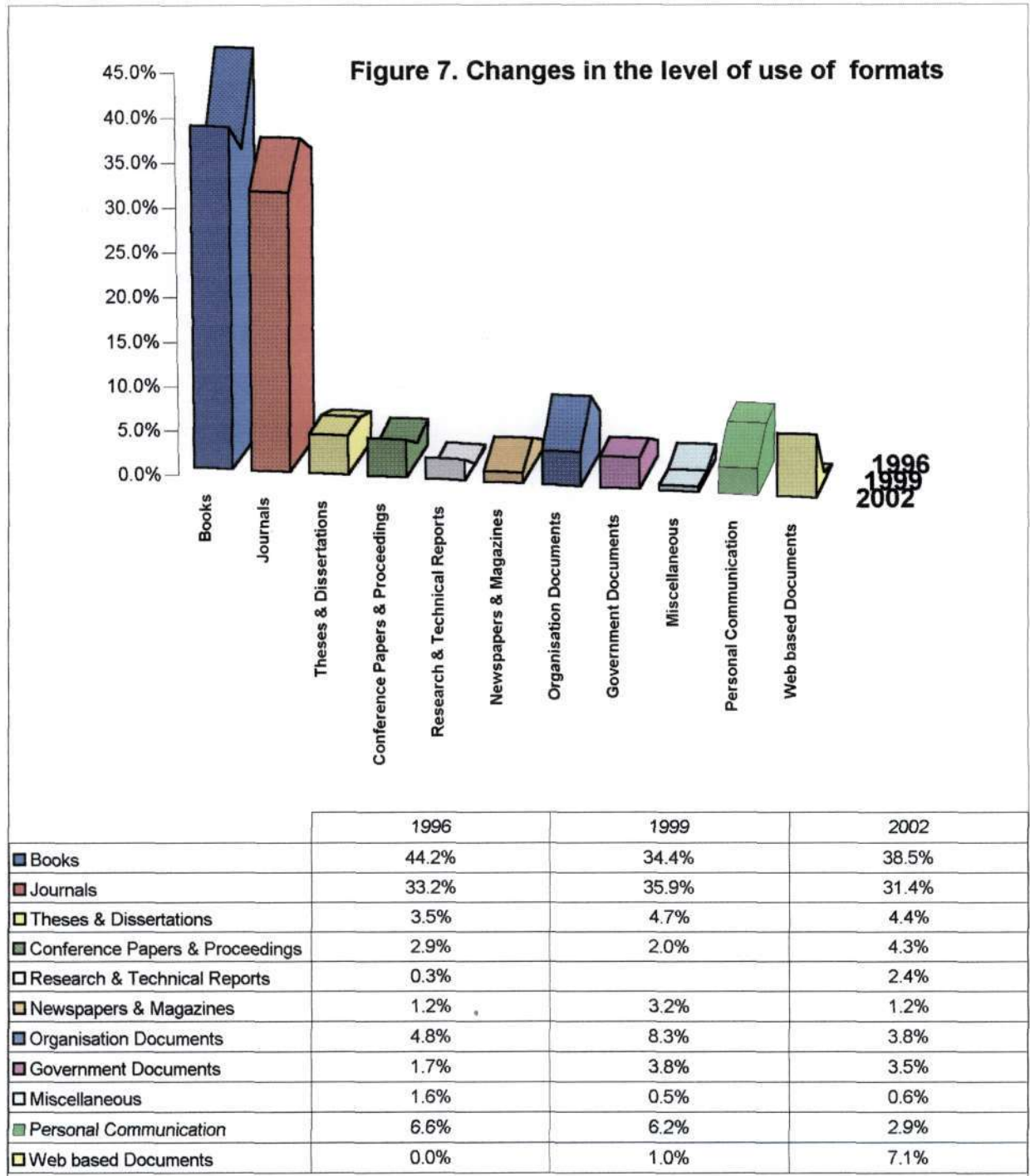
Figure 6. Distribution in the occurrence of categories of formats - 2002



Formal formats continued to predominate and accounted for 70% of all citations. Distribution in the occurrence of this category was more evenly spread ranging from 62.7% to 76.5%. Informal formats accounted for an average of 11% of all citations and this increase reflected an increase in the use of conference papers and research reports. Distribution in occurrence of this category ranged from 2.3% to 21.3%. The incidence of other formats dropped from the previous year of the study to an average of 19%. Web based

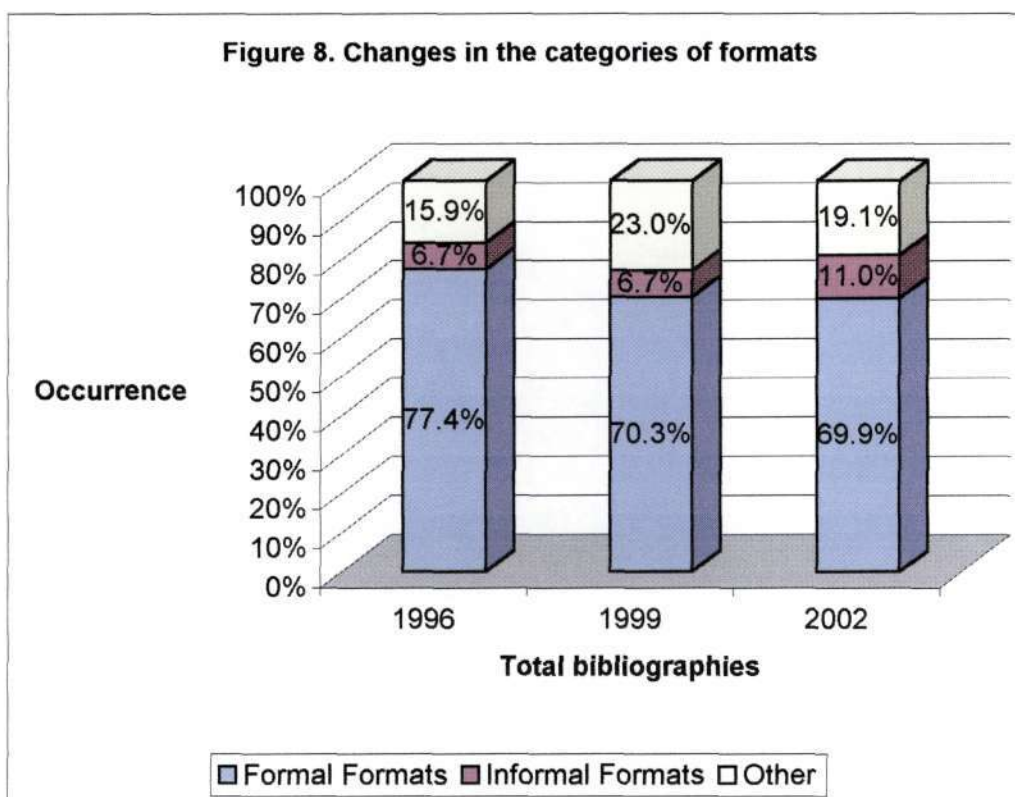
documents accounted for 7% of all citations and were ranked first within this category. Distribution in occurrence for this category ranged from 8.2% to 31.1% (see Table 3).

5.2.1.4 Comparison of changes in the level of occurrences of different formats



- A drop in use of the book format from 1996 to 2002 by 5.7% was observed. This format however continued to predominate and had the highest occurrence in 1996 and 2002 and continued to comprise a third or more of each bibliography for the three years of the study.
- The occurrence of the journal format at group level remained relatively consistent with a rise in use of 2.7% from 1996 to 1999 and a subsequent drop by 4.5% in 2002. Individual use of journals however was disparate for the period of the study with a difference of 47% and 43% respectively between the least and highest incidence for this format in 1996 and 1999 (see Table 1 and 2). In 2002 the difference in the least and highest occurrence of the journal format at an individual level dropped to 39% (see Table 3). At an individual level the highest occurrence of the journal format in bibliographies dropped from 58% in 1996 to 57% in 1999 and a further 10% drop to 47% in 2002 (see Table 1, 2 and 3).
- The use of unpublished conference papers and research reports increased in the last year of the study. Research reports grew in occurrence from 0.3% of all citations in 1996 to 2.35% of all citations in 2002. Conference papers also grew a percent from 2.9% in 1996 to 4.26% of all citations in 2002.
- Government documents increased from 1.7% in 1996 to 3.8% in 1999 and dropped to 3.52% in 2002. Of interest is that in 1999 18% of cited government documents were accessed online, in 2002 this figure went up to 50%.
- Organisation documents increased significantly from 1996 to 1999, from 4.8% to 8.3% of all citations. However occurrence dropped in 2002 and these formats accounted for only 3.8% of all citations.
- The incidence of Web based documents rose 6% from 1999 to 2002. However due to referencing styles it was not always clear from a citation analysis what format these citations may have reflected.
- With few exceptions, other formats have remained relatively stable with peaks and dips more reflective of individual practices than group behaviour. This is particularly the case with the increase in use of organisation documents and personal communication in 1999 (see Table 2).

5.2.1.5 Summary



An obvious change in citation behaviour is the drop in the occurrence of formal formats by 7.5% from 1996 to 2002. This can be largely attributed to the drop in the occurrence of the book format. In comparison and on average, the occurrence of the journal format remained relatively stable from 1996 to 2002 (see Figure 7). Despite the drop, formal formats continue to predominate and on average comprise two-thirds of a bibliography.

An obvious increase from 1999 to 2002 has been in the use of informal formats. This can be largely attributed to the increased use of research reports and conference proceedings since 1999. Of the total occurrence of 45 for both formats, 30 (or 67%) citations indicated an online medium of delivery.

An increase in the *other* formats (not formal or informal formats) was also observed and can largely be attributed to the incidence of Web documents in bibliographies for last two years of the study. These formats accounted for 37% of this category in 2002. While the "other" category peaked in 1999 this was

more indicative of individual behaviour specifically the occurrence of personal communication and organisation documents in individual bibliographies, than reflective of group behaviour (see Table 2).

Observed from the citation analysis is that there is no average bibliography and that disparities in the level and range of use of formal, informal and other types of formats exists at individual levels. While there is a higher occurrence of informal, grey literature and Web based formats in bibliographies for 1999 and 2002 this occurrence is limited to individual citation behaviours. At an individual level the affect of the Web is observed in the presence of Web documents in non-traditional formats and in the increase in use of informal formats, most notably through evidence of online citations of unpublished research reports and conference papers.

5.2.2 The use of the online medium

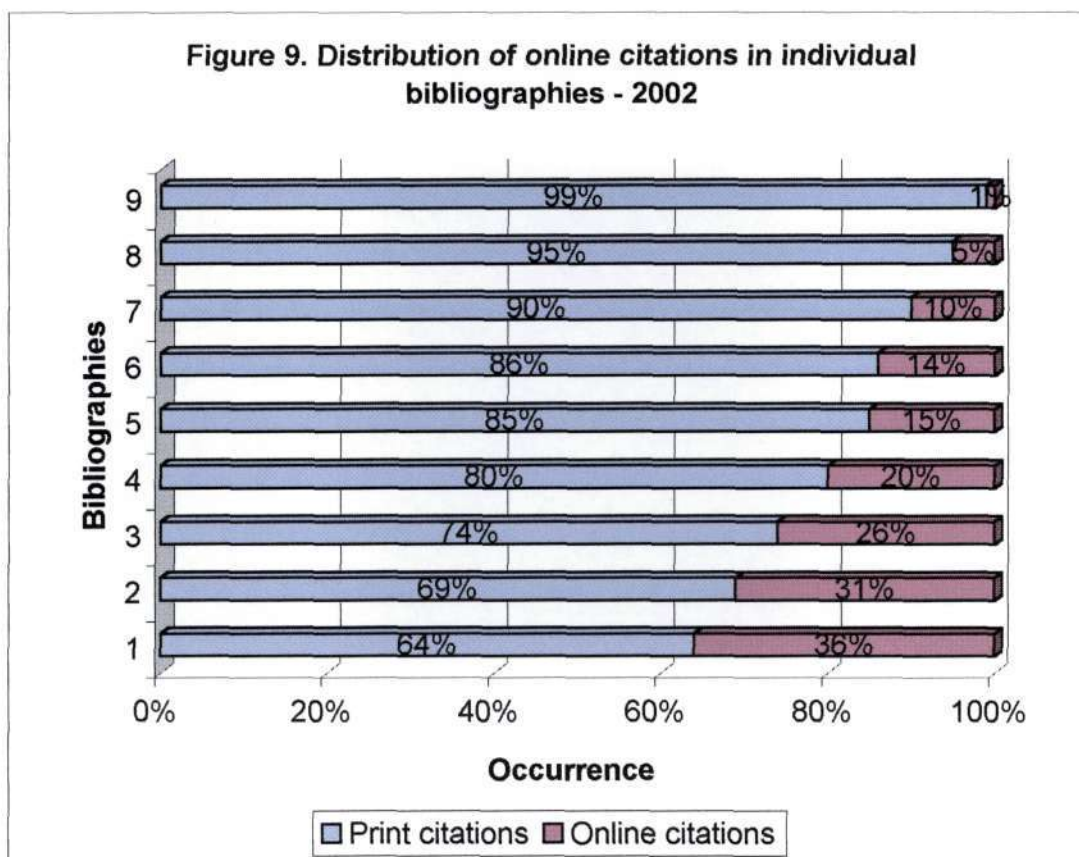
The following measurements and comparisons were undertaken to investigate the occurrence of online citations in MIS bibliographies for each year of the study.

5.2.2.1 Growth in the occurrence of online citations

Table 4. Total occurrence of online citations in bibliographies

Year	Bibliographies	1	2	3	4	5	6	7	8	9
1996	Total	181								
	Online	2								
1999	Total	58	89	47						
	Online	26	2	1						
2002	Total	74	83	65	80	77	67	84	61	89
	Online	27	26	17	16	11	10	8	3	1

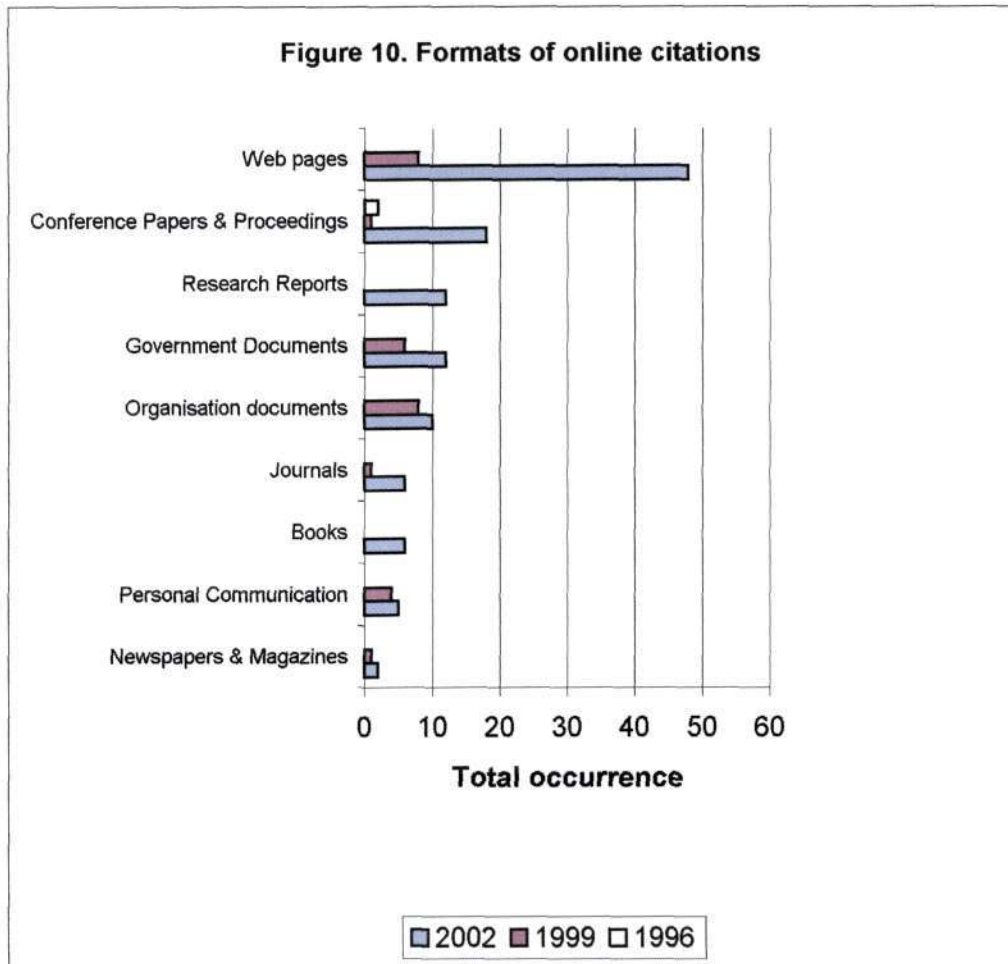
Citations to online sources occurred twice in 1996 in one bibliography, 29 times in 1999 in three bibliographies of which 26 of these occurrences were observed in a single bibliography.



In 2002 the occurrence of online citations was observed in every bibliography but the level of use of this format was disparate and ranged from a total of 1 to 27 citations and in the former case represented 1% of all sources and in the latter, 36% of all sources cited in these individual bibliographies

At group level a trend in the increase of the online medium may be observed. From 1996 to 1999 there was a 3.1% increase in total occurrence and in 1999, 3.4% of all citations were online. From 1999 to 2002 there was a 14.7% increase in total occurrence and in 2002, 17.5% of all citations for the year were online.

5.2.2.2 Types of full-text online formats



	Newspapers & Magazines	Personal communication	Books	Journals	Organisation documents	Government documents	Research reports	Conference papers	Web pages
1996								2	
1999	1	4		1	8	6		1	8
2002	2	5	6	6	10	12	12	18	48

- The highest incidence of online citations for 2002 was for Web based documents at a total occurrence of 48 citations. In 1999 level of use was substantially lower at a total occurrence of eight (8) citations. However as has been observed above, this category may have included online documents that fulfilled traditional print formats but citations may not have included enough information to identify these.

- The first and only two online formats cited in 1996 were for conference papers. In 2002 conference papers (a total of 18) ranked highest in use after Web based documents and accounted for 65% of the total occurrence of this format for the year (see Appendix VII).
- In 2002 75% of all unpublished research reports encountered in bibliographies were delivered through an online medium (see Appendix VII). This format ranked highest after conference papers but was not present in previous years.
- In 1999 government documents were encountered a total of 32 times of which 18% or a total of 6, were delivered online. In 2002 the percentage of government documents delivered online went up to 50% of the total occurrence of 24 (see Appendix VII).
- In 1999 online organization documents (guidelines, manuals and procedures) represented 11.5% of the total occurrences for this format (see Appendix VII). In 2002 online versions of these formats represented 38% of the total incidence for this format (see Appendix VII).
- The delivery of journals and books through an online medium remained insignificant in 1999 and in 2002 went up to 2% and 3% of total occurrence.
- In 1999, 7% of personal communication was delivered through an online medium. In 2002 the percentage of total occurrence for these citations in an online medium went up to 25%.
- The total occurrence of newspapers and magazines remained low in the three years of the study. In 1999 (with a total use of 27) online delivery represented 4% and in 2002 (with a total use of 8) represented 25%, of total occurrence of this format.

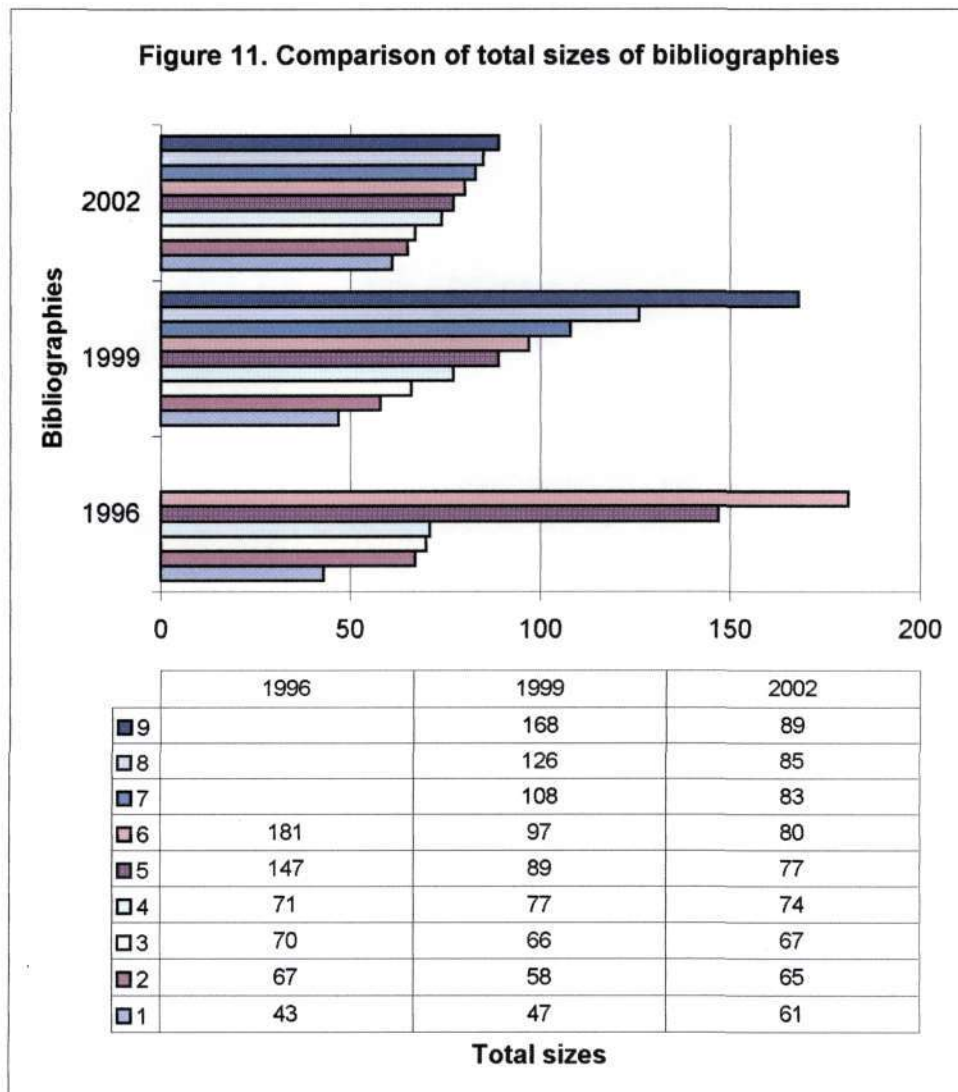
5.2.2.3 Summary

The occurrence of online citations in bibliographies from 1996 to 2002 has increased on average, and from 1999 to 2002 occurrence of this medium has increased by 14.7% to an average of 17.5%. Individual occurrence however continues to be disparate and in 2002 at its lowest occurrence the Web

medium accounted for 1% of a bibliography as opposed to 36% of a bibliography at its highest occurrence.

After Web based documents (Web pages, discussion forums and unidentifiable formats) the Web medium was used most frequently in the three years of the study, for the delivery of full text informal formats (22% for both conference papers and research reports) and grey literature (24% for government and organisation documents). Conversely it was least used for the delivery of non-scholarly formats (2% for magazines and newspapers) and formal formats (9% for both books and journals) and personal communication (6%).

5.2.3 Growth in the overall size of bibliographies



The average size of a bibliography for 1996 was 97.5, for 1999, 93 and for 2002, 75.4.

The distribution in the total size of bibliographies in 1996 was disparate with the largest bibliography (a total of 181 citations) being 4.3 times bigger than the smallest bibliography (a total of 43 citations). The biggest bibliography accounted for the only online citations for the year, a total of two.

In 1999 distribution in the total size of bibliographies continued to be disparate with the biggest bibliography (a total of 168 citations) being 3.5 times bigger than the smallest bibliography (a total of 47 citations). The bibliography with the most online citations for the year (26 online citations) had a total of 58 citations and was below the average size of 93 for the year.

In the last year of the study the distribution in sizes of bibliographies was less disparate, and ranged from 61 to 89 total citations with an average of 75 citations per bibliography. The most extensive bibliography in 2002 had 89 citations and a total of one online citation (see Appendix VII). The bibliography with the most online citations for this year (27 online citations) had a below average sized bibliography of 74 citations.

5.2.3.3 Summary

What is immediately apparent in the period under study is the contraction in the distribution of different sized bibliographies. In 1996 the largest bibliography was 4.5 times bigger than the smallest bibliography. In 2002 the difference is substantially less and the largest bibliography is only a third of the size bigger. It is feasible that the difference in the size of bibliographies may be a reflection of the difference between the requirements of a major and minor thesis and/or the subject of the thesis, and this requires further study.

Of interest is the increase in the size of the smallest bibliographies, a total of 43 citations in 1996, a total of 47 citations in 1999, and a total of 62 citations in 2002. The changes in size cannot be attributed to the Web as the

occurrence of online citations were absent in the smallest 1996 bibliography, only one was observed in the 1999 bibliography and three in the 2002 bibliography (see Appendix VII). No consistent pattern could be established between bibliographies with the most occurrences of online sources and greater size of bibliographies. Cases in the converse were evident with the greatest occurrence of online sources having below average size bibliographies for both 1999 and 2002.

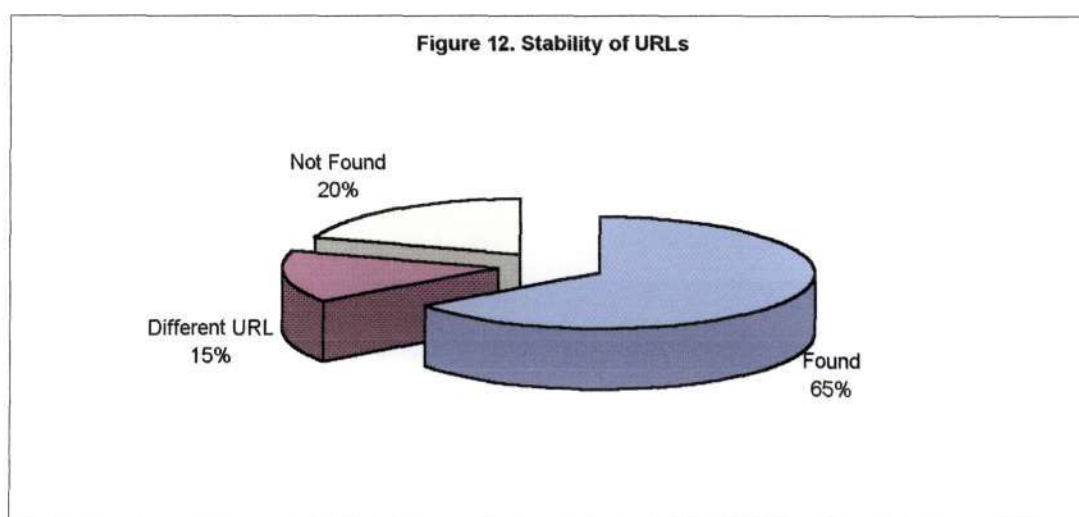
5.2.4 The scholarly attributes of online citations

The manifest content of a total of 60 online citations for the year 2002 was analysed and the following attributes investigated and counted:

- Evidence of accessibility through the stability of the URL.
- Evidence of scholarly activity through the provision of references.
- Evidence or statements of peer review.
- Evidence of academic or research affiliation.
- Format type.
- Domain type.

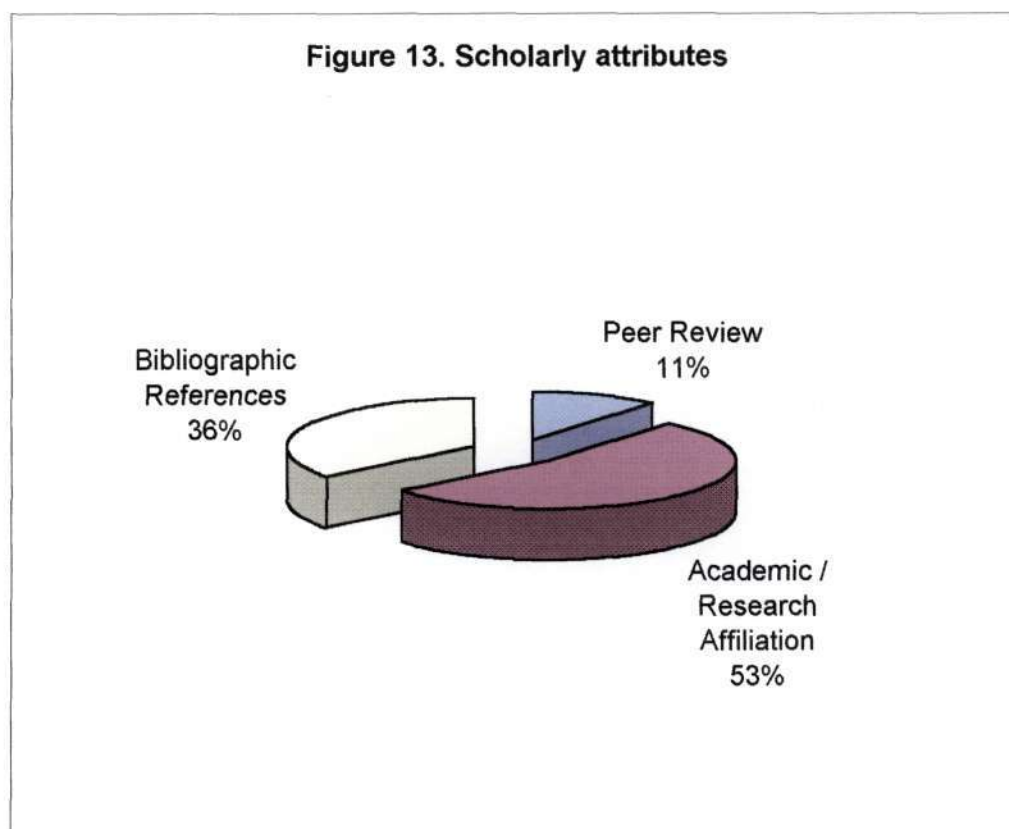
A comparison of the association of the above attributes was undertaken to establish the scholarly nature of Web sources encountered in MIS bibliographies.

5.2.4.1 Stability of Uniform Resource Locators



Of the total online citations tested 65% (a total of 39) URLs continued to point to the correct document approximately one year after first being cited. Documents that could not be located from the URLs provided by online citations underwent two levels of investigation. Firstly the relevant parts of the URLs were visited to see whether documents had been moved within the sites and if not successful, a second step was to search for document titles and or authors through a search engine, using phrase and open search statements. The search engine Google was used for this purpose and only the first page of hits was used to locate a document. In this manner a further nine (15%) documents were found. Altogether 12 (20%) documents could not be retrieved through this process.

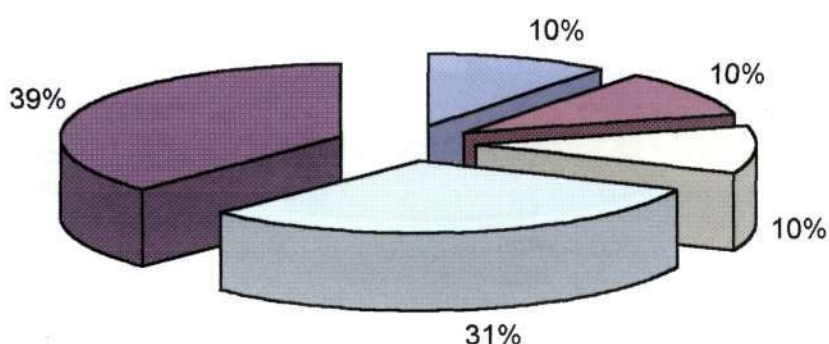
5.2.4.2 Scholarly attributes



Of the remaining 48 online citations that could be accessed the following manifest attributes were observed.

- Of the 48 found online citations 36% (16) provided bibliographic references. Documents were viewed for evidence of bibliographic references and no parameter was set on the amount of references required to fulfil this attribute.
- Of the 48 online citations accessed 53% indicated an academic affiliation at a higher education (university) level and or a research affiliation. Evidence of academic or research affiliation was sought on the accessed document, if absent the parent site was visited either through provided links or surfing the elements of the relevant URL.
- Of the 48 online citations analysed only 5 documents in total indicated that they had been refereed. The nature and requirements of the peer review received by these documents was not analysed. For this analysis only documents that included clear statement of peer review either/or at the beginning or end of the document were included.

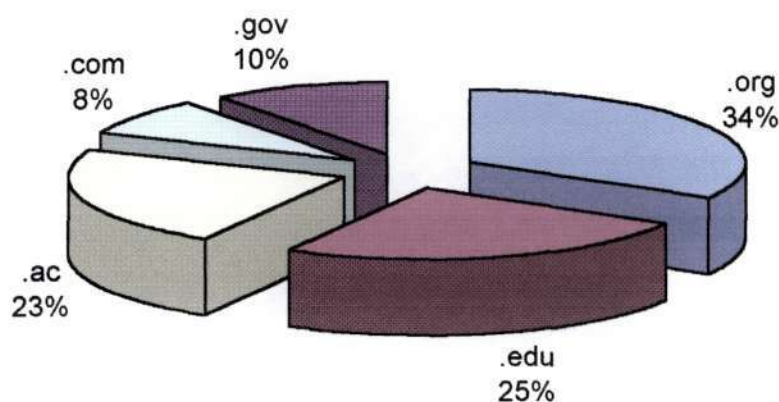
Figure 14. Association in the occurrence of scholarly attributes



- All three attributes
- Bibliographic references and Academic/Research affiliation
- Bibliographic references only
- Academic/Research affiliation only
- None of the above attributes

- Of the 48 citations found 10% (a total of 5) demonstrated the evidence of three attributes, peer review, academic or research affiliation and bibliographic references.
- A total of 5 (10%) demonstrated evidence of both academic and research affiliation and bibliographic references.
- A total of 5 (10%) demonstrated evidence of only bibliographic references.
- A total of 15 (31%) of the 48 online citations analysed demonstrated only the attribute of an academic or research affiliation.
- No attribute for peer review was found outside a relationship including both bibliographic references and an academic or research affiliation.
- A total of 18 (39%) demonstrated none of the above attributes.

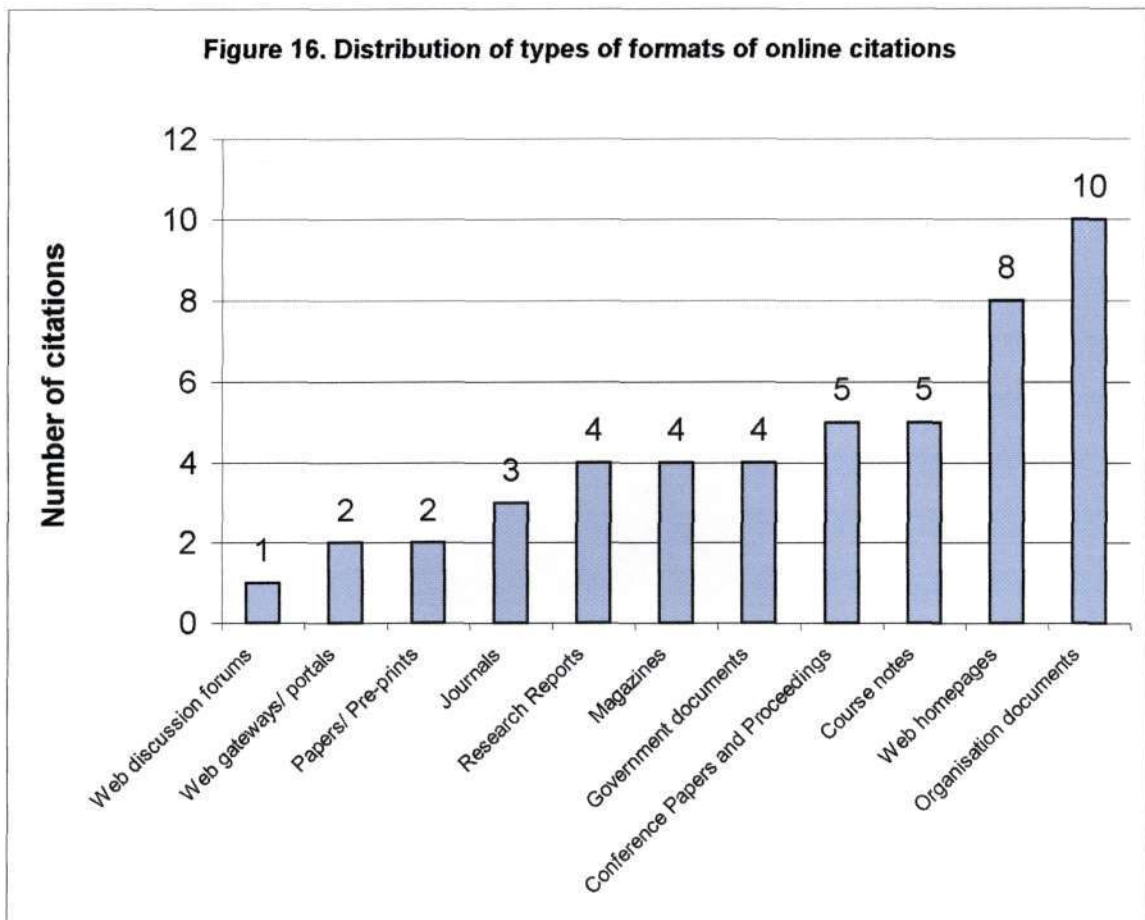
Figure 15. Distribution in use of generic domain names



- The education (.edu) and academic (.ac) generic domains names largely represent the same type of sources, namely those hosted by educational and professional institutions or affiliations. Together they

accounted for 48% of all domains cited. Types of formats delivered through this domain included pre-prints, course notes, research reports, gateways, conference papers and e-journals.

- Citations with an organisation (.org) domain name accounted for 34% of all online documents analysed and included home pages, project pages, magazines, annual reports, manuals, policies and guidelines as well conference papers, research reports and e-journals.
- Government (.gov) domain names were encountered 10% of the time and included acts, white papers, manuals and other miscellaneous documents.
- The .com generic domain name for sites hosted by commercial interests (.com) were least observed in online citations and represented an e-magazine, companies' home pages and a research report that included bibliographic references.



- At 21% (or 10 of the 48 citations analysed) of all citations analysed, organisation documents occurred most frequently. This category was used to group organisations' in-house activities and included policies, manuals and guidelines. All other pages emanating from organisations were grouped where appropriate with other categories.
- Ranked second in frequency were Web homepages with eight occurrences. This category was used to group introductory pages of an organisation, individual or project.
- A notable occurrence, ranking third was of course notes. These comprised traditional course handouts and lectures in online mediums, none of which were from the UNP.
- Of the traditional informal scholarly formats, conference proceedings and then research reports occurred highest in frequency, in five and four instances respectively. Scholarly papers or pre-prints occurred less frequently with only two encountered.
- Of the traditional formal formats journal formats were only encountered three times and accounted for 6% of the total sample. Of interest was that all online full text journals encountered were free and not part of a commercial aggregator database like EBSCOhost.
- Two citations were to academic library portals or gateways and a third to an academic discussion forum.

5.2.4.3 Summary

In summation of the 60 online citations assessed for bibliographies composed in 2002 the following was concluded:

- In terms of stability, 80% of online citations analysed were accessible (15% of which no longer had the same URLs) a year after first being cited.
- A total of 18 or 39% of the 48 online citations found did not demonstrate any manifest scholarly attributes. A total of five or 10% of the 48 online documents found demonstrated all three attributes of peer review, academic or research affiliation and bibliographic references simultaneously.

- The single domain name occurring most frequently at 34% of the 48 documents analysed was of the .org generic type. The domain names .edu and .ac together accounted for 48% of online documents analysed. The least occurring domain name at 8% was the .com type.
- The least occurring formats encountered in a content analysis of online documents, was that for formal formats of scholarly communication. The journal format accounted for 6% of all documents analysed. It is possible, as proposed in Gooden's study (2001) (that reported a substantial increase in journal use) that students did not always identify the source of online journals. This was not considered as likely a possibility, given that the current study's population were MIS students and that their bibliographies were supervised by academic librarians and information specialists who would be likely to identify omissions and incomplete citations. However, in the case of a journal article downloaded in a portable document format (pdf), inferring or correcting the medium of delivery by either the supervisor or the researcher would not be possible. A pdf. document is an electronic copy of an article as it appeared in the print/hardcopy journal and includes the original page numbers. A student may feel for whatever reason, that including the online source of the article may be superfluous. However given the evidence that students are more likely to cite all their influences (Oppenheim and Smith 2001); that guidelines for the correct documentation of e-journals are available to MIS students (Aitchison 1999), and that not all e-journal are available in this format; the current study did not give any weight to this type of "deviant" citation behaviour.

Informal formats namely, conference papers, research reports and scholarly papers (a total of 11) accounted for 23% of all documents analysed. Non-scholarly (magazines), grey literature (government and organisation documents) and non-traditional formats (Web home pages) accounted for 54% (total 26) of all documents analysed. A significant occurrence is that of online course notes that accounted for 10% of all documents analysed.

5.3 Survey of Master of Information Studies supervisors

A key observation that arose from the literature review was the role played by teaching faculty played in influencing students' research behaviour. In line with this the current study explored a possible relationship between the extent of the Webs' affect on student citation behaviour and MIS supervisors own use of the Web for research, their preferences, expectations and promotion of the Web for student research and their opinions on the affect of the Web on student research quality. The nature of the survey was preliminary and exploratory and the intention was to juxtapose group level information behaviour of MIS supervisors with that of MIS students' citation behaviour.

5.3.1 Questionnaire results

The responses of the four-member population are reported and summarised under broad headings and describe selected attributes of MIS supervisors as researchers', their information gathering behaviour, their expectations and preferences for student use of the Web, and lastly their agreement on the affect of the Web on student research behaviour. Data gathered was coded and numerical values assigned to responses and transferred to Excel™ spreadsheets for numerical and graphical manipulation.

5.3.2 Characteristics of Master of Information Studies supervisors

The first set of questions (questions 1 to 9) attempted to arrive at a general description of the study's populations' level of involvement in supervision and research activities and concluded the following description of MIS supervisors:

- That all four respondents surveyed were responsible for the supervision of graduate student research.
- That altogether, the four respondents were responsible for the supervision of 37 master's degree theses for the period 1996 to 2002. This represents 80% of the total theses of 46 for this period. However it was not always clear whether the individual figures provided by supervisors included the co-supervision of graduate research.
- That the supervision of master's degree research is a major responsibility for all four respondents. Other activities, for three

respondents, namely involvement in committee work, professional societies and reviewing the work of peers are also minor responsibilities. For one respondent these were equally major responsibilities.

- An aggregate of respondents' areas of research include: information literacy, rural information provision, preservation and access to information, information seeking behaviour, information needs assessment, knowledge management and library education and training.
- Two respondents indicated spending less than 25% of their working hours on research and two indicated spending less than 50% of their working hours on research.
- One respondent indicated frequently participating (posting messages) in electronic mail discussion groups on research themes the rest (three respondents) indicated that they hardly ever participated.
- All respondents were able to connect to the Internet from their offices and only one respondent indicated being able to connect from home as well.

5.3.2.1 Summary

The FHMS *Guide for Higher Degrees Candidates* (UN nd.b: 8) describes a suitable supervisor as an active researcher with experience and/or knowledge in the area of research, is up-to-date with the literature and has sufficient time to supervise adequately. A further recommendation included in the IFLA *Guidelines for LIS Programmes* (IFLA 2000) is that academic staff be technologically proficient.

Initial questions posed by the questionnaire established the population as largely representative for the supervision of MIS theses undertaken in the time period of the study. The level of MIS supervisors' involvement with master's degree research is high and all supervisors indicated this as a major responsibility. Supervisors also indicated involvement in other activities, to a minor and in one case, major level; these activities may feasibly improve a

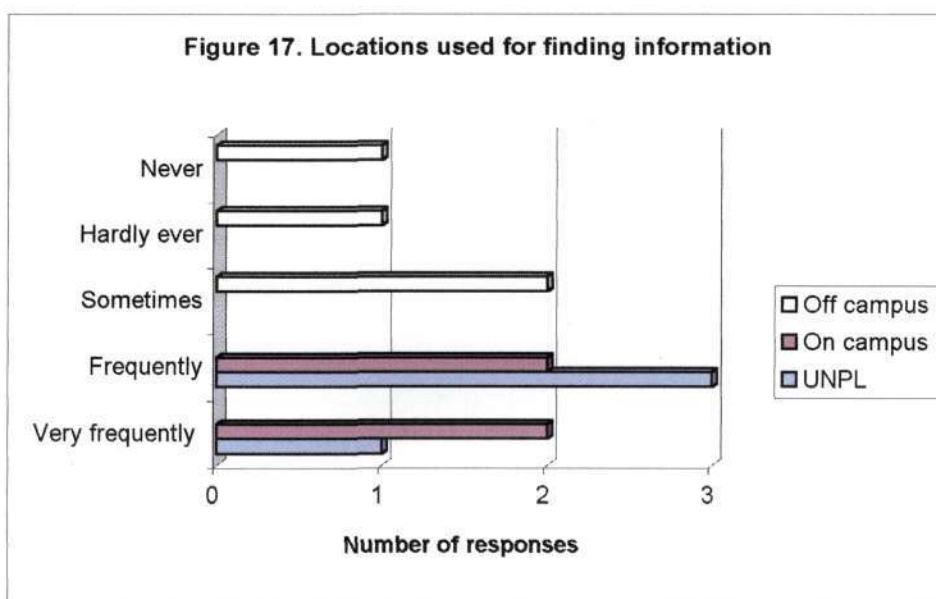
supervisors' knowledge base as a researcher and supervisor, namely committee work, involvement in professional societies and organisations and peer review.

All supervisors are active researchers and all expressed areas of primary research and indicated spending a proportion, and in the case of two respondents more than a quarter, of their working hours on research. It is inferred that supervisors have the potential to enjoy some level of technological proficiency as they all indicated, at the very least, access to the Internet from their offices. Indication of participation in a Web facilitated invisible college and in the form of electronic discussion forums was low however, and only one respondent indicated frequent participation.

5.3.3 Information gathering behaviour of Master of Information Studies supervisors

The current study investigated the level of use and preference for different locations (physical and virtual) and tools (online and print); the level of use and preference for different types of online facilities, the extent to which traditional scholarly sources are used in their online or print versions; and the location (physical or virtual) that best fulfils their information needs.

5.3.3.1 Level of use and preference for different locations and tools



Question 10 attempted to assess supervisors preferred location for accessing information.

- Supervisors indicated a predominant use of the University of Natal's Pietermaritzburg Library (UNLP) and other locations on campus including office and computer labs as opposed to locations off campus for finding information for research needs.
- One respondent indicated using the UNLP and other on campus locations with the same high level of frequency.
- One respondent indicated using on campus locations more frequently than the UNLP.
- Two respondents indicated using both locations frequently. It is not clear whether these latter respondents had other locations they used more frequently or whether they preferred to describe their use of any location as frequent rather than very frequent.

What was not made clear by the question was whether respondents' choice of other on campus facilities may have included the use of other physical collections.

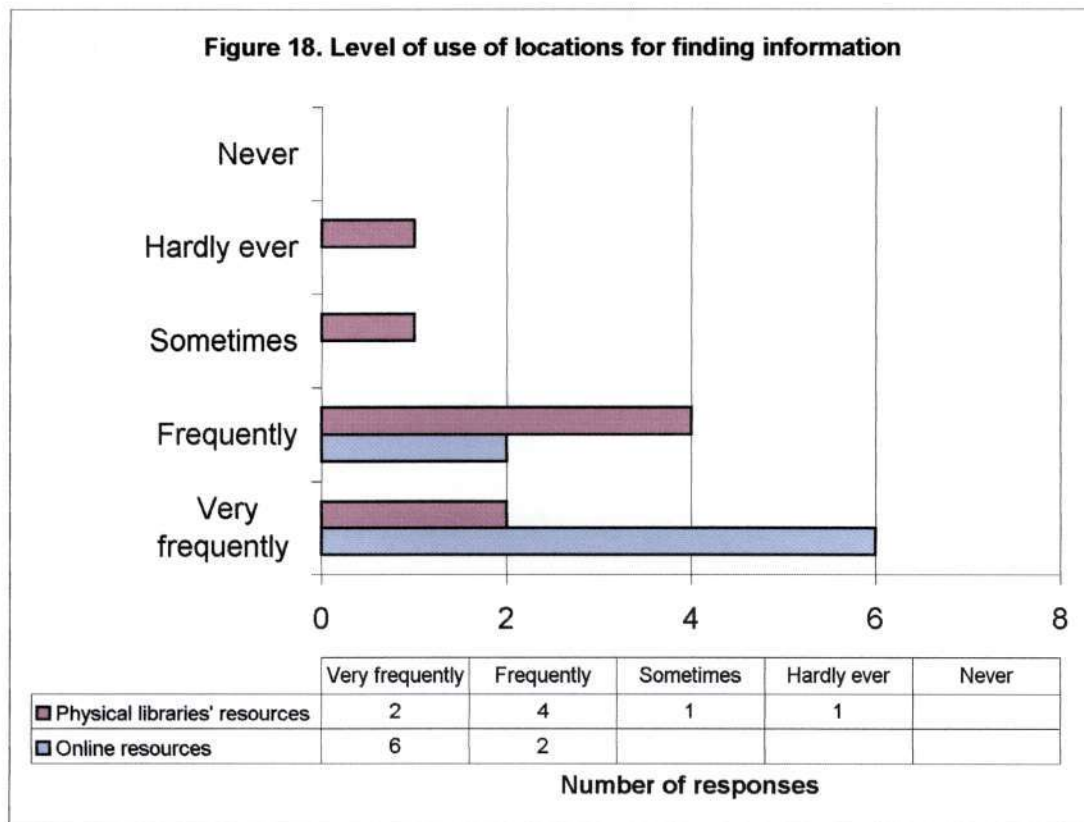
Questions 11 and 13 attempted to establish MIS supervisors' level of use of online resources and physical libraries for identifying relevant information sources including print sources. The physical libraries category included print and electronic finding aids and resources provided by the UNPL and other physical collections. Online resources were defined as online catalogues, indexes and abstracts database, search engines, subject directories and guides, gateways and portals, Websites of organisations, institutions and individuals and other types of documents. Figure 18 represents the distribution in frequency for both questions and out of a total score of 8.

- All respondents indicated the very frequent use of online resources for identifying information sources.
- One respondent indicated the same level of frequency for both online resources and physical libraries.

- Three of the respondents indicated a lesser frequency in using physical libraries for finding out about relevant resources.

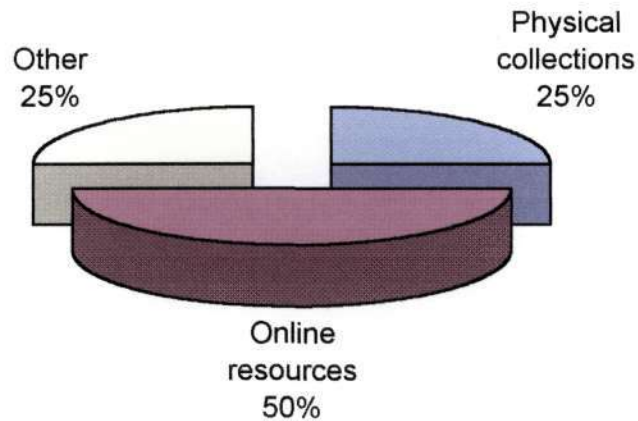
Responses to question 13 established that:

- One respondent used both physical libraries and online resources with the same frequency (very frequently) to identify print sources.
- One respondent used online resources more frequently and physical libraries less frequently.
- Two respondents indicated using online resources frequently and physical libraries sometimes and hardly ever, to locate print sources.



Questions 12 and 14 attempted to establish which locations, physical or virtual, MIS supervisors utilised first most of the time, for identifying relevant information sources. Figure 19 represents the total score out of eight for each location.

Figure 19. Location used first, most of the time to identify information sources



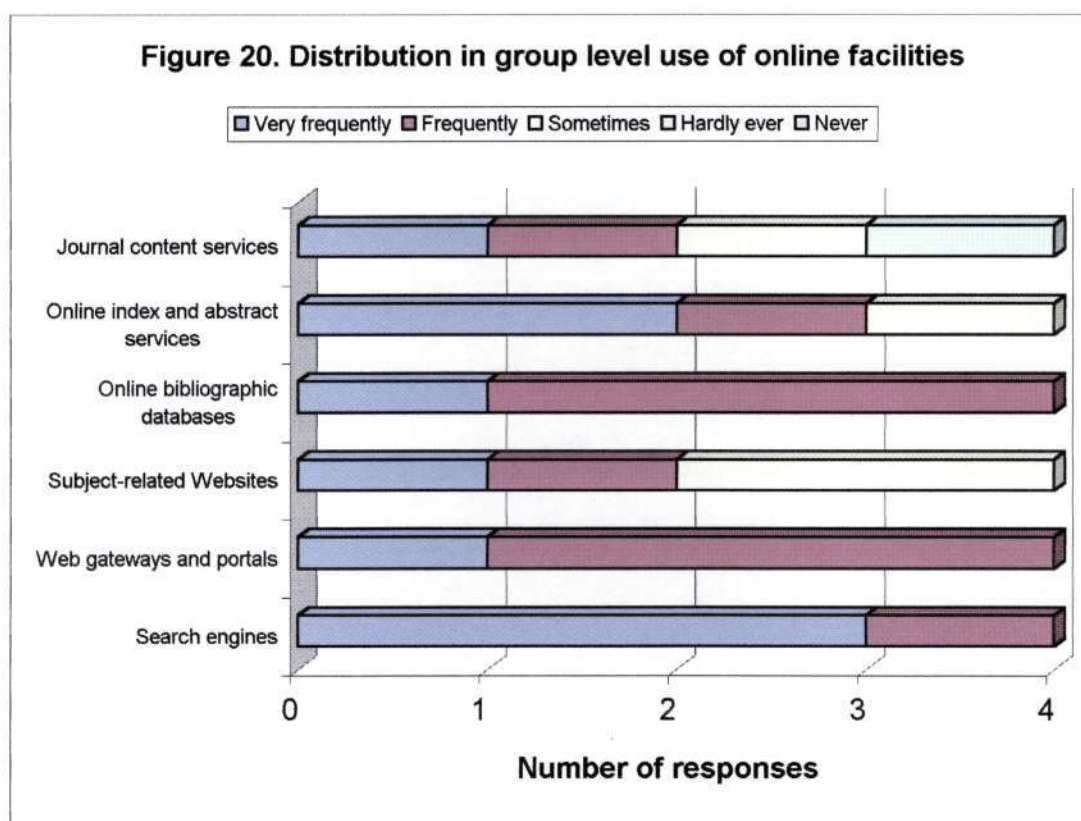
The responses for finding out about relevant information sources (print and/or online) included the following:

- Two respondents indicated going online first.
- One respondent indicated using a physical library first for identifying relevant information sources.
- A fourth respondent did not prefer either location and indicated using both online and physical collections. What may be inferred from this latter response is that the choice of using either an online location or a physical library first, is based on the particular information need.

In finding out about print sources the responses included the following:

- Two respondents indicated going online first to identify relevant print sources, and a third indicated the use of a physical collection first. The last respondent did not choose either location but indicated using both first. As above, it is inferred that, for this respondent, the choice of which location to use first was based on a particular information need. The *other category* represents this latter respondent's choice of both online and physical locations for both questions.

5.3.3.2 Level of use and preference for types of online facilities



Question 15 attempted to establish the level of use of different online facilities.

- Ranked first in level of frequency for all respondents was the use of search engines.
- All respondents indicated using online bibliographic databases and Web gateways and portals frequently and one individual used these facilities very frequently.
- Used less frequently by some respondents, were journal content services, subject related Websites, and online index and abstract services.
- In the case of journal content services, distribution in use was disparate with very frequent use by one respondent, while another indicated never using this facility.
- An additional facility proposed by one respondent in the “other” category, was the use of an electronic invisible college. The frequency in the use of this facility was not established however.

Question 16 attempted to establish which online facility specified by the questionnaire was used first, most of the time, to identify relevant information. Responses were disparate with search engines, online bibliographic databases and online index and abstract services chosen as first choice by individual respondents. A fourth respondent indicated the use of three facilities, namely search engines, Web gateways and portals and subject related Websites. It is inferred that the latter respondent bases the choice and use of an online facility on a particular information need and never favours one of the three indicated first.

Question 17 and 18 attempted to establish the utility of the Internet in comparison to a physical library for the provision of full text information. The response from all four supervisors was unanimous in indicating that only some of the information required was available through the Internet. In comparison three respondents indicated that most of the information they required was available at the UNLP or through the library's interlibrary loan facilities. One respondent indicated that only some of the information required was available through the UNLP. It is possible however, that this latter response may be particular to the respondent's view of the UNPL's collections and services rather than the utility of the Web.

5.3.3.3 Level of use of print and online mediums

Question 19 attempted to establish formats used most often and the frequency in the use of the different mediums of delivery. Table 5 summarizes the results.

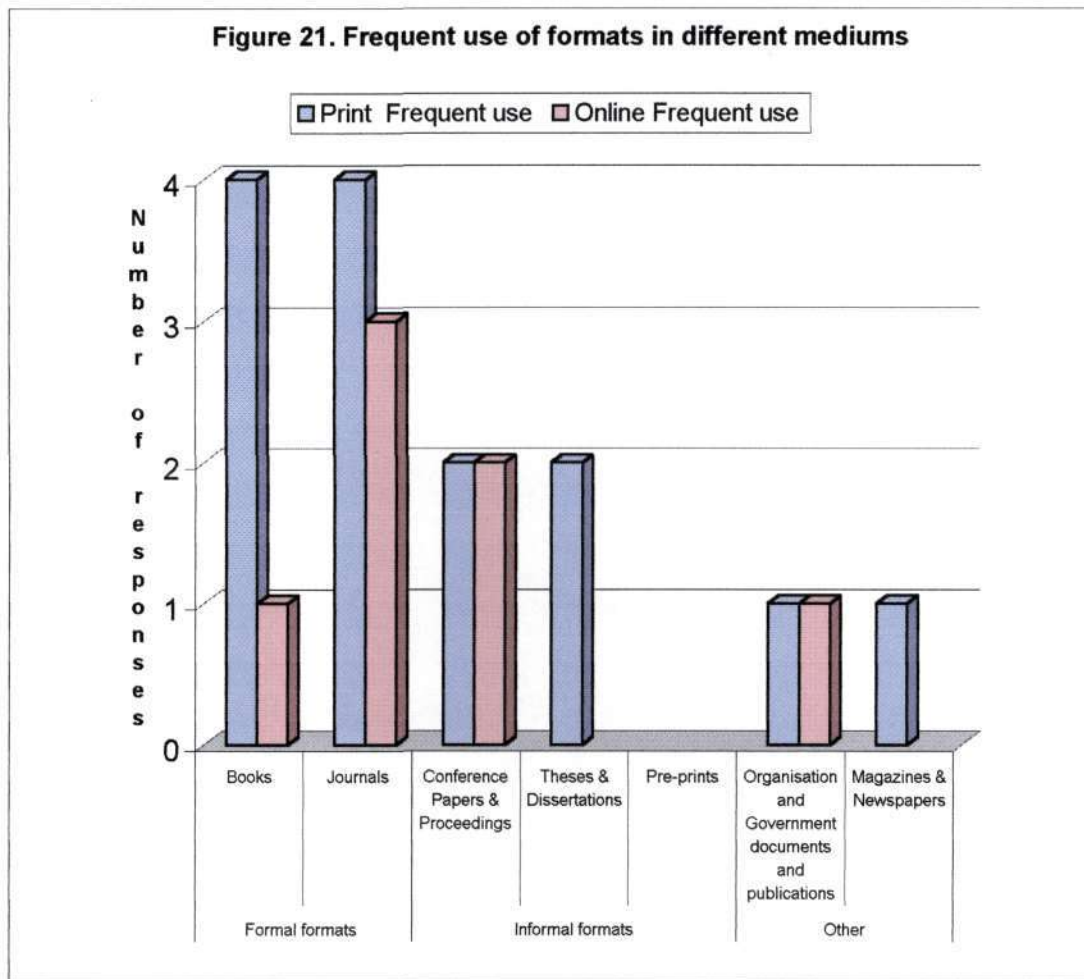
- All respondents indicated using formal formats very frequently and most frequently in the print medium.
- Ranked second in frequency of use were online formal formats used very frequently and frequently by three of the respondents. This level of use was more particular to the journal format and books in this medium were sometimes or hardly ever used by three of the respondents.
- Very frequent use of conference proceedings in both online and print medium was indicated by two of the respondents and a third

respondent indicated using this source in either medium, only sometimes.

- All respondents indicated the infrequent use (and in some cases, no use) of online theses and dissertations and pre-prints or electronic pre-prints. The less or lack of use of these formats may be indicative of the lesser presence and/or supervisors' knowledge of the availability of this format on the Web. The reported poor use of pre-prints and electronic prints may be due in part, to the questionnaire's failure to provide a definition for this format. However it may also indicate the lesser use and presence of this format in the LIS discipline. This would be consistent with Friedlander's (2002) study that reported a greater use of this format by the applied sciences.
- Other formats, organisation and government documents in both print and online mediums' and newspapers and magazines in print medium were very frequently and frequently used by only one respondent. Other respondents used these resources sometimes and some, less frequently. The overall range of formats were used by half of the respondents some of the time, and in most cases in both mediums.

Table 5. Level of use of different formats and mediums

Category	Format	Medium	Very				
			frequently	Frequently	Sometimes	Hardly ever	Never
Formal formats	Books	Print	1	3			
		Online	1		1	2	
	Journals	Print	2	2			
		Online	2	1	1		
Informal formats	Conference Papers & Proceedings	Print	2		2		
		Online	2		2		
	Theses & Dissertations	Print	2		2		
		Online			2	1	1
	Pre-prints	Print			2	1	1
		Online			2		2
Other	Organisation and Government documents	Print	1		2	1	
		Online			2	2	
	Magazines & Newspapers	Print		1	3		
		Online	1		2	2	
			Number of total responses for each category of frequency				



The above figure combines categories of *very frequent* and *frequent* use of formats.

- All respondents favoured the use of formal formats most frequently and the majority used the journal format in both mediums of delivery.
- Only half of the respondents however used other informal formats as frequently and in both mediums.
- Only one respondent used grey literature and non-scholarly formats very frequently.
- No respondent used pre-print formats frequently.

5.3.3.4 Summary

The following findings were observed:

- The majority of supervisors' predominately use on-campus locations, including computer laboratories, offices and the UNLP to locate information, and with the same levels of frequency.

- The majority of supervisors use online sources more frequently than physical collections to identify relevant information sources, including print sources.
- The majority of supervisors use online resources first, most of the time, to identify relevant information sources including print sources.
- Supervisors use a wide range of online finding aids including search engines in varying frequencies and also vary in their first choice of an online finding aid.
- The majority of the supervisors continued to rely on a physical library for the provision of most of their full text information.
- Clearly observed is that at group level, MIS supervisors use formal formats most frequently and continue to favour a print medium for their delivery.
- Of the informal formats, conference papers are most frequently used by half of the respondents in both mediums.
- Less frequent use by the majority of MIS supervisors, is made of grey literature and non-scholarly formats.
- Most formats are used frequently or some of the time by all respondents and in both mediums, exceptions include pre-prints, electronic books and electronic prints and online theses and dissertations.

5.3.4 Expectations and preferences for students' information gathering behaviour

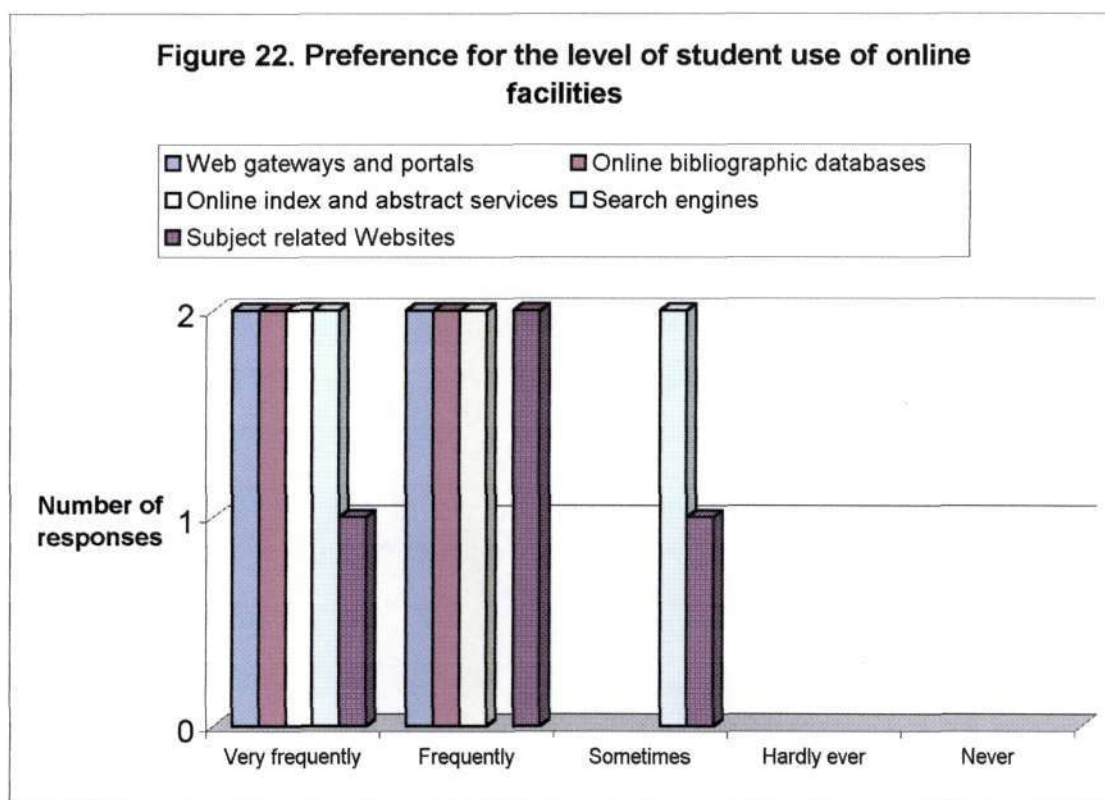
The third part of the questionnaire attempted to establish supervisors' expectations and preferences of MIS students' information gathering behaviour. The questions in this section sought answers on the preferred information locations (online and physical) and preferred online tools. Supervisors' expectations and promotion of traditional sources in both print and online versions were also sought.

5.3.4.1 Preference for students' use of different locations

Question 20 and 22 attempted to establish MIS supervisors preference for their students' use of either an online environment or a physical collection for the identifying (finding aids) and location of relevant sources (full text). The majority of supervisors indicated a preference that students use both locations in the same frequency. A fourth respondent indicated a preference for a higher frequency of use of the online location as a finding aid. Responses to a third category of *no preference* on what medium students used was disregarded due to the ambiguity of the question.

Question 21 attempted to establish which location MIS supervisors preferred their students to use first, most of the time. All but one respondent indicated an online environment. A fourth respondent indicated both locations and that the choice of medium should be based on the particular information need.

5.3.4.2 Preference for the level of students' use of online facilities



Question 23 attempted to establish supervisors' preference for their students' frequency of use of different online facilities for identifying relevant information. From the summary in Figure 22, it is clear that:

- All respondents indicated a preference for a balanced and frequent use of most online facilities.
- Exceptions however, were made for the use of search engines and Web subject directories. Two respondents indicated a preference for student's very frequent use of search engines and two indicated that this facility should be used only sometimes. Subject related Websites were indicated only once for frequent use and other respondents indicated less frequent use of this facility by students.

5.3.4.3 Comparison of expectations and promotion of use of different formats

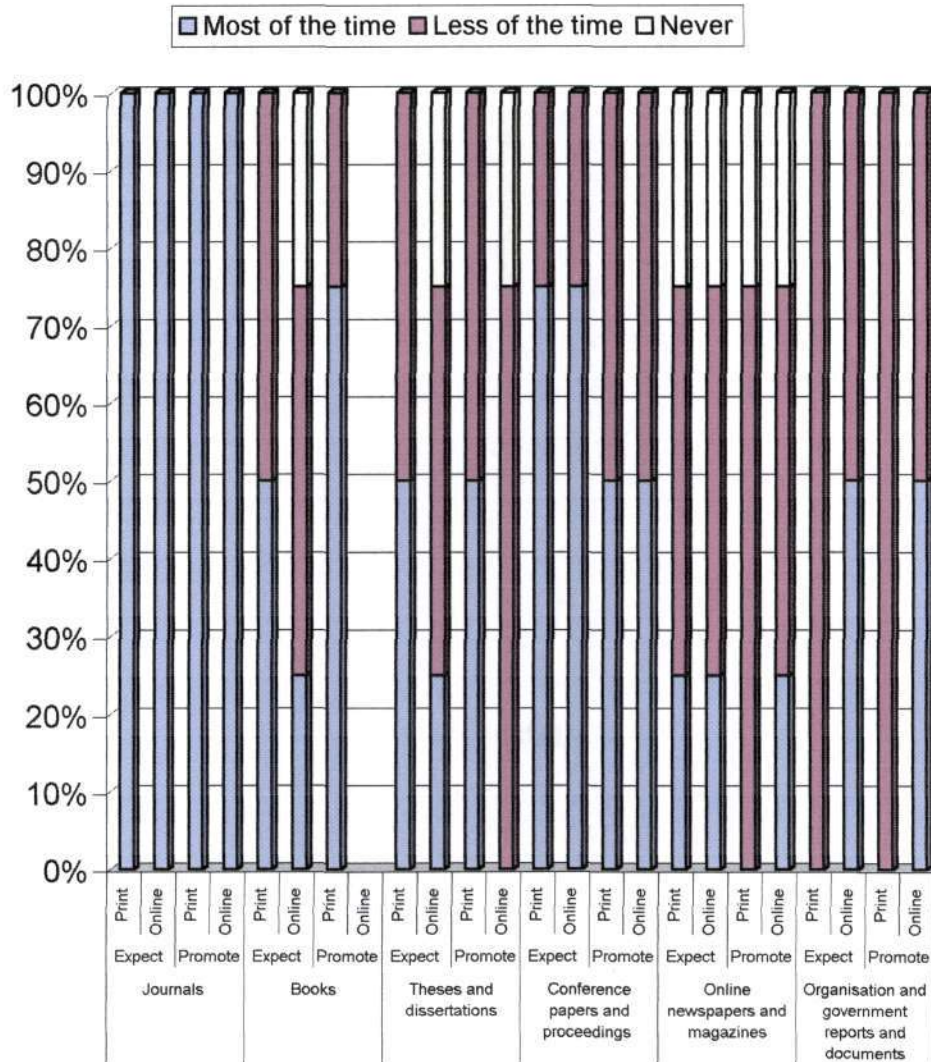
Table 6. MIS supervisors' expectations and promotion of use of different formats and mediums of delivery

			Most of the time	Less of the time	Never
Journals	Expectations	Print	4		
		Online	4		
	Promotion	Print	4		
		Online	4		
Books	Expectations	Print	2	2	
		Online	1	2	1
	Promotion	Print	3	1	
		Online		3	1
Theses and dissertations	Expectations	Print	2	2	
		Online	1	2	1
	Promotion	Print	2	2	
		Online		3	1
Conference papers & proceedings	Expectations	Print	3	1	
		Online	3	1	
	Promotion	Print	2	2	
		Online	2	2	
Online newspapers & magazines	Expectations	Print	1	2	1
		Online	1	2	1
	Promotion	Print		3	1
		Online	1	2	1
Organisation & government reports and documents	Expectations	Print		4	
		Online	2	2	
	Promotion	Print		4	
		Online	2	2	

From the results in Table 6, one can say:

- All respondents expect their students to use journals most of time in either print or online mediums and refer their students to this format most of the time in both print and online mediums.
- Conference papers and proceedings are ranked second in expected use and promotion in both mediums. Three respondents expected students to use this format in both mediums most of the time, and two refer students to this format most of the time, in both mediums.
- Books are ranked third overall in expected use and promotion, with print being the predominant medium expected and the only medium promoted. It is inferred the expected use and lack of promotion of e-books is a reflection of supervisors' own use or knowledge of this medium and the lesser appropriate presence of this format on the Web.
- Theses and dissertations are ranked fourth overall in expected use and promotion for most of the time and in a print medium. Again as above and in comparison with supervisor's own use of this format, the lack of promotion in a Web medium may be a reflection of supervisors' own lack of use and/or knowledge of the availability of this format.
- Online documents of organisations and governments are ranked fifth overall in terms of expected use and promotion. Of interest is that half the population (two supervisors) expect the use and promote this category in its online medium only.
- The least expected use most of the time was for print and online versions of magazines and newspapers.

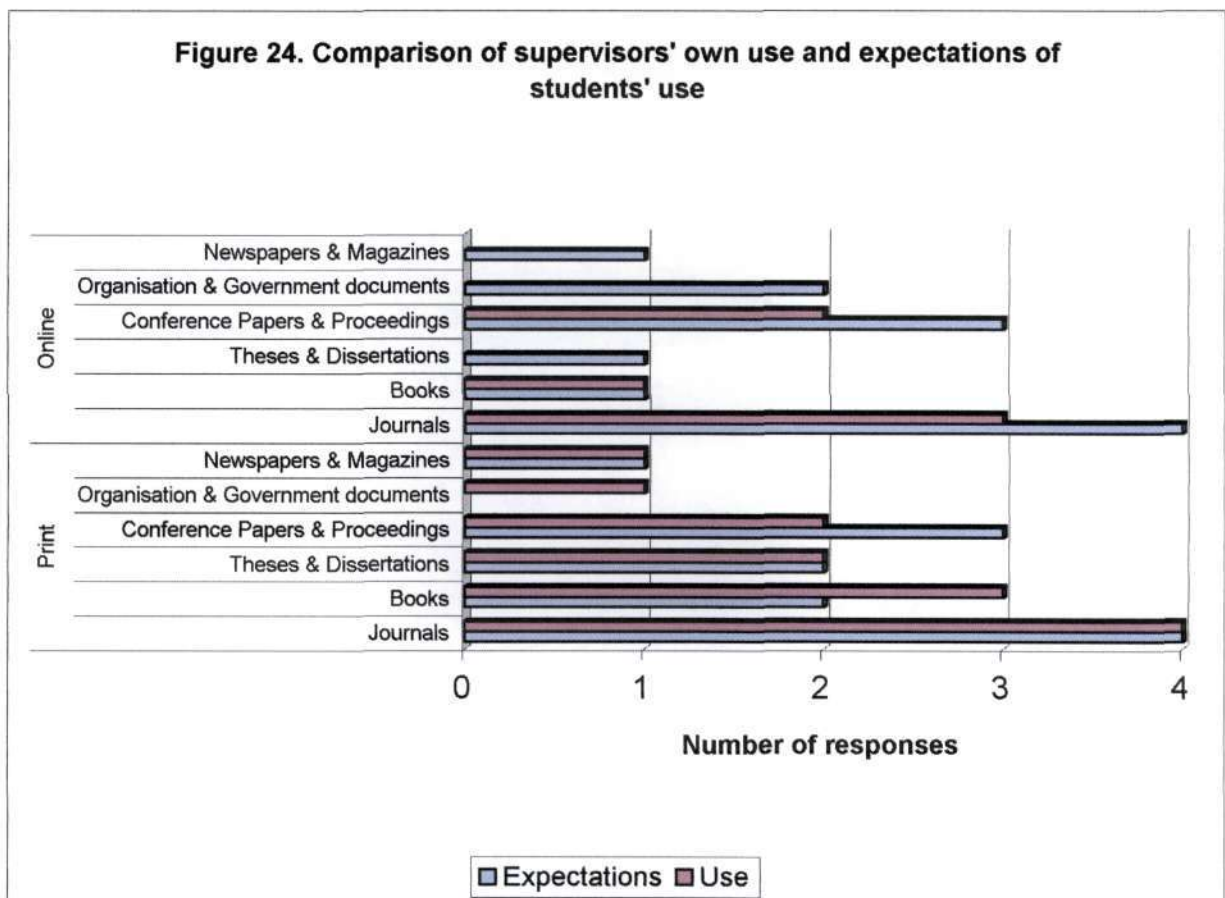
Figure 23. Expected and promoted use of different formats



The following can be deduced from Figure 23:

- The journal is the predominant format expected and promoted for student use by MIS supervisors. All four respondents expect and promote the print and online use of this format.
- Only half of the respondents expect students' to use books most of the time and half, less of the time, the majority however promote this format most of the time
- Expected use of conference papers in both mediums was supported by the majority of supervisors, however only half promote this format most of the time. This format ranked second in expected use.

- Half of the respondents support the use of documents of organisations and governments most of the time and of note, they favour students' online use of these formats. This may be a reflection of the supervisors' knowledge of the popular presence of these formats online.
- Only one respondent favoured the frequent use of newspapers and magazines.



The above figure represents the combination of supervisors' *very frequent* and *frequent* use of the formats specified by the questionnaire and in both online and print media. Their perceived use is compared to their expectations of students' use of these formats for most of the time.

- Frequent use and the expected use of the journal format was ranked first but not all supervisors make use of this format frequently in an online environment.

- Books are frequently used by the majority of supervisors, but less of a majority expect students to use the book format most of the time.
- The majority of supervisors expect students to use conference papers most of the time in both mediums but less of a majority of supervisors use this format frequently.
- Expected use and own use of theses and dissertations is balanced but only half of supervisors use and expect students to frequently use this format. None of the supervisors expected students to use this format frequently online.
- Only one supervisor makes use of organisation and government documents frequently but more of the supervisors' expect students to make use of the availability of these formats online.
- Only one supervisor uses and expects students to use newspapers and magazines formats frequently.

5.3.4.4 Summary

- The majority of MIS supervisors support an equally balanced and frequent use of both a print and online medium for identifying and locating relevant information sources by their students.
- The majority of supervisors prefer that students use an online environment first for identifying relevant information sources.
- The majority of respondents indicated a preference for a balanced and frequent use of most online search facilities.
- The predominant format all MIS supervisors expect students to use most of the time for their research and that they refer students to most of the time is the journal format, in both a print and online medium.

5.3.5 Agreements on the affect of the Web

The last part of the questionnaire sought to establish supervisors' views on the effects the Web may have had on students' research behaviour. The purpose of these questions was to establish an African educators' perspective

on the utility of the Web for research in African higher education environments.

Question 26 sought to establish the level of supervisors' agreement with the statement accrediting the majority of master's degree students with the ability to evaluate non-scholarly sources. Non-scholarly source were defined as information that had not undergone any process of scholarly review and of an informative, advocate or commercial nature.

- Only one respondent was strongly of the opinion that the majority of students were competent in evaluating non-scholarly sources.
- Two respondents were less certain that the majority of students had the necessary competencies to evaluate non-scholarly sources and chose to indicate that they *somewhat agreed* with the statement.
- One respondent indicated a neutral stance on the statement and neither agreed or disagreed.

The level of the survey was preliminary and further research is required as to why respondents indicated less agreement with the statement.

Question 27 sought supervisors' level of agreement with the statement ascertaining that use of the Web as a whole (and as opposed to an academic library) undermined the quality of master's degree students' research. Respondents were asked to provide reasons for the level of their agreement.

- The first respondent indicated that he/she somewhat agreed with the statement and supported his/her choice of agreement with the observation that while the Web was useful, it only represented one of a number of information sources and included his/her preference that students not rely on the Web entirely.
- A second respondent strongly disagreed with the statement and supported his/her answer by ascertaining the utility of the Web in providing current information and its particular utility in a developing country where print sources and journal budgets are limited.
- A third respondent also strongly disagreed with the statement and supported his/her response by ascertaining that the ability to evaluate

sources and thus the issue of quality in research is pertinent to both a print and Web medium. The respondent also ascertained the particular utility of the Web for certain subject areas.

- The fourth and last respondent indicated a neutral stance in terms of agreeing or disagreeing with the statement and supported this choice of response by ascertaining that at master's degree level the use of the Web should not undermine the quality of research.

Question 28 and 29 attempted to establish whether supervisors perceived an increase in the use of certain types of sources and generally in the range of different types of sources. The choice of formats for question 28 was based on findings of related studies (Herring 2001; Halliday 2001; Davis 2001; 2003) where an increase in the use of journals, newspapers and other previously ephemeral formats (theses and dissertations, government and organisation documents and preprints) was observed. Perceptions were disparate with one respondent perceiving major increases in the use of journals, government documents and reports and a minor increase in the use of pre-prints. Of interest is that the previous responses of this particular supervisor indicated a stronger support than his/her colleagues for Web tools and resources. Other respondents perceived minor increases or no change at all in the use of these sources.

Question 29 attempted to establish whether supervisors perceived a change in the range of sources used by students. The motivation for this question was based on the generally accepted ease of access provided by the Web to previously ephemeral sources and non-scholarly sources and the use of Web-based documents with no print equivalent. Responses confirmed that all supervisors felt that the Web has had a minor affect in increasing the range of sources used by students one respondent limited his/her response to a print sources and did not see change in range with the inclusion of non-traditional formats.

5.3.5.1 Summary

In summary the majority of MIS supervisors are of the opinion that research entry students in African higher education environments have the necessary competencies to evaluate non-scholarly resources available online and cited in their bibliographies. A major portion of this agreement was however restrained (somewhat agreed) and it is inferred, based on the phrasing of the statement, that supervisors may not feel that the majority of students exhibit these competencies in equal measure.

MIS supervisors provided opinions on both the utility of the Web for research and secondly on the affect of the Web on the quality of students research. Respondents indicated both strong and more judicious support for the utility of the Web in research. The utility of the Web in a limited resource environment and for particular subject areas was expressed by three of the supervisors but caution for a more balanced use of mediums was also expressed by one of these three respondents.

In terms of the Web affecting the quality of research two respondents answered the question directly. One respondent maintained that the ability to evaluate the quality of sources is pertinent to both mediums and another was of the opinion that at master's degree level students should display the required competencies to correctly evaluate sources.

In terms of an increase in previously less utilised formats of grey literature, non-scholarly and non-traditional sources, most respondents were of the opinion that these sources continued to be less cited or not at all. Accordingly the majority of supervisors perceived a minor change in the range of information sources cited by MIS students. One respondent, who recorded a particular strong support for the Web, differed in opinion and perceived a greater impact of the Web on students' use of these resources.

5.4 Summary of findings

The research questions are revisited and the findings arranged accordingly.

- *How has the level and range of use of traditional print sources changed in a period of access to the Web?*

The affect of the Web in terms of increasing the range of print sources used is minimal with only an increase in the occurrence of unpublished research reports (0.3% in 1996 to 2.4% in 2002) and conference papers (2.9% in 1996 to 4.3% in 2002) observed. The level of occurrence of the book format continues to predominate in MIS bibliographies but has dropped significantly (6% from 1996 to 2002). No anticipated increase in the use of the journal format was observed. Non-traditional formats in the form of Web documents with no equivalent print description have made an impact on MIS bibliographies and accounted for 7% of all citations of the average bibliography for 2002. The distribution of use of this particular format is however disparate and ranged from no occurrence to 16% occurrence in individual bibliographies for 2002.

- *What is the growth in the level of use of the online medium for the delivery of full-text information sources during the period under study?*

The occurrence of the online medium for the delivery of full text formats has grown from an insignificant 0.3% average in 1996 to a 17.5% average occurrence in 2002. The use of this medium on an individual level is disparate however and at its lowest occurrence only accounted for 1% of total citations of an individual bibliography in 2002.

In the years studied the Web medium was used most frequently for the delivery of Web based documents (33% of all online citations), unpublished conference papers and research reports (26% of all online citations) and government and organisation documents (24% of all online citations). It was least used for the delivery of non-scholarly sources in the form of newspapers and magazines (2% of all online citations); formal formats (9% of all online citations); and personal communication (6% of all online citations). The single

traditional print format most frequently delivered through an online medium was conference papers (33% of the total occurrence for this format). However and except for unpublished research reports, the use of the Web medium has not significantly increased the occurrence of these traditional formats but rather provided an alternative medium to access them.

□ *Have bibliographies grown in size during the period under study?*

The impact of the Web in increasing the size of bibliographies through the availability of a wider range of sources was not evidenced in the current study and in fact the converse was found. Cases of individual bibliographies with a high occurrence of online citations and below average size bibliographies were observed in 1999 and 2002.

□ *Do cited Uniform Resource Locators (URLs) point to the correct document?*

Of the 60 online citations tested from bibliographies compiled in 2002, 65% of all URLs continued to point to the correct document. After one year of being cited, 35% of the URLs tested no longer pointed to the correct document. Of the online documents not found at the indicated URLs, nine documents or 15% were located at different addresses. Altogether 80% of online citations were located one year after being cited in MIS bibliographies.

□ *What proportion of students' online citations may be categorised as non-scholarly?*

An enduring requirement of a scholarly publication is that a source be accessible over a period of time. Of the 60 online citations analysed 20% (a total of 12) could not be located a year after being cited. Of the remaining 48 online citations located, a total of 18 or 39% did not demonstrate any manifest scholarly attributes in terms of being refereed, providing bibliographic references and boasting an academic or professional affiliation. Only 10% of all online citations located and analysed, demonstrated all three of these attributes. The least occurring format encountered through a content analysis was for traditional formal formats of scholarly communication (and then only

journals), the highest occurring source was for grey literature emanating from organisations and included manuals, policies and guidelines.

- *What is the level and nature of MIS supervisors' use of Web resources in their own research?*

MIS supervisors indicate a high level of support for the use of the Web for their own research but not at the expense of print or physical resources. All supervisors have access to the Internet from their offices but the majority use both online facilities and physical resources of the university library (UNLP) to locate required information sources with the same frequency. Moreover all MIS supervisors are in agreement that only some of the information they require is available through the Internet.

The use of the Web as a finding aid ranks first and supervisors indicate use and knowledge of specialised online finding aids and facilities. All supervisors indicated the frequent use of online facilities for identifying relevant information sources including print sources, and the majority go online first most of the time to find information.

The majority of supervisors continue to use formal formats of scholarly communication most frequently and the majority continue to favour a print medium of delivery. Of the informal formats, conference papers are favoured in both mediums of delivery. Formats not frequently used by a majority of supervisors include pre-prints, electronic prints, theses and dissertations and books.

MIS supervisors do indicate a preference for a print medium for certain formats of scholarly communication but recognise the utility of the Web in delivering informal formats such as conference papers and organisation and government sources of information.

- *What are the expectations and preferences of MIS supervisors in regard to the use of the Web by their master's degree students for research?*

For the most part MIS supervisors expect their masters' students to observe the same information gathering behaviour as they do. The majority prefer that students use both a virtual and physical environment in the same frequency, to identify and locate relevant information sources. As indicated in their own information gathering behaviour, they support the use of the Web by their students' as the predominant finding aid and the majority prefer that students go online first most of the time, to identify relevant sources.

In certain instance their support for students' use of the Web is stronger than their own perceived use and they prefer that students use Web finding aids more frequently than they do. However half do prefer that students make less use of search engines and in comparison, less than they do.

Moreover the single format that all supervisors expect students to use most of the time and that they promote most of the time, in both a print and online medium, is the journal format. In comparison supervisors use this format in different frequencies and less in its online medium. The same pattern was observed with conference papers, where two of the supervisors only used this format sometimes in either medium but the majority expected students to use this format in both mediums most of the time.

- *What changes have MIS supervisors perceived in the citation behaviour of students under their supervision?*

The majority of MIS supervisors are of the opinion that research entry students in African higher education environments have the necessary competencies to evaluate non-scholarly resources available online and cited in their bibliographies. The utility of the Web in a limited resource environment and for particular subject areas was expressed by the majority of supervisors, however the majority of supervisors perceived little affect of the Web in terms of the level and range of information sources cited by MIS students.

5.5 Summary of chapter

The chapter presented an analysis and interpretation of the data derived from a bibliometric study of MIS theses bibliographies compiled in a period of access to the Web. The data derived from a preliminary survey of MIS supervisors was also analysed and interpretations offered. An overall summary of the findings was offered and arranged according to the study's research questions. At this stage no attempt was made to compare the findings with other related studies. The nature of the study dictated the approach that was used. The next chapter attempts to juxtapose the findings with those of related studies.

The study found that the level of affect of the Web on students' citation behaviour was limited and disparate with a small number of bibliographies accounting for most of the changes. The study found that the range of traditional print informal formats has grown to include more unpublished research reports and the use of the book format has dropped but continues to predominate. Other formats continue to be used in more or less the same levels but the Web is being used as an alternative medium to access these. Most notably, formats accessed online include government and organisation documents and conference papers. Of further note was the lack of use of the online medium for the delivery of scholarly formats, specifically journal formats, observed in both a citation and a content analysis.

The study found that the occurrence of online formats in MIS bibliographies has grown but use is disparate. The study found that the majority of online documents analysed did not demonstrate the scholarly attributes expected from traditional scholarly sources. From a content analysis of online documents the study found that the most frequent use of the Web is not for formal and informal formats of scholarly communication but for grey literature in the form of organisations documents.

The study found that MIS supervisors strongly support the Web for their own and for their students' research and most particularly as a finding aid. The study found that in certain instances MIS supervisors' expect their students to make more use of this environment than they do. The study observed that while MIS supervisors' supported the utility of the Web for research the majority were aware of the limited affect it has had on their students' citation behaviour.

CHAPTER SIX: SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

6.0 Introduction

Usage of electronic forms of scholarly information has typically been growing at 50 to 100 % per year...On the other hand, print usage has shown little change...a decade is about the length of time we should expect for new modes of electronic communication to become dominant, if current growth rates continue (Odlyzko 2001: 5).

A literature review and survey of MIS supervisors has supported the perception of the Web as an important information resource and research tool. The importance of the Web medium in the delivery of scholarly information has received particular support in an African higher education environment (Kaniki 1999; Geslin 2002a; b; c; Mugwisi and Ocholla 2002). The overall purpose of the current study was to assess the utility of this medium in an African higher education environment and at a research-entry level.

6.1 Revisiting the objectives of the study

The objective of the current study was to assess whether a period of access to the Web had affected the research behaviour of research entry-level students in an African higher education environment. In measuring an affect the study examined the research behaviour of MIS candidates as reflected in their citation behaviour. The study followed a normative approach and gathered evidence of this behaviour from a retrospective analysis of bibliographies of MIS theses submitted in 1996, 1999 and 2002.

The study employed a citation analysis methodology and measured the level of use of different types of formats and sources, the growth in the use of online

sources and changes in the overall size of bibliographies. A content analysis methodology was also employed to assess the affect of the Web on the quality of research behaviour, specifically in terms of the level of use of non-scholarly online sources and the stability of cited URLs.

The study explored possible determinants of MIS students' citation behaviour, specifically their use of the Web, and accordingly investigated MIS supervisors' support of this medium for research. The study was also positioned against a background study of the facilities and services offered by the UNP.

6.2 Conclusions of the study

The following conclusions were drawn and are juxtaposed with findings of related studies.

6.2.1 Changes in the level of use and range of traditional print formats

The current study investigated changes in the level of use of different types of traditional print formats, delivered in different mediums and conveyed through both print and online citations. This activity was based on the observation, arising in the literature (Herring 2002; Davis P.M. 2001; 2003; Halliday 2001; Odlyzko 2001) that the Web has increased access, through finding aids and full-text, to specific types of traditional print formats including journals, types of informal formats, grey literature and non-scholarly sources.

The current study concluded that the effect of the Web in terms of increasing the range of print sources used by MIS students on an individual level was minimal. At group level or on average, an increase (0.3% in 1996 to 3% in 2002) in the occurrence of unpublished research reports was observed. The range of formats occurring in MIS bibliographies has been extended to include non-traditional formats in the form of Web documents with no equivalent print description. These formats account for 6% of all citations of the average bibliography for 2002. The distribution of use of this particular format is however disparate and ranged from no occurrence to 16% occurrence in

individual bibliographies for 2002. Moreover, identifying this format correctly from a citation analysis methodology was problematic. Documentation styles varied in terms of online citations and the particular format of a work was not always clearly defined or obvious. The study concluded that until methods of documenting online sources are standardised a citation analysis is not a suitable method to qualify the nature of these citations.

The study found that the level of occurrence of formal formats continue to predominate and on average continue to account for a third of citations of a MIS bibliographies and that MIS research continues to be largely dependant on scholarly formats. Of the formal formats the book format continues to predominate in occurrence but has dropped significantly (6% from 1996 to 2002) and in 2002 accounted for 39% of the average bibliography. This has occurred at the same time that Web based citations have increased in occurrence.

No anticipated increase in the use of the journal format was observed and the level of use was 32% as opposed to 33% of all citations in bibliographies for 1996. It was inferred that given the reasonable level of documentation of journal sources evidenced from the analysis and expected from supervised MIS bibliographies and moreover, the support of the programmes' referencing style manual, the journal citations provided, reflected their true status, namely that of hardcopy/print journals obtained from a physical library. It cannot however be ascertained from a citation analysis what finding aids were used to identify journal literature. It is reasonable to infer however, that given the strong presence of this format online, had online finding aids been used a greater number of journals would have indicated an online source.

Other traditional print formats continued to be used without a consistent pattern of increased use from 1996 to 2002, observed. Increases and decreases in the use of organisation and government formats were deemed more reflective of the individual requirements of the topic of a thesis than of changes in group-level behaviour.

The citation behaviour of UNP MIS students is consistent with Smith and Oppenheim's (2001) analysis of LIS final year undergraduate students' research at Loughborough University. The study also recorded a continued dependence on monographs in assignments for the year 2000 and 40% of all citations were to book formats. Journal use for the same year was only 29.5% of all citations. These findings differ from Buttlar's earlier analysis (1999) of the citation patterns of LIS doctorate dissertations in the period 1994 to 1997. The study found that the ratio was in favour of journal use with 46% of all citations to journals as opposed to 31% to books.

The findings of the current study are consistent with Mgobozi and Ocholla's (2002) assessment of the poor use of electronic journals, despite the perceived importance given to this format, by academics, librarians and postgraduates of the universities of Natal and Zululand. The current study concludes that, with very few exceptions, MIS candidates continue to be dependant on a hardcopy print environment and continue to favour the book format.

6.2.2 Changes in the level of use of the online medium for the delivery of full-text information sources

The study found that the occurrence of the online medium for the delivery of full text formats has grown from a 3% average occurrence in 1996 to a 13.2% average occurrence in 2002. Over the six-year period, growth in total use of this medium has increased annually by 2.7%. Given the improvement in quantity and quality of access and information sources experienced during and after 1999, on the UNP campus (evidenced from the background study) a better indicator of growth may be the growth of occurrence between 1999 and 2002. Accordingly from 1999 to 2002 there was a 14.7% increase in total occurrence of this medium and in 2002 17.5% of all citations were for an online medium, this suggests an annual growth of 5%.

Growth in use of the online medium by MIS students compares favourably with related studies. Oppenheim and Smith's (2001) study recorded an initial 1.9% total occurrence of online citations in LIS undergraduate assignments for 1997 and within two years, an increase by 15.3%. Over a two-year period, annual growth in use of the online medium by Loughborough's LIS students, increased by 7.6%. No equivalent quantitative analysis was available for a comparison of postgraduate use of the Web medium for this time period.

Despite an increase in the average occurrence of this medium in MIS bibliographies, on an individual level however, occurrence of this medium was disparate. At its lowest occurrence in 2002, this medium only accounted for 1% of the total citations of an individual bibliography as opposed to its highest occurrence of 36%. It is concluded that MIS students use this medium disparately and outside the particular need of their theses topics, the common enablers required to utilise this medium including physical access and information literacy skills, may not be held in equal measure by MIS students. The issue of individual barriers to Internet access requires further study.

In the years studied and observed from a citation analysis the Web medium was used most frequently for the delivery of Web based documents (33% of all online citations) that could not be described in terms of traditional print formats, unpublished conference papers and research reports (26% of all online citations) and government and organisation documents (24% of all online citations). It was least used for the delivery of non-scholarly sources in the form of newspapers and magazines (2% of all online citations); formal formats (9% of all online citations); and personal communication (6% of all online citations). The single traditional print format most frequently delivered through an online medium was conference papers (33% of the total occurrence for this format). It was concluded however and on the basis of the findings of the first research question that except for unpublished research reports, the use of the Web medium has not significantly increased the occurrence of these *traditional print formats* but merely provided an alternative medium to access them.

6.2.3 Changes in the size of bibliographies

The impact of the Web in increasing the size of bibliographies through the availability of a wider range of sources was not evidenced in the current study and in fact the converse was found. Cases of individual bibliographies with a high occurrence of online citations and below average size bibliographies were observed in both 1999 and 2002. These findings are consistent with the conclusions of the first and second research questions in which the impact of the Web in increasing the range and level of use of traditional print formats was found to be minimal and largely limited to unpublished research reports; and secondly that the Web has not increased level of use but merely provided an alternative medium to access traditional formats.

6.2.4 The stability of Uniform Resource Locators

A concern expressed in the literature is the acceptance of the Web medium for the dissemination of scholarly communication given the mercurial nature of Web addresses (Zhang 1998). The current study accordingly concluded a lack of persistence in the stability of URLs included in the online citations of MIS bibliographies. Of the 60 online citations tested from bibliographies compiled in 2002, 35% of the URLs no longer pointed to the correct document. Altogether only 65% of online citations pointed to the correct document one year after first being cited in MIS bibliographies. This stability is consistent with Davis' (2003) testing of undergraduates URLs in 2000 were only 65% of the online citations continued to point to the correct document a year after first being cited. Herring's (2002) study of scholars use of electronic resources from 1999 to 2000 and tested in 2001 found a better level of persistence and only 18% of online citations could not be found at the indicated URLs.

6.2.5 The nature of online citations

An enduring requirement of a scholarly publication is that a source be accessible over a period of time. Of the 60 online citations for which a content analysis was undertaken, 20% (a total of 12) could not be located a year after being cited. Of the remaining 48 online citations located, a total of 18 or 39%

did not demonstrate any manifest scholarly attributes in terms of being refereed, providing bibliographic references and boasting an academic or professional affiliation. Only 10% of all online citations located and analysed, demonstrated all three of these attributes.

The least occurring format encountered through a content analysis was for traditional formal formats of scholarly communication (and then only journals at 6%), the highest occurring source was for grey literature emanating from organisations and included manuals, policies and guidelines. These results are inconsistent with Herring's (2002) citation analysis of online sources cited in electronic journals, which included LIS titles from 1999 to 2000. Of a total of 26.5% electronic resources (including online citations) cited by scholars the highest-ranking occurrence was to articles in online journals (42.5%) and ranked second in occurrence were online research reports at 20.1%. The current study concludes from a content analysis of a sample of online citations and in comparison with the above study, MIS students are using the Web for the delivery of formal scholarly information to a limited extent and the majority of sources used do not meet the traditional description of a scholarly source.

These findings suggest that MIS students' citation behaviour in this regard, is more consistent with Grimes and Boening's (2001) study of undergraduates' use of Web resources, and less consistent with Herring's (2002) study of scholars' use of electronic resources. Grimes and Boening (2001), from a content analysis, found that undergraduates were largely using unauthenticated Web documents. Herring's (2002) citation analysis of scholars' research found that the majority of online sources cited, were electronic journals.

6.2.6 Master of Information Studies supervisors' support of Web resources for research

In the absence of an interpretivist approach to students' citation behaviour the current study investigated possible external determinants of this behaviour in the form of an investigation of MIS supervisors' own and promoted information

gathering behaviour. This was motivated by a common observation in the literature that students' research behaviour was affected by teachings staff's expectations and own information gathering behaviour (Davis 2001; 2003; Grimes and Boening 2001; Herring 2001; Urquhart 2003; Rowley 2002). The current study specifically explored the possible relationship between supervisors' use, expectations and promotion of Web resources and students use of Web resources.

The current study concluded a greater support by MIS supervisors for the use of the Web environment than is evident from a citation analysis of MIS bibliographies. On the most part MIS supervisors expect their masters students to observe the same information gathering behaviour as they do. Accordingly they prefer that students use both a virtual and physical environment in the same frequency to locate relevant information sources, and the majority prefer that students go online first most of the time, to identify relevant sources. This is consistent with findings of related studies (Herring 2001; Friedlander 2002) that reported academics preference for a hybrid print and electronic research environment and an overall preference for the use of the Web as a finding tool.

Disparities were observed between MIS supervisors' own use and their expectations of student use of the Web environment for research and in certain instances it was observed that the support for students' use of the Web is stronger than supervisors' own perceived use. MIS supervisors indicated a preference in certain cases that students use Web finding aids more frequently than they do. In terms of formats favoured supervisors ranked the use of journal literature first in expected students use and referred students most of the time to this format in both mediums of delivery. However *and in comparison, supervisors use this format in different frequencies and less in its online medium.* Moreover and observed from the citation analysis, this format has not increased in occurrence in MIS bibliographies and an online medium of delivery of this format remains particularly limited. It is beyond the scope of a citation analysis to infer the finding aids used for

locating information sources but it is reasonable to expect that had these online facilities been used more by MIS students and given the constructs build by the current study, the impact of the Web should have been greater.

The current study concluded that MIS supervisors support the use of the Web for their and their students' research needs but from an analysis of students citations are not communicating their expectations of the use of this medium adequately. A possible explanation for this is that offered by Leckie (1996), that faculty operate on "an expert mode" in terms of information gathering behaviour and expect the same behaviour from their students especially at postgraduate level.

6.2.7 Master of Information Studies supervisors' perceptions of the effect of the World Wide Web

Addressing a concern arising in the literature of students' use of non-scholarly resources in tertiary and higher education environments (Grimes and Boening 2001; Davis 2001; 2003; Jenkins 2002; Herring 2001), the current study sought MIS supervisors' opinion on the affect of the Web on research behaviour in an African higher education environment.

The majority of MIS supervisors were generally of the opinion that research entry students' in African higher education environments have the necessary competencies to evaluate non-scholarly resources available online and cited in their bibliographies. This opinion is not wholly consistent with the findings of a content analysis of online documents cited in bibliographies of MIS theses submitted in 2002. Only 10% of the sample of online citations analysed, exhibited the traditional attributes of a scholarly source. How students used the remaining documents remains outside the scope of this study but it is reasonable to infer that these sources were largely used to support the arguments and discussions presented by their theses.

A tentative correlation found by the current study was that supervisors' who supported the Web more strongly (in terms of the amount and frequency in

the use, expected use and promotion of Web medium resources) and who went on to express the Web's importance in a limited resource environment and for particular subject areas, perceived greater change in their student's citation behaviour. This finding is consistent with related studies that observe that teaching faculty's own information behaviour, expectations and interventions strongly determine student citation behaviour (Davis 2003; Grimes and Boening 2001). The size of the population was small however and the analysis preliminary and greater research is required to continue to test this correlation.

6.2.8 Positioning conclusions within the background study

Assumptions of the current study included that, given the nature of the discipline, the analysed citations were compiled by an information and library literate group who had the necessary skills to select and locate information resources and secondly that given the nature of the profession, this group should have greater access to the Internet, through their place of work, or at the very least, through a "historically advantaged" university (Aitchison 1998). The study concluded however that use of the Internet is disparate amongst this group. In the absence of a survey of individual behaviour possible inferences for group-level citation behaviour may be drawn from the background study.

The background study undertaken by this study explored the level and nature of the supporting infrastructure for the Web medium. Common barriers explored were based on those expressed by related local studies (Ehikhamenor 2002; Ocholla 1999; Mgobozi and Ocholla 2002) and these included limited physical access, slow connection speeds and poor information and computer literacy skills. Other barriers or enablers explored by the current study included the availability of information resources, the nature and expectations of the academic programme.

The following observations were concluded:

- The bulk of student access to the Web on the UNP campus is provided by the ITD's computer laboratories. Before 1999 the availability of physical access and suitable connection speeds on the UNP campus was limited but an improvement in both areas was realised after this date with an increase in the amount of terminals and the upgrading of the Internet services and facilities. However the available physical facilities at the point of expertise for specialised online databases (in other words, the UNLP) remains limited.

- Before 1999 the availability of online databases including aggregated databases was limited. A major reason for this was the poor connection speeds and cost of subscription to these databases. Other limitations in use included the restriction of access to most online databases to the campus's LAN. Since 1999, improvements in the availability of online databases have been realised, most notably with the inclusion of the very popular EBSCOhost aggregated database. More recent improvements, which would have only affected the last year of the study, is the extension of the use of EBSCOhost and SABINET databases outside the campus LAN. A formal acceptance of the Web medium for research by the university's libraries is inferred from the recent investigation into the inclusion of Web based resources as an alternative approach to the subscription to expensive online databases (Geslin 2002a; b; c).

- Annual reports of the UNLP for the period of study (1996 to 2001) recognised the importance of user education programmes but relevant programmes offered at postgraduate level remain product-driven and accordingly limited to demonstrating the use of specific databases and the library's portal. While numerous programmes are available they continue to be largely physical library bound and no instruction for research-entry students on the mining of the Web medium for scholarly sources was evidenced by the current study.

- A recent bibliometric study on the productivity of local LIS departments (Ocholla 2000) ranked the UNP's Information Studies department first in the production of research at masters and doctorate level. The UNP's IS offers a number of approaches for undertaking a master's degree but all require independent research of the same standard (UN nd.a) and supervision by competent supervisors who are active researchers (UN nd.b). No comparative quantitative data on the research productivity of the IS' supervisors is available however. Moreover Ocholla's (2000) study is limited to quantifying productivity and no comparative data on the quality of research produced by local MIS students' is available.

A tentative conclusion to be drawn from this information in light of the disparate use made of the Web medium in MIS theses, and given the perceived support provided by the MIS supervisors for a Web medium, is that the supporting infrastructure provided by the UNP and the UNPL specifically, is not adequate at this point in time and secondly, resources that are available are not being sufficiently promoted or marketed.

This supports related studies (Whitmire 2001; Aitchison 1998) that indicate that a persistent problem in library use is one of physical proximity. This can be extended to the use of online resources for which access is provided on campus. Aitchison (1999b) explores possible solutions to providing on-campus and off-campus students with equitable access to library resources, these include the dissemination of required information resources online. However, a pertinent pre-requisite remains the need to develop the necessary information and computer literacy skills to make this access effective.

6.3 Recommendations

Recommendations drawn from the conclusions of this study include the following:

- A greater intervention from teaching faculty, in this case, supervisors, in the support of the appropriate student research behaviour is

recommended. The extent of supervisors' expectations in the use of formats and mediums should be clearly communicated and followed up. As observed by Leckie (1996) and Grimes and Boening (2001) teaching faculty staff should not pre-suppose that students have the same skills or are capable of the same expert researcher model as they are. This recommendation is supported by local studies and Davis cautions (2002: 217) that certain assumptions held by librarians and academics as to the level and nature of students' information literacy skills need to be addressed. Given the disparate use of the Web medium, the lack in utilising the Web for scholarly sources, MIS students are equally in need of greater intervention from their supervisors in adopting and adapting to new and hybrid research environments.

- The gap in the disparate use of the Web by postgraduate students and the recognition of the utility of the Web for research evidenced from both a survey of MIS supervisors and a background study of the UNP's supporting infrastructure, requires that faculty, librarians and the supporting educational institution reassess their roles and adopt more active approaches in supporting a new research environment.
- To effectively operate in a Web environment, students should be in possession of the skills traditionally held by information specialists. These skills include traditional information literacy competencies and more specifically network literacy skills. Appropriate information literacy programmes, as expounded by Nassimbeni and De Jager (2002), should be integrated into the curriculum and have administrative and institutional support. Ideally these programmes should be the sum of the collaboration between librarians, teaching faculty and administrators.
- Formats available on the Web may differ from those traditionally expected by supervisors and those traditionally provided by a physical library. Observed from a citation and content analysis of students' bibliographies was the increase in Web-based documents with no equivalent print description and the use of the course notes of other

universities. A greater awareness of the nature of scholarly communication evolving on the Web may be required from faculty to properly anticipate and evaluate the sources used by students; and from librarians to help inform collection development policies and information literacy programmes.

- Citation analysis of library users' research output has traditionally been used to assess libraries' collection development policies (Kelland and Young 1998; Smith 1981) and may indicate information sources not owned by the library but of potential high use (Kelland and Young 1998: 62,63) and accordingly the converse. An analysis of MIS bibliographies has revealed the disparate use of the Web medium and in light of this evidence the UNLs' support for Web resources (Geslin 2002a; b; c) should be equally supported by appropriate instruction and physical access. Ideally this should be provided at the point of expertise, namely the library.

6.4 Future research

A more interpretive approach in assessing students' citation behaviour is required to properly assess the affect of students' particular circumstances and their utilisation of a Web medium. Ideally a survey assessing students' citer motivations should be juxtaposed with a citation analysis of their research.

While it was the assumption of the current study that MIS students are largely library and information literate, and that they have a greater potential of access to the Internet, there is a need to investigate this group's levels of network literacy as delineated by Savolainen (2002). Applying Savolainen's (2002) cognitive behavioural model may help indicate whether MIS students exhibit the pre-requisite feelings of self-efficacy required to use the Web medium competently and secondly, whether they are being provided with the required incentives to develop an interest to acquire these competencies.

The survey of MIS supervisors' information behaviour was preliminary and focussed on determining a perceived use and support of the WWW for research by this group. Further study on the level of actual use and interventions in supporting the Web for research, is required.

The background study on facilities and services supporting student access to the Web on the UNP campus was focussed on establishing a general context for the bibliometric analysis and more research is required in determining the efficacy of this infrastructure.

Generally more comparative quantitative data on the use of the Web made by postgraduates in the same discipline in different higher education institutions is required to arrive at an evaluative assessment of the utility and diffusion of this medium amongst MIS students at the UNP.

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APPENDICES

APPENDIX I: List OF UNP MIS theses for the period 1996 to 2002

No.	Year conferred	Title	Author
1	1997	An evaluation study of the psychology collection at the University of Transkei	Breakfast, K.
2	1997	The school community as a solution to the lack of library services in the Umtata district of the former Transkei	Dube, L.
3	1997	The relevance of popular English language fiction to black adult readers in libraries affiliated to the kwaZulu-Natal Provincial Library Services	Gallagher, J. I.
4	1997	Community participation in the establishment of public libraries: a one shot case study of the Georgetown Public Library	Mini, T. P.
5	1997	A performance evaluation of the Pietermaritzburg cluster of theological libraries in order to determine whether it meets the demands of its users	Van Rooyen, K.
6	1997	The application of a participatory evaluation method to the public library: the case of Tholulwazi Library, besters Camp, Inanda Durban.	Wyley, C. H.
7	1998	Access to books and journal articles by postgraduate students on a course work Master's programme in Information Studies at the University of Natal, Pietermaritzburg.	Aitchison, J. M. H.
8	1998	Authoring and information seeking on the World Wide Web: an experimental study	Ilcheva, S. A.
9	1998	An evaluative study of the resource centre within a community learning centre with particular reference to Tembaletu community education centre	Lombo, S.
10	1998	The role of the Transkei College of Education (TCE) library in the preparation of lectures: An analysis of the lecturers views	Makopi, Z. N.
11	1998	The preparedness of Technikon-trained library and information science diplomats for the work situation, an evaluative study.	Mhlongo, M.
12	1998	Mangosuthu Technikon Resource Centre and its involvement in the Umlazi community with particular reference to High Schools: 1991-1997	Msimango, H. L.
13	1998	The kwa-Zulu Natal Provincial Museum Service 1974-1997: A brief History	Ridley, H.
14	1999	An investigation of the role of microcomputers as information retrieval sources in the greater Pietermaritzburg schools' water and audit projects	Addo, G. H. K.

15	1999	The Department of Information Studies, University of Natal: its role in education for librarianship in South Africa: 1973-1994	Bell, F. R.
16	1999	Collection development and use of non-book materials in university libraries of South Africa	Ntuli, N. C.
17	1999	Utilization of information technology in providing access to information for decision-making and policy formulation in the Ministry of Health, Kenya	Nyamato, R. M.
18	2000	Preserving electronic memory: an investigation into the role played by the National Archives of South Africa in the management of electronic records of central government	Abbott, B. S.
19	2000	An investigation into the availability and adequacy of environmental information resources to support field workers at the Wildlife and Environment Society of South Africa's four environmental education centres in KwaZulu-Natal	Holland, C.
20	2000	The use and effectiveness of the East Africana Collection in the provision of information and resources for teaching and research at the University of Dar es Salaam, Tanzania	Kibakaya, N. T.
21	2000	Public secondary schools in Nairobi and the satisfaction of the curriculum needs among history teachers	Kimotho, J.
22	2000	The satisfaction of postgraduate education students with library services at the University of Transkei	Ndudane, R. Z.
23	2000	Sexuality and sexual health information needs and seeking patterns of school-going teenagers in Pietermaritzburg, South Africa	Nsengiyumva, A. M.
24	2000	Information-seeking patterns and information-providers of aurally impaired school-children in the Eastern Cape Province, South Africa	Pantshwa, Z. V.
25	2000	College libraries in the Transkei	Puzi, M. E.
26	2000	An exploratory study of the information needs of secondary schools students in Mdantsane Township, Eastern Cape	Rubushe, B. P.
27	2001	An evaluation of the Russel High School's library collection in meeting the curricula needs of learners	Atagana, F. O.
28	2001	Evaluation of the information retrieval skills – Agri 220 module in Faculty of Science and Agriculture at the University of Natal, PMB	Krige, E-AJ.
29	2001	A survey of compact disc-read only memory (CD-ROM) technology in South African university libraries	Munoo, R.
30	2001	Communication between healthcare workers and patients at the Scottsville Clinic, PMB, South Africa	Niba, M. B.
31	2001	An investigation into the possibility of mainstreaming library user education into the curriculum for the Engineering Faculty of ML Sultan Technikon	Webster, L.E.
32	2002	Information needs of agricultural researchers and extension agents in addressing farmer's production-related constraints and information needs in the Gambia	Janneh, F.M.

33	2002	An investigation into staff development activities at the University of Natal libraries on the Durban campus	Mabengu, M.N.
34	2002	The use of the EG Malherbe Library, University of Natal (Durban) : by non-University of Natal users	Magwaza, F.P.
35	2002	Establishing an Internet-based information exchange system for the Kwa-Zulu-Natal Midlands Rural Development Network (MIDNET), South Africa	Molla Setegn, A.
36	2002	An evaluation of Sangonet as a regional electronic information and communication network for the development and human-rights organisations in Kwa-Zulu Natal	Ndlovu, N. P.
37	2002	The management of public records in the member countries of the Eastern and Southern Africa Regional Branch of the International Council on Archives	Tafor, V.F.
38	2003	Management of university records: a case study of the University of Natal, Pietermaritzburg	Chinyemba A.
39	2003	The Information and Communication Technology (ICT) knowledge and skills of subject librarians at the university libraries of KwaZulu-Natal	Hoskins, R.
40	2003	Information literacy among form five students at the four government senior secondary schools in Gaborone, Botswana	Isaac, G.G.B.W.
41	2003	Staff attitudes to access and outreach in KwaZulu-Natal archives	Koopman, J.M.
42	2003	Information seeking patterns of distance learners registered with the Zimbabwe Open University	Maenzanise, J.L.
43	2003	Knowledge sharing and distribution in an open system: a case study of the Eastern Cape Estuaries Management Programme	Mosia, L.N.
44	2003	The use and application of information communication technologies for information provision by library workers of the University of Botswana Library	Mpotokwane, E.S.
45	2003	The role of the churches in disseminating HIV/AIDS information among the youth in Pietermaritzburg	Nizigiyimana, S.
46	2003	An investigation into the use of electronic information resources for information searching and retrieval among academic staff at the Edgewood Campus, University of Natal	Nsanzya, B.M.K.

APPENDIX II: Citation analysis transfer sheet

CASE NO. [] (Year of research [] Year degree conferred []

CODES	Print Count	Online Count	Score
TRADITIONAL SCHOLARLY FORMATS			
Books / Chapters			
Journals			
<i>Total for traditional formal sources</i>			
Theses and dissertations			
Conference papers and proceedings			
Research and technical reports			
Pre-prints			
Total for traditional informal formats			
<i>Total for traditional scholarly formats</i>			
OTHER TRADITIONAL FORMATS (Grey literature and Non-scholarly formats)			
Government documents			
Organisation documents			
Newspapers and Magazines			
Miscellaneous			
Total for other traditional formats			
Personal communications			
NON TRADITIONAL FORMATS			
Web based documents			
Total size of bibliography			

APPENDIX III: Content analysis transfer sheet

Year	Count						Description	
Case No.	HTTP Stability			Peer Review	Academic / Research Institution/ Affiliation	Bibliographic References	Domain	Format
	Found	Diff. URL	Not Found					
Score								

APPENDIX IV: Questionnaire

SURVEY INSTRUMENT FOR COLLECTING DATA ON MIS SUPERVISORS' USE AND SUPPORT OF THE WWW FOR RESEARCH

This research is undertaken for the requirements of a Master of Information Studies degree, Information Studies Programme, School of Human and Social Studies, University of Natal, Pietermaritzburg.

Type: Self-administered questionnaire

Mode of delivery: email

Instructions: Please print, complete and return via Dr. P. Ngulube

Room 311, New Arts Block,

e-mail: ngulubep@nu.ac.za,

Tel: 033-2605972

Elizabeth Thompson

Tel: 033 3422723

Email: ecgthompson@mweb.co.za

CASE NO. []

**Instructions: Please tick the appropriate box or answer in the provided space
Please answer all 29 questions.**

1. Do you supervise graduate student research?
 - a. Yes []
 - b. No []
2. How many master's degrees' theses have you supervised in the period 1996 to 2002?
Please specify amount: []
3. Is your supervision of master's degree students' research a *major* (a) [] or *minor* (b) [] responsibility?
4. Which of the following activities are major or minor responsibilities for you?
 - a. Committee work in institution/ school/ programme: major [] minor []
 - b. Review of peers' work, including refereeing: major [] minor []
 - c. Work with professional societies and organisations: major [] minor []
 - d. None of the above []

5. What is your primary area of research within the discipline of Information Studies?

6. Over the course of the year, what percentage of your working hours do you spend on research?
 - a. Less than 25% []
 - b. Less than 50% []
 - c. More than 50% []
 - d. More than 75% []
 - e. Not sure []
7. Are you able to connect to the Internet from your office?
 - a. Yes [] b. No []
8. Are you able to connect to the Internet from your home?
 - a. Yes [] b. No []
9. How often do you participate (post messages) in electronic mail discussion groups (Listserv) on research themes?

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

10. How often do you use the following locations to access the information you need for research?

a. University of Natal Pietermaritzburg Library (Physical building)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. On campus (including office and computer labs)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

c. *Off campus (including home)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

11. How often do you use the following locations to find out about information sources for your research needs?

a. **Online** (for example, catalogues, indexes and abstracts databases, search engines, subject directories and guides, gateways and portals, Websites of organisations, institutions and individuals, various types of documents)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. **Physical libraries** (for example, print and electronic finding aids and resources provided by the UNPL and school/department/private/other physical collections)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

12. Of the above locations, which do you go to *first, most of the time*, to find out about information sources for your research needs?

a.	b.	c.
Online	Physical libraries/ collections	Other (please specify):

13. How often do you use the following locations to find out about *print information sources* for your research needs?

a. **Online** (for example, catalogues, indexes and abstracts databases, search engines, subject directories and guides, gateways and portals, Websites of organisations, institutions and individuals, various types of documents)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. **Physical libraries** (for example, print and electronic finding aids and resources provided by the UNPL and school/department/private/other physical collections)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

14. Of the above locations, which do you go to *first, most of the time*, to find out about *print information sources* for your research needs?

a.	b.	c.
Online	Physical libraries/ collections	Other (please specify):

15. How often do you use the following online facilities to find out about information sources for your research needs?

a. Search engines

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. Web gateways and portals (including UNPL Website)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

c. Subject-related Websites (For example guides and directories)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

d. Online bibliographic databases (for example, SABINET and EBSCOhost)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

e. Online index and abstract services (for example ISI citation indexes and EBSCOhost)

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

f. Journal content services

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

g. Other (Please specify)

--

16. Of the above online facilities, which do you go to *first, most of the time* to find information sources for your research needs?

a.	b.	c.	d.	e.	f.
Search engines	Web gateways and portals	Subject-related Websites	Online bibliographic databases	Online index and abstract services	Other (please specify)

17. How much of the information (full text) you need for your research is available through the Internet?

a.	b.	c.	d.	e.
All of the information	Most of the information	Some of the information	Hardly any of the information	None of the information

18. How much of the information (full text) you need for your research is available in print or electronic format at the University of Natal, Pietermaritzburg Library (including through inter-library loan)?

a.	b.	c.	d.	e.
All of the information	Most of the information	Some of the information	Hardly any of the information	None of the information

19. How often do you use the following types of information sources for research?

	Type of source	Very frequently	Frequently	Sometimes	Hardly ever	Never
A	Print journals					
B	Print books					
C	Print theses and dissertations					
D	Print conference proceedings and papers					
E	Print reports of organisations and governments					
F	Print newspapers and magazines					
G	E-journals including journals with print versions					
H	E-books					
I	Pre-prints					
J	Electronic pre-prints					
K	Full text conference papers and proceedings available online					
L	Dissertations and theses available online					
M	Newspapers and magazines available online					
N	Documents of organisations, governments, and individuals available online					
O	Listservs					
P	Other(s) (please specify):					

20. How often do you prefer that master's degree students under your supervision, use the following locations to find out about information sources for their research needs?

a. *Online (for example, catalogues, indexes and abstracts databases, search engines, subject directories and guides, gateways and portals, Websites of organisations, institutions and individuals, various types of documents)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. *Physical libraries (for example, print and electronic finding aids and resources provided by the UNPL and school/department/private/other physical collections)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

c. *No preference*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

21. Of the above locations which do you prefer that master's degree students under your supervision use *first, most of time* to find out about information sources for their research needs?

a.	b.	c.
Online	Physical libraries	Other (please specify):

22. How often do you prefer that the master's degree students under your supervision access information sources from the following locations, for their research needs?

a. *Online (Full text)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. *Physical libraries (Full text)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

c. *No preference*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

23. How often do you prefer that the master's degree students under your supervision use the following online facilities to find information sources for their research needs?

a. *Search engines*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

b. *Web gateways and portals (including UNPL Website)*

i.	ii.	iii.	iv.	v
Very frequently	Frequently	Sometimes	Hardly ever	Never

c. *Subject-related Websites (including guides and directories)*

i.	ii.	iii.	iv.	v.
Very frequently	Frequently	Sometimes	Hardly ever	Never

d. *Online bibliographic databases (for example SABINET and EBSCOhost)*

i.	ii.	iii.	iv.	v.
Very frequently	Frequently	Sometimes	Hardly ever	Never

e. *Online index and abstract services (for example EBSCOhost and ISI citation indexes)*

i.	ii.	iii.	iv.	v.
Very frequently	Frequently	Sometimes	Hardly ever	Never

24. How often do you expect the master's degree students under your supervision to use the following types of information sources? (Check table)

25. How often do you refer the master's degree students under your supervision to the following types of information sources? (Check table)

Q. 24	Type of Information Source	Most of the time	Less of the time	Never	Q. 25	Most of the time	Less of the time	Never
A	Print journals				A			
B	Print books				B			
C	Print theses and dissertations				C			
D	Print conference proceedings and papers				D			
E	Print reports of organisations and governments				E			
F	Print newspapers and magazines				F			
G	E-journals				G			
H	E-books				H			
I	Electronic pre-prints				I			
J	Full text conference papers and proceedings available online				J			
K	Dissertations and theses available online				K			
L	Newspapers and magazines available online				L			
M	Documents of organisations, governments, and individuals available online				M			
N	Listservs				N			
O	Other(s) (please specify):				O			

26. How strongly do you agree or disagree that the majority of master's degree students, under your supervision, have had the necessary competencies to determine the quality, credibility and accuracy of non-scholarly* online sources of information cited in their theses?

a.	b.	c.	d.	e.
Strongly agree	Somewhat agree	Strongly disagree	Not sure	Neutral

**Non-scholarly – for the purpose of this study, described as information that has not undergone any process of scholarly review and information of an informative, advocate or commercial nature.*

27. How strongly do you agree or disagree that use of the Web as a whole (and as opposed to a traditional academic library) undermines the quality of master's degree students' research?

a.	b.	c.	d.	e.
Strongly agree	Somewhat agree	Strongly disagree	Not sure	Neutral

Please provide reasons for your answer:

28. To what extent do you feel the Web has increased the level of use of certain types of sources cited in master's degree students' theses?

	Information type	Major increase	Minor increase	No change in level	Not sure
A	Newspapers				
B	Journals				
C	Government documents				
D	Theses and dissertations				
E	Reports of organisations				
F	Pre-prints				

29. To what extent do you feel that the Web has increased the range of different types of information sources cited by master's degree students in their theses?

a.	b.	c.	d.
A major increase	A minor increase	No change in range	Not sure

Thank you for completing this questionnaire.

APPENDIX V: Pre-test letter

7 October 2003

Dear

Re: Pre-test of questionnaire for MIS research

As part of the research component of the Master of Information Studies programme by coursework, I am investigating the effect of the WWW on the citation behaviour of MIS students at the University of Natal, in the period 1996 to 2002. One of the research questions posed by my study is to determine how MIS supervisors' use and support the WWW for research.

My supervisor, Dr. Patrick Ngulube, suggested your help and I would be very appreciative if you would test the questionnaire and e-mail your comments to me as soon as you have a moment to spare. I hope to send out the final version of the questionnaire to the targeted population, by the end of this week.

A version of the following information will accompany the tested questionnaire:

The purpose of this survey is:


- To gather data on the use supervisors make of Web tools and resources for their own research;
- To determine whether supervisors promote and support the use of various Web tools and resources by master students under their supervision;
- To solicit supervisor's opinions about the changes the Web may have effected on the quality, range and level of use of information sources cited by the master students under their supervision.

The questionnaire is self-administered and will be e-mailed to the population under study. Respondents are required to print, complete and submit questionnaire to my supervisor's office. All gathered data will be aggregated and no personal details are required.

Thank you.

Yours sincerely,
Elizabeth Thompson

 ecgthompson@mweb.co.za

 033 3422723

APPENDIX VI: Letter of introduction

☎ 033 3422723
✉ ecgthompson@mweb.co.za

10th October 2003

Re: Investigation of the effect of the WWW on MIS students' citation behaviour.

As part of the research component of the Master of Information Studies programme by coursework, I am investigating the effect of the WWW on the citation behaviour of MIS students at the University of Natal in the period 1996 to 2002.

One of the research questions posed by my study is to determine how MIS supervisors' use and support the WWW for research. The purpose of this survey is thus, firstly, to gather data on the use you make of Web tools and resources for your own research; secondly, to determine whether you support the use of various Web tools and resources by master's degree students under your supervision; and finally, to solicit your opinions about the changes the Web may have effected on the quality, range and level of use of information sources cited by master students under your supervision.

All gathered data will be aggregated and personal details are not required. Findings of this survey should help inform the results of the current study's bibliometric analyses of MIS theses bibliographies.

I would be very appreciative if you would print and complete the attached questionnaire and return it to me, at your earliest convenience, through my supervisor, Dr. Patrick Ngulube, Information Studies, SSHS, UNP. Contact details are as following:

E-mail: ngulubep@nu.ac.za,
Room 311, New Arts Block, SSHS, UNP
Tel: 033-2605972

Yours sincerely,
Elizabeth Thompson

APPENDIX VII: Total counts of formats and categories of MIS theses for 1996

Case numbers:												
	1	%	2	%	3	%	4	%	5	%	6	% of total
1996												
Books	73	40.3%	42	59.2%	21	48.8%	24	35.8%	70	47.6%	26	37.1%
Journals	75	41.4%	8	11.3%	9	20.9%	39	58.2%	27	18.4%	34	48.6%
Formal formats		81.8%		70.4%		69.8%		94.0%		66.0%		85.7%
Theses / Diss.	4	2.2%	1	1.4%	3	7.0%	1	1.5%	6	4.1%	5	7.1%
Conf. P&Ps	5 (2)*	2.8%	5	7.0%	1	2.3%	0	0.0%	4	2.7%	2	2.9%
R&T Reports	2	1.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Informal formats		6.1%		8.5%		9.3%		1.5%		6.8%		10.0%
Newsp. & Mag.	4	2.2%	0	0.0%	0	0.0%	0	0.0%	3	2.0%	0	0.0%
Org. Doc.	0	0.0%	5	7.0%	2	4.7%	3	4.5%	18	12.2%	0	0.0%
Gov. Doc.	5	2.8%	0	0.0%	3	7.0%	0	0.0%	0	0.0%	2	2.9%
Misc.	3	1.7%	0	0.0%	2	4.7%	0	0.0%	3	2.0%	1	1.4%
Personal Com.	10	5.5%	10	14.1%	2	4.7%	0	0.0%	16	10.9%	0	0.0%
Web based Docs												
Other		12.2%		21.1%		20.9%		4.5%		27.2%		4.3%
Size of Bibl.	181	100.0%	71	100.0%	43	100.0%	67	100.0%	147	100.0%	70	100.0%
												579
												15.9%
												100.0%

* () online citations of format

APPENDIX VIII: Total counts of formats and categories of MIS theses for 1999

Case numbers:														% of total score						
1999	1	2	3	4	5	6	7	8	9	%	Total	%	Total	% of total score						
Books	11	19.0%	22	28.6%	42	25.0%	32	33.0%	48	53.9%	21	44.7%	40	37.0%	41	32.5%	31	47.0%	288	34.4%
Journals	6(1)	10.3%	44	57.1%	29	17.3%	42	43.3%	27	30.3%	12	25.5%	54	50.0%	68	54.0%	18	27.3%	300	35.9%
Formal Formats	17	29.3%	66	85.7%	71	42.3%	74	76.3%	75	84.3%	33	70.2%	94	87.0%	109	86.5%	49	74.2%	588	70.3%
Theses / Diss.	0	0.0%	3	3.9%	4	2.4%	7	7.2%	3	3.4%	3	6.4%	10	9.3%	5	4.0%	4	6.1%	39	4.7%
Conf. P&Ps	10(1)	17.2%	1	1.3%	1	0.6%	2	2.1%	0	0.0%	0	0.0%	1	0.9%	2	1.6%	0	0.0%	17	2.0%
R & T Reports	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Informal Formats	10	17.2%	4	5.2%	5	3.0%	9	9.3%	3	3.4%	3	6.4%	11	10.2%	7	5.6%	4	6.1%	56	6.7%
Newsp. & Mag.	0	0.0%	0	0.0%	3	1.8%	11	11.3%	6(1)	6.7%	0	0.0%	0	0.0%	2	1.6%	5	7.6%	27	3.2%
Org. Doc.	13(8)	22.4%	4	5.2%	37	22.0%	1	1.0%	1	1.1%	5	10.6%	1	0.9%	3	2.4%	4	6.1%	69	8.3%
Gov. Doc.	7(6)	12.1%	2	2.6%	12	7.1%	1	1.0%	2	2.2%	2	4.3%	0	0.0%	2	1.6%	4	6.1%	32	3.8%
Misc.	1	1.7%	1	1.3%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	2	1.9%	0	0.0%	0	0.0%	4	0.5%
Personal Com.	3(3)	5.2%	0	0.0%	40	23.8%	1	1.0%	1	1.1%	4(1)	8.5%	0	0.0%	3	2.4%	0	0.0%	52	6.2%
Web based. Docs	7	12.1%	0	0.0%	0	0.0%	0	0.0%	1	1.1%	0	0.0%	0	0.0%	0	0.0%	0	0.0%	8	1.0%
Other	31	53.4%	7	9.1%	92	54.8%	14	14.4%	11	12.4%	11	23.4%	3	2.8%	10	7.9%	13	19.7%	192	23.0%
Size of Bibliography	58	100.0%	77	100.0%	168	100.0%	97	100.0%	89	100.0%	47	100.0%	108	100.0%	126	100.0%	66	100.0%	836	100.0%
Total online	26	44.8%	0	0.0%	0	0.0%	0	0.0%	1	1.1%	1	2.1%		0.0%		0.0%		0.0%	28	

APPENDIX IX: Total counts of formats and categories of MIS theses for 2002

Case numbers:													of							
	1	2	3	4	5	6	7	8	9	%	Score	% total score								
2002																				
Books	32(2)	43.2%	23	29.9%	34	38.2%	25	29.4%	22(1)	27.5%	44(2)	67.7%	23(1)	27.7%	35	57.4%	24	35.8%	262	38.47%
Journals	16(1)	21.6%	28	36.4%	34	38.2%	40	47.1%	29(3)	36.3%	5	7.7%	29(2)	34.9%	8	13.1%	25	37.3%	214	31.42%
Formal Formats	48	64.9%	51	66.2%	68	76.4%	65	76.5%	51	63.8%	49	75.4%	52	62.7%	43	70.5%	49	73.1%	476	69.90%
Theses / Diss.	1	1.4%	6	7.8%	0	0.0%	5	5.9%	7	8.8%	0	0.00%	4	4.8%	4	6.6%	3	4.5%	30	4.41%
Conf. P&Ps	2(2)	2.7%	3(1)	3.9%	0	0.0%	1(1)	1.2%	2(1)	2.5%	4(3)	6.2%	8(8)	9.6%	6	9.9%	3(2)	4.5%	29	4.26%
R&T Reports	0	0.0%	4(3)	5.2%	2(1)	2.3%	1	1.2%	3(2)	3.8%	0	0.00%	3(3)	3.6%	3(3)	4.9%	0	0.00%	16	2.35%
Informal Formats	3	4.1%	13	16.9%	2	2.3%	7	8.2%	12	15.00%	4	6.2%	15	18.1%	13	21.3%	6	9%	75	11.01%
Newsp. & Mag.	0	0.0%	0	0.00%	1	1.1%	0	0.00%	1	1.3%	1(1)	1.5%	1(1)	1.2%	4	6.6%	0	0.00%	8	1.17%
Org. Doc.	2(2)	2.7%	3	3.9%	1	1.1%	4(1)	4.7%	7(3)	8.8%	1(1)	1.5%	6(3)	7.2%	0	0.00%	2	3%	26	3.82%
Gov. Doc.	8(8)	10.8%	3(1)	3.9%	9	10.1%	2(2)	2.4%	0	0.00%	0	0.00%	1(1)	1.2%	0	0.00%	1	1.5%	24	3.52%
Misc.	1	1.4%	1	1.3%	0	0.00%	0	0.00%	0	0.00%	0	0.00%	1	1.2%	1	1.6%	0	0.00%	4	0.59%
Personal Com.	0	0.0%	2(2)	2.6%	8	9%	5(2)	5.9%	3	3.8%	0	0.00%	0	0.00%	0	0.00%	2(1)	3%	20	2.94%
Web based. Docs	12	16.2%	4	5.2%	0	0.00%	2	2.4%	6	7.5%	10	15.4%	7	8.4%	0	0.00%	7	10.5%	48	7.05%
Other	23	31.1%	13	16.9%	19	21.4%	13	15.3%	17	21.3%	12	18.5%	16	19.3%	5	8.20%	12	17.9%	130	19.09%
Size of Bibliography	74	100.0%	77	100.0%	89	100.0%	85	100.0%	80	100.0%	65	100.0%	83	100.0%	61	100.0%	67	100.0%	681	100.00%
Total online	27	36.5%	11	14.3%	1	1.1%	8	9.4%	16	20.00%	17	26.2%	26	31.3%	3	4.92%	10	14.93%	119	17.47%