A comparative study of the costs and benefits of journal ownership versus full-text electronic access in the Faculty of Science at the University of Natal, Durban, Libraries

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Declaration

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

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Dedication

This thesis is dedicated to my husband, Rajan and daughters, Natasha, Bhavna and Kirthi, who supported me throughout the completion of this thesis. And to my father, Jay Ramoudh and mother, Anjenidevi Ramoudh, who instilled in me, the love for learning and striving for the highest.

Abstract

There has been a huge increase in the costs of the journal collection at the University of Natal, Durban Libraries. This is due to the increased foreign exchange rate compounded by the frequent increase in the price of journal subscriptions. The library budget has not been able to keep pace with these increases in materials. The consequence is the cancellation of journal subscriptions together with the erosion of new book purchasing. To cope with this situation, libraries are coming to measure their collections and looking at alternative ways to overcome this journal crisis.

The development of the technology of computers has greatly widened access to information but still at a cost in money and specialized skills much higher than is required for access to the traditional media. With the technology, the user can access the information or journal from anywhere not necessarily in the library but from home as well as the office. The patron can access various information sources from one point.

For this study a multi-pronged method was employed. The methods employed were a literature review, a review of the documentary sources, an analysis of the journal data, surveys by self-administered questionnaires to the users – postgraduate students and academic staff in the Faculty of Science and an interview with the Acting University Librarian, Ms Nora Buchanan.

One important element of the survey was to obtain in-depth information on journal usage patterns. The study was interested in determining whether the shift from print to electronic would affect journal usage patterns and dependence on the physical library.

The findings of the survey demonstrated that usage patterns have changed and now favour the use of e-journals. There are, however, certain advantages to both formats and it is important to take advantage of both. The University Librarian interviewed recognized the popularity of e-journals and saw that over time the journal collections will shift from print to electronic. The archiving of online content remains a concern and print is still regarded as a short-term answer to the archive problem. The analysis of the journal data revealed that print and e-journal prices increased substantially each year, with the exception of 2004, for various reasons. But the print journals increased much more than the e-journals. The findings of this study could be drawn on to inform policy and practice regarding journal acquisition at the Howard College Libraries, University of KwaZulu-Natal and possibly other libraries as well.

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List of acronyms and abbreviations

The following is a list of abbreviations that are commonly used in the study:

AIP	American Institute of Physics
ARL	Association of Research Libraries
ARL/RLG	Association of Research Libraries / Research Libraries Group
ARPA	Advanced Research Projects Agency
BSc	Bachelor of Science
BSc Hons	Bachelor of Science Honours
Café Jus	Commercial and Free Electronic Journals User Study
CALICO	Cape Library Cooperative
CBA	cost-benefit analysis
CD-ROM	compact disk – read only memory
COSALC	Coalition of South African Library Consortia
DARPA	Defence Advance Research Project Agency
DLAC	Durban Library Advisory Committee
DOI	document object identifier
EGM	E G Malherbe
e-journal	electronic journal
e-mail	electronic mail
eSAL	Eastern Seaboard Association of Libraries
FRELICO	Free State Library and Information Consortium
fte	full-time equivalents
FTP	file transfer protocol
GAELIC	Gauteng and Environs Library Consortium
GIS	Gateway Information Service
HTML	hyper-text markup language
ICT	information and communication technologies
IOP	Institute of Physics

IP	Internet protocol
ISI	Institute for Scientific Information
ITD	Information Technology Division
JSTOR	Journal Storage
LAN	local area network
LIS	library and information service
LP	long playing
MASA	Medical Association of South Africa
MIT	Massachusetts Institute of Technology
MSc	Master of Science
NASA	National Aeronautics and Space Administration
NUDF	Natal University Development Foundation
OCLC	Online Computer Library Center
OCLC ECO	Online Computer Library Center Electronic Collections Online
OPAC	online public access catalogue
ORNL	Oak Ridge National Laboratory
PC	personal computer
PDF	portable document format
PEAK	Pricing Electronic Access to Knowledge
PhD	Doctor of Philosophy
PLoS	Public Library of Science
QUT	Queensland University of Technology
RSC	Royal Society of Chemistry
SAPSE	South African Post Secondary Education
SASLI	South African Site Licensing Initiative
sci-tech	Science and technology
SGML	standard generalized markup language
SPARC	Scholarly Publishing and Academic Resource Coalition
STM	Science, technology and medicine
UKZN	University of KwaZulu-Natal
UND	University of Natal, Durban

UNP	University of Natal, Pietermaritzburg
URL	uniform resource locator
US	United States
USSR	Union of Soviet Socialist Republics
WWW	World Wide Web

Chapter One : Introduction

1.1 Introduction

There has been a dramatic escalation of the cost of the journals collection at the University of Natal, Durban (UND) Libraries over the past few years. The library experienced severe budget restrictions and faced a crisis with regard to the maintenance of the journal collection. Over the last five years journal price increases have averaged 12 – 40 percent while the average yearly increases of the materials budget has been 3.3 percent. The situation has recently improved slightly but still remains a concern for libraries. (Walker 2003 : 2)

The increased foreign exchange rate compounded by the frequent increase in the price of journal subscriptions has led to journal cancellations. Higher costs and less money to spend are continuing this trend. The library budget has not been able to keep pace with the huge increases in materials' costs caused by excessive journal price increases. Since 2000 the Libraries have reduced their journal subscriptions by approximately 100 titles, or 10 percent. However in 2003, the Library was faced with another round of journal cancellations. The aim was to reduce expenditure by R 550 000. (Walker 2003 : 2)

Publishers have addressed their fall in revenue by increasing institutional subscriptions, thereby causing a vicious circle of cancellations and further increases in institutional rates. Large publishing conglomerates are driving the prices of journals higher and higher and libraries are finding themselves spending more money to purchase fewer and fewer titles. (Rambler 1999 : 1)

The University of Natal is now the University of KwaZulu-Natal (UKZN) as a result of the merger between the Universities of Durban-Westville and Natal. The bulk of the data was collected prior to the merger. The new UKZN libraries have not yet agreed to a common mission statement, and do not have common budgets and journal procedures. Acting University Librarian, Ms Nora Buchanan, was interviewed in the UKZN libraries but commented on the UND library situation. The focus of this study is the UND Libraries.

1.1.1 The journals crisis

The consequence of the set of circumstances described above is the current journal cancellation crisis. Tenopir and King (2000) from their base in the United States (US) presented findings of research on

scholarly journal publishing from 1960 to 1995 and coined the phrase “serials pricing crisis”. In their study Tenopir and King presented evidence showing that the average institutional price of a scholarly journal subscription had increased from $39 in 1975 to $284 in 1995, a factor of 7.3 in just twenty years. The average price of a Chemistry journal in 2003 was $2, 403, Physics $ 2, 357, Biology $ 1,175, Mathematics and Computer Science $1,151 and Geography $ 820. It is clear that traditional scholarly publishing is in serious economic difficulty. (Van Orsdel 2003 : 51) This crisis has provoked widespread dissatisfaction with the journal pricing system. With larger portions of library budgets being spent on journal subscriptions, the focus of budget cuts has shifted to journal subscriptions. Journal prices have been spiraling out of control. The result has been massive cancellations of library journal subscriptions together with the steady erosion of new book purchasing. To prevent journal cancellations, libraries are looking at alternative solutions. (Bot 1998 : 1)

To cope with this situation, libraries are evaluating their collections and looking at alternative solutions to the journal crisis. Libraries are considering methods of managing the bottom line as rationally as possible and providing the highest quality information support within often severe budget restrictions. For most libraries and the faculties they serve, meeting this objective means making choices; namely canceling journal subscriptions, choosing new subscriptions with caution, and seeking alternative cost-effective means of providing users with information. Any cuts not made to the materials budgets in times of crisis are at the expense of other aspects of library service. A high percentage of the budget is spent on developing journal collections, besides the subscriptions, the handling of such journal collections also takes a certain proportion of the library resources. Broadly speaking, libraries spend their financial resources on materials, staff and operating expenses and these are the only areas in which major economies can be made. (Gorman 2002 : 263)

The amount of published research worldwide continues to grow supplied by scholars who must “publish or perish” but libraries are increasingly unable to purchase this research. The economic viability of the present printed system of scholarly communication is in serious doubt. The crux of the matter is that the prices of scholarly publications especially in the field of science, technology and medicine (STM) have skyrocketed in the last decade of the twentieth century. The cost of maintaining STM journals is increasing at a particularly rapid rate because of significant price increases and the proliferation of ever more specialised journals that must be added to the collection. Together these two factors threaten to overwhelm the journal budget. (Pikowsky 1997 : 31)

There is a clear price difference between arts and humanities journals, social science journals and science journals. In each category of publisher (commercial, learned societies and other) the journals of the sciences cost more than those of the social sciences or humanities journals. Two factors make up this difference. On the one hand, science journals publish more pages than either social science or humanities. (Gorman 2002 : 261) Those categories of publications that average a greater number of pages cost more. On the other hand, science journals publish more graphic, tabular and mathematical information. This also affects the average price of the journal since when compared with the cost of printing straight text, graphics, mathematical equations and tabular data are more expensive to reproduce. (Sosteric 2002 : 4) There is an economic crisis in the publishing and acquisitions of journals in the arts and humanities, but not as severe as in the Sciences. But this is debatable. Hunter (1998 : 1) argues that these journals are reasonably priced and are not subject to unwarrantably steep increases in prices. To the humanist or social scientist, the book is a publishing form that can be leveraged in the promotion and tenure process. His views, however, are debatable.

Even before the onset of the electronic revolution, the well documented 'serials crisis' in which journal subscriptions have risen at levels well beyond annual increases in library budgets was impacting directly on the ability of libraries to build comprehensive core collections for current users and long-term archives.

New information technologies now enable libraries to consider alternative means of access to journals. One of these, the electronic journal (e-journal), offers a partial solution to the problem. E-journals may be available through compact disk – read only memory (CD-ROM), online, or through networks, such as the Internet. E-journals can be mounted and stored locally, or accessed from a remote site. The Internet offers much lower costs of reproduction and distribution than print. The technological possibilities of e-journals have opened up a whole new field of possibilities for the exchange of scholarly information. The scholarly community has excellent connectivity and the current system of journal pricing seems to be too expensive. Each of these factors is helping to push journals from the print to the electronic media. Libraries are now developing into technological centres where users may come to access networks and online resources. (Kent 1999 : 2; Shemberg 1999 : 27)

One important role of libraries is to ensure that the best possible information is provided to their user communities at minimum cost. That rarely means one single approach to dissemination, because the wide variety of information-seeking and use patterns require a range of

dissemination mechanisms. The role of the library is not limited to making available a range of publications and information to a specialized group of users. (Tenopir 2002 : 26)

The library is a crucial element in the publishing industry. Publishers publish for profit but the basis for the activities of the industry is to make the creativity of authors more widely known to the public. Most authors write not for profit but to make their research and ideas more widely known. (Cornish 1999 : 34) But no author or publisher can reach all potential readers of any work and they need intermediaries. Libraries are used by people, who have never had any intention of buying their information nor have the economic power to do so. The library provides the interface between the publisher and the market. Publishers cannot hope to reach every potential outlet for their products because they do not have direct contact with the necessary groups to achieve this. Publishers are also limited in what they can provide in terms of repertoire which will normally be limited to their own products or those of associated companies. Libraries, however, can, and do, reach a wide audience as they have direct access to a very broadly based user community. They can also offer a wider range of products as they are not motivated primarily by financial incentives, although they may limit the range of resources because of financial constraints. (Cornish 1999 : 34)

While there are many developments in the field of scholarly communication, the Sciences have always been in the forefront. The United States Department of Defense Advanced Research Projects Agency (DARPA) originally sponsored Internet development because it wanted a military communication system that could survive a nuclear war. Later, the Internet was funded as a research support system by the National Science Foundation. Physics journals were one of the leaders in the field of electronic journals. The field of physics has been a leader in the move towards the utilisation of electronic media particularly the World Wide Web (WWW) for scientific communication and journal “publication”. The Institute of Physics, for example has hosted its own electronic journals since the early 1980s.

At the same time that the costs of producing print journals have increased sharply, developments in computer and communications technology have accelerated. With the dramatic explosion of the WWW have come the possibilities of using computers and communication networks to create alternative electronic forms of the conventional print journal.

1.1.2 The current situation at UND Libraries

Many institutions have therefore asked why the Library has not embraced this new medium of scholarly information. For example at the University of Natal, Durban (UND) Libraries from 2000 to 2003 there was a 45 percent increase in price in the Science journal subscriptions. Journal prices have increased so dramatically that in 2003, the Faculty of Science had to embark on a rigorous cancellation exercise, despite previous cancellation exercises each year from 2000. At UND Libraries a decision had to be made regarding this crisis. The Library could not continue canceling journal titles at the end of each year.

Many Schools in the Faculty of Science have been compelled to cancel journal subscriptions or purchase fewer or no monographs on an annual basis, despite a cumulative ten percent increase in the Acquisitions budget over the last five years. These additional funds did not sufficiently compensate for the rise in the cost of journal subscriptions particularly when combined with the deteriorating currency exchange for the purchase of foreign materials. Schools were over the budget at the beginning of the year, all except the School of Mathematical and Statistical Sciences even though journal allocations for the Faculty represented 21.5% of the total serial expenditure. (Scigliano 2000 : 44 ; University of Natal 2002 : 20) Although a bigger part of the budget is allocated to Science, the Faculty was still overspent.

1.2 Purpose of the study

The purpose of the study was to compare the Science print and electronic journal collections at UND Libraries, in terms of costs and benefits, to provide a useful indicator of what can be done at this Library and possibly other academic libraries in the country. UND Libraries form part of a system and the problems experienced here are likely to be similar to those experienced at other tertiary institutions.

In a period of decreasing library budgets and of rising costs in journal subscriptions it is important for academic libraries and researchers to understand the trends and implications of the digital information revolution. The outcome of this study could inform UND Libraries decision-making (chiefly journal cancellation decisions and possible choices between print and electronic full-text journals) and establish a utility mode on accrued value and subscriptions cost which could be used automatically as an alerting guide or decision-making

tool. The study aims at informing Faculty and other users of journal literature of the options available in this very expensive sector of scholarly publication and to open up discussions about the implications of changing the scholarly communication system. Information about and answers to these questions could help the Library anticipate trends in journal collection and subscriptions and help in financial planning and budgeting. In addition to satisfying the purpose of the study, results could potentially lead to meaningful policy changes and ideas for future studies.

1.3 Objectives of the study

The objectives of the study were:

1. To conduct a cost analysis of the print and electronic journals to which the UND Libraries subscribes.
    1.1 To identify costs of access to electronic journals.
        1.1.1 To identify costs that are unique for the provision of access to an electronic journal.
    1.2 To identify the costs in accessing and subscribing to a print journal.
        1.2.1 To examine costs unique to print journals.
2. To compare the cost of print subscriptions to the cost of full-text access.
3. To determine the benefits of print journals.
4. To determine the benefits of electronic journals.
5. To compare the benefits of print journals and electronic journals.
6. To compare the benefits accrued based on the costs of print and electronic full-text.
    6.1 To determine if the benefit derived would outweigh the costs or have any bearing on the costs of print and electronic full-text journals.
    6.2 To determine if the expense of providing access or subscribing to both or either formats are justified.
7. To determine which of the two, periodical ownership or full-text electronic access, is most cost beneficial at UND Libraries.

1.4 Research questions

The research questions for this study, therefore, are:

1. What are the costs of print and electronic journals?
2. How do the costs of access to the print and full-text compare?
3. What are the benefits of print journals?
4. What are the benefits of electronic full-text journals?
5. How do the cost of a journal, print and electronic and their associated benefits compare?
6. What is the best way forward for UND Libraries?

1.5 Hypotheses

Five hypotheses formed the base for the study.

1. There are unique costs related to access to print and electronic journals
2. There are unique benefits of print versus electronic journals.
3. Costs are significantly higher in accessing electronic journals than print journals.
4. Benefits are significantly higher in accessing electronic journals than print journals.
5. The cost and benefit of accessing electronic journals is significantly higher than that of print journals.

1.6 Comparative analysis

UND Libraries has not engaged itself sufficiently in this debate to arrive at an informed decision on what to do about ownership of print journals and electronic access. UND Libraries has devised some strategies to cope with the present budget crisis such as collaborating and sharing some journal titles with University of Natal, Pietermaritzburg (UNP) Libraries, but these strategies are not working effectively. (Geslin 2002 : 4)

Regardless of the format, information is the currency of business today. While content rather than format is the primary consideration for the user, the change to electronic delivery creates many new opportunities and ways of working. (Kent 1999 : 1) The library

must approach and analyse access, both bibliographic and physical, as a system of interrelated processes in order to bring order to the chaos of choices offered. It must understand its users' information-seeking habits, identify available access options and weigh the cost of each against its benefits, select the options most appropriate to local needs, and determine the order of applying them. (Cain 1995 : 366)

One way to deal with this matter requires a comparative analysis of the print and electronic journal service. This study will compare print and electronic journals in terms of their similarities, differences, costs and benefits. The grounds for the comparison are whether the library should provide access to electronic journals or have ownership of its print journals. The key concepts of this study are costs, benefit and access. In order to derive cost and benefit measures, it is necessary to calculate the cost of each product or service. In order to calculate the cost of a library service, all components of the cost must be identified. (Broadbent 1991 : 5) Any form of benefit analysis requires input from users on the nature of their use of particular library and information service (LIS) products.

Evaluation is a broad concept which can be defined as 'the act of placing a value on an object. (Broadbent 1991 : 6) A decision to introduce a new product or to cancel an existing one is based on an evaluation, undertaken through a formal process. Formal evaluation requires time and resources. Evaluation is more useful and has more credibility if applied as an ongoing management tool, providing evidence of whether the system is improving over time, or, alternatively tends to respond less well to the information needs of users. Evaluation often entails a comparison between alternatives. (Broadbent 1991 : 6)

Given a fixed budget, the library has to allocate its fund judiciously to various activities and services, while at the same time assuring that it maximizes benefit to cost ratios. In other words, the library carries out benefit-maximising and cost-minimising programmes.

1.6.1 Costs

Costs are resources expressed in monetary or cash values that have been exchanged for products or services. The term is often used synonymously with expense, but more properly it means the value of resources exchanged for past, present and future benefits represented by the outflow of resources in return for assets. (Corrall 2000 : 180)

Traditionally, the library has borne costs as a consequence of providing access to scholarly information: the book or journal has to be ordered, catalogued, sometimes bound, shelved and re-shelved, circulated and so on. The largest component in the cost of operating of a library is likely to be the cost of the staff. Other costs to be considered are equipment, use, space occupied, copyright clearance, cost of online access, purchase and maintenance of the collection. The biggest problem associated with costing of library services is that of allocating the proportion of the budget to the costs of books and journals respectively. Since subscriptions to journals tend to be a very substantial component in the total cost of a library collection, it is probably necessary to separate the annual material costs into the cost of journals and the cost of acquiring all other materials. Electronic products, while they may offer some savings, also bring new costs: for instance, the library now has to provide computer workstations at which users can access the relevant materials. (Eckmann 1999 : 7)

Many library cost studies (Bevan 2001; Bot 1998; Case 1998; Gorman 2002; Kingma 1998) view the user's time (time spent by the customer using the service) – as free, but for many types of evaluation a realistic analysis of the cost of using the service is an important factor.

1.6.2 Benefits

A benefit is an improvement made or advantage gained. Benefits of a library service or product relate to the desired outcome or impact. In accounting terms, such benefits are gauged in discrete quantitative monetary terms, as actual or predicted cash inflows, cost savings and cost avoidance. Generally, the benefits of a library service are more difficult to measure. Most published goals and objectives statements for library services relate to supposed ultimate benefits, for example improved level of education and socially responsible citizenry but these are very difficult to measure.

The primary goals of a library service are to maximize user need satisfaction and minimize time loss to the user. The measure of benefit is the savings associated with the present service as compared with the costs of the alternative method of achieving the same results. As Broadbent states (1991 : 10-11, 56) evaluation often entails a comparison between alternatives. Various forms of value and benefit can be identified and estimated. In particular, libraries can assess the benefits of access to and use of information and journals provided by the library. While costs can be measured in monetary terms, values can only be assessed in qualitative or relative terms. In the value identification process the cost of each

information resource entity (unit) is stated in monetary terms, while benefits are expressed in qualitative terms. The costs and benefits are then compared. The value of the system should be judged according to the users' perceptions rather than according to actual cost structure. (Broadbent 1991 : 10-11)

For this study benefits can be identified in three categories : first the cost savings/avoidance to the user together with the opportunity costs the user has foregone; second, the cost of the alternative sources of similar products or services (in this case journals); and third, the impact the product has on the work or output of the user. (Broadbent 1991 : 57) Again, the last category is difficult to measure.

1.6.3 Access

Access may be defined in at least three ways. First, legal access describes the right of a person or group of people to use a certain collection and obtain library services. Information is embodied in artifacts such as books, journals, newspapers, and video. Libraries are storehouses of these artifacts and provide physical access to them. In the traditional library sense access therefore means physical access to books and journals on the shelf. To have adequate physical access to printed materials means not only to be able to get currently issued books but also the opportunity to use the accumulated stores of publications. Certain restrictions may or may not apply, and access for some groups may not be as generous as for other groups, but some common right of access exists. (Shaughnessy 1991 : 5)

Cataloguing and bibliographic services provide the physical description that identify these artifacts and the classification system that arranges them on the shelves and permits them to be found. Bibliographic access then makes it possible to locate individual items within the total mass of resources. Bibliographic access refers to users being able to identify books, journals and other resources through catalogues (online or card), finding lists, databases and so on. (Shaughnessy 1991 : 6) By searching the catalogue a user will know what is available in the library or in the collection. This gives the user a bibliographic reference to where the full text is. Theoretically, therefore, the users of a particular library have bibliographic access to all material owned by that library.

But bibliographic access does not always result in physical access or actual access. Physical access refers to the user actually obtaining the item which is sought. In most cases, legal

and bibliographic access are prerequisites to physical access, but not always. (Shaughnessy 1991 : 6)

The development of computer technology has greatly increased access to information but still at a much higher cost in money and specialized skills than is required for access to the traditional media. The concept of access may be further defined by distinguishing between mediated and unmediated access. (Shaughnesy 1991 : 6) End users who search electronic databases and the Internet are accessing citations or data without direct assistance, while those who seek assistance in finding needed materials, access materials on a mediated basis. With virtual access users have instant and convenient access to wider bodies of information including current information. Access achieved electronically can provide the user with far more power over the data than access in other ways. Electronic access to information requires the use of networks and other communication structures or systems. Technologies that were previously both physically and functionally discrete (print, digital, audio and video) are now converging within one apparatus. With the technology, the user can access the information or journal from anywhere: not necessarily only in the library but also from home as well as the office. Furthermore the patron can access various information sources from one point. (Kent 1999 : 5)

The term 'access' is used in a generic manner since a library may not actually house an e-journal but subscribe to its use on the Internet or have access on a per-view basis. Similarly libraries can provide access to their journal collection of current and bound volumes. Libraries also provide access to their collections to other libraries through interlibrary loans. (King et al 2003 : 382)

There are two stakeholders in the cost-benefit matrix of academic library journal access: - the library and the user – actual or potential. The costs to the library are the purchase of the print or electronic journal subscription, but in addition the library must bear the costs for processing, binding, storing and re-shelving the journal subscription. Producing services and products with a minimum use of resources – achieving efficiency – is a concern of the library operating the system. (Broadbent 1991 : 8)

An important consideration in moving to electronic delivery is ongoing access to data. Archiving and access to information in the future, when perhaps the library no longer subscribes to the title, are key concerns for librarians. Where the data resides, that is, at the

vendors, customers or third parties site is relevant. Most electronic information is leased and if customers want perpetual access, this must generally be negotiated at a premium price, thereby increasing the pricing model. (Kent 1999 : 5)

For the patron the cost of access (not necessarily monetary) is the time spent on browsing, and finding the journal in the library, photocopying the article and printing or downloading the article. Another aspect on the question of access is the convenience associated with access. Each part of the cost matrix must be established to compare the economic efficiency of providing access through a journal subscription, print or electronic.

The Mc-Graw Hill encyclopedia of professional management defines cost-benefit analysis (CBA) as 'determining the ratio of benefits of a given project to its cost, taking into account the benefits and costs that cannot be directly measured in dollars.' (Bittel 1993:10)

A CBA requires a study of both costs and benefits, or potential costs and benefits, of a product or service. Direct costs can be relatively easy to identify and calculate. However, indirect costs are just as important to identify. Factors such as time, tangential costs such as paper or ink cartridges (or any other somewhat "hidden" costs), costs of training and materials, or any other factors that add to the cost of providing a service or product are considered to be indirect costs. An exact figure for indirect costs is extremely difficult to calculate. Estimates of the true costs, both direct and indirect, are necessary to more accurately calculate the total cost of the product or service. Some data, such as salaries and fringe benefits, may be difficult to obtain due to employee confidentiality. (White 1998 : 505)

The objective of a cost-benefit study is typically to determine the economic feasibility of alternative proposals for achieving defined objectives, by identifying both the monetary/financial and opportunity/social costs and benefits. Such studies are both objective in terms of financial cost data and subjective regarding determination of values for non-monetary and intangible costs and benefits. Ideally all the costs and benefits should be expressed in the same units of measurement (in Rands) but this is very hard to do in a satisfactory and credible manner. Further difficulties arise with the range of data theoretically required, which usually includes estimates not only of service usage but also of time spent by both service staff and service users – and possibly by other stakeholders. Estimating costs and benefits properly thus requires significant input from users as well as management

approval and support. Another problem is that the costs and benefits of an undertaking often occur in varying timeframes, and benefits are typically more long-term. (White 1998 : 505)

Not only are the benefits difficult to measure, but the costs also are difficult to calculate accurately. Although direct costs of say, subscription costs, equipment costs, and so on are typically easy to measure, indirect costs are much harder to ascertain. Indirect costs include items such as staff time in assisting users, training and instruction time and materials, or troubleshooting and problem correction. In addition, the concepts of fixed, variable, and marginal costs need to be considered. Fixed costs are costs that do not change regardless of level of service or number of customers. An example is the cost of keeping a building open and running. Variable costs are costs that increase with each level of output. For example, every time another page is photocopied, the costs of paper and toner increase. Marginal costs are related to variable costs and are the measure of each additional unit of output. Finally, there is an inherent bias in looking at costs versus benefits. Whereas costs typically are more immediate and somewhat more accurately known, benefits are much more difficult to measure and typically are spread out over a much longer time period. (Lancaster 1988 : 269)

Data provide indicators of quality, relevance, and cost-effectiveness but do not establish these characteristics beyond question. Data strengthen the probability that decisions that must be made will be the best possible decisions and that educational efforts will be credible. In effective journal collections management, judgment is always informed by consultation with the academic staff and other journal users.

Comparisons of print and electronic usage, that do not take into account the broader coverage and longer back-files of the print collection, can create the impression that print is still very much the dominant and preferred medium. When a study compares usage levels for an identical subset of information available in both formats, the results are likely to show more clearly the degree to which electronic usage is overtaking print usage. (Morse 2000 : 4)

Levels and patterns of usage are an important focus for monitoring and evaluation, and present no major conceptual difficulty, whereas the precise impact of the use of information in almost all circumstances is an unknown quantity. Indicators of benefits are available, such as estimates of time saved or the cost of alternatives. For an assessment of the impact of use of information on the quality of decisions and actions, the evaluator has to rely essentially on

users' perceptions of the functionality and usability of products and services provided. (Broadbent 1991 : 10) For the reasons outlined and taking into account the problem of measuring benefit and particularly measuring use accurately, this study provides a comparison of costs and benefits rather than a tighter cost-benefit analysis.

1.7 Definitions used in the study

For purposes of this study, the following definitions apply:

"**Aggregation**" is the packaging of contents of journals into a single product for electronic delivery to libraries and their users with the provision of searching across the whole collection and linking between all articles contained in the collection. (Dorn 2001 : 1)

"**Computer networking**" is the linking up of a group of computers electronically. (Sherman 2003 : 53)

"**Electronic-journal or e-journal**" is a publication that is available in digital format. (Ashcroft 1999 : 105) Characteristics that are essential to an e-journal:

1. The main content consists of original, scholarly research-based writings
2. Contributions should be peer-reviewed
3. Electronic networks must be utilised as primary distribution channels. Supplementary distribution through paper, microfiche or floppy disk.
4. It is intended to continue indefinitely

"**Free-access journals**" are journals that are available free-of-charge without access restrictions. (Ashcroft 1999 : 105)

"**Information superhighway**" is a term used to describe the Internet. (Sherman 2003 : 54)

"Journal bundling" refers to the practice of aggregating all titles produced by a publisher into a single product or subject based subsections. (Nabe 2001 : 1)

A '**Network**" is a group of computers that are connected to work together. (Sherman 2003 : 54)

"Network-based information services" are those electronic information resources that users access on-site in the library, from their offices, student LANs or home. Examples of network-based resources are library licensed databases like EbscoHost. (McClure 1999 : 1)

"**PDF**" refers to the formatting of articles in the "portable data format" read by Adobe® Acrobat®. This file format is designed to preserve the original look of a print document. (McGuire 2000 : 40)

"Peer-review" is a system whereby a piece of work is judged by researchers working in the same field for its intellectual content and/or practical relevance. (Sweeney 1997 : 4)

"Personal subscriptions" are defined as "those which are personally addressed to an individual at his/her home – including those obtained as a member of a professional society. (Tenopir 2002 : 2)

"**Printed edition**" refers to conventional journal editions published and distributed as paper copies, and "**online edition**" refers to journal editions available online (same as "e-journal"). (Ashcroft 1999 : 105)

"**Reading"** is defined as going beyond the title and abstract to the text of the article. (Tenopir 2002 : 2)

"**Scholarly communication**" is a social phenomenon whereby intellectual and creative activity is passed from one scholar to another. It mainly refers to research, writing and ideas produced at universities and colleges by faculty members. (McEldowney 1995 : 3; Milne 1999 : 1)

"**Serial**" is a publication in any medium issued in successive parts bearing numerical or chronological designations and intended to be continued indefinitely. Something popular or of a general nature is called a magazine, something scholarly is called a serial, journal or periodical. Journals are published to record research, document ideas, communicate findings, educate and assist in knowledge transfer and growth. (Degener 2000 : 5)

"**Web browser**" is a program or client software that retrieves information from the Web for a user and displays the formatted text. (Sherman 2003 : 54)

"**World Wide Web or WWW**" is a vast collection of text, graphics, sound and video files. It is a set of standards that enables documents to be shared easily over the Internet. (McGuire 2000 : 11; Sherman 2003 : 54)

1.8 Assumptions

The assumption of this research is that once the access to print or electronic journal is provided the user is likely to use it and benefit from that usage.

1.9 Methodology

Although a majority of surveys utilise a single data collection method, for this study a multi-pronged method was employed. Triangulation means that the data is gathered by comparison of the results of two or more methods. (Bailey 1987 : 263) Both qualitative and quantitative data was collected. The methods employed were a literature review, a review of documentary sources, an analysis of journal data, surveys by self-administered questionnaires and an interview with the Acting University Librarian, Ms Nora Buchanan.

The four research populations were the "population" of Science journals, the Acting University Librarian, Ms Nora Buchanan and the users of UND Libraries – postgraduate students and the academic staff. Postgraduate students are those students doing Postgraduate Diplomas, Masters degrees and Doctorates; and academic staff are those in the Faculty of Science, Durban.

Ms Nora Buchanan is the Acting University Librarian and is responsible for the materials budget and budget allocations to the Faculties on the Durban campus. She oversees the Technical Services Department which is responsible for acquiring and cataloguing the journals.

The journals studied are those titles that are subscribed to by the Faculty of Science. The journal titles fall into broad categories : Biology, Chemistry, Computer Science, Geography, Geology, Mathematics, Physics and Statistics. The annual subscription prices and the

percentage increase in the journals with their electronic counterparts during the academic year 2002 to 2003 were studied.

Journal data was obtained by various means. The costs of print and electronic journals according to the URICA Library acquisitions module were used. These costs indicated the definitive price paid by the Library for each subscription. The criteria for selecting the journals were : titles that were subscribed to by the Faculty of Science during the period studied. The present study concentrated on the most current Internet or online editions of journal titles. The bound journals were not considered for this study because these titles were not current but archival and consisted of back issues. A current journal subscription is a title that is subscribed to and received by the Library for the current year, in this case 2003. The total number of current journals held by UND Libraries as at the end of 2003 was 6733 current journals and approximately 320 electronic journals. Of these 223 were Science print journals and 30 were Science electronic journals.

1.10 Significance of the study

It is widely recognized that the journal is of great significance in the academic tenure process. (Hunter 1998, Keller 2001, Whalley 1997) Tenure, which is achieved by reward and recognition in academia, is essentially linked to the publication activity of scholars and the quality standard of journals. (Keller 2001 : 385) What does an academic want from a journal? They publish to gain other forms of recognition (such as promotion and tenure.(Academics communicate material – rapidly, accurately, widely, cheaply and also a format which can be preserved for posterity and provide a vehicle for discussion. Academic science researchers publish to establish their claim at a specific time to a specific result. They publish in order to have independent certification of the results and have these certified (refereed) results archived in perpetuity. Academics wish to publish in high quality journals for prestige. Reputation and status depend on publishing in good journals and further research funding and job promotion opportunities depend on this reputation. (Whalley 1997 : 2) Finally, they publish to communicate with those who may be interested in their work today but also for researchers in related fields, researchers in less well-connected institutions and students. (Hunter 1998 : 1) Therefore as long as journals remain the main indicator of quality control, scholars will be forced to publish in high-quality journals in order to enhance their careers and conduct and share their research.

The problem being experienced by UND Libraries is not unique. University of Natal, Pietermaritzburg (UNP) and other tertiary institutions are also experiencing similar, if not the same problem. In July 2002, for instance, the University of Natal appointed Dr N. Geslin (a researcher) to investigate the alternatives and challenges to the serials crisis. She investigated what special initiatives existed to address this problem. (Geslin 2002 : 1) Her post was funded by a special grant made available by the School of Applied Environmental Science, UNP. (University of Natal 2003b : 6)

In 2003, the Deputy Vice-Chancellor, Professor Salim Abdool Karim, to whom the Library (University Librarian) reports, advised the Library that the University would cover the shortfall for journal expenditure in 2003. This was an interim solution. Professor Karim was committed to finding ways to fund the library and therefore halted the journal cancellation process for budgetary reasons. (University of KwaZulu-Natal 2004b : 2)

1.11 Limitations and delimitations

The documentary sources used for this study were not written with a view to research. They were compiled for different audiences and reasons, like the Durban Library Committee minutes which reflected budgetary decisions taken. Therefore the financial data and records used for this study may contain institutional bias. The reports may be written in such a way as to safeguard the interests of the parent institution and fulfill some long or short term goals such as to support the efficiency of the institution or the need for more funds.

A second limitation of this study is that there are many problems with analyzing costs and benefits. Firstly the library is a not-for-profit organization and most CBA models rely on the use of the return or profit the product or service generates. Secondly, the benefits that arise from products or services in libraries are usually not quantifiable. How can 'value' of a piece of information be measured? How is it possible to put indicators like figures, time, convenience on such non-tangible benefits as user satisfaction or faster delivery of information? Moreover, measuring benefits is a problem for several other reasons. Accurately projecting benefits over a long time period also is difficult, if not impossible.

A delimitation of the study is that the costs of journals in the full-text databases such as EbscoHost are not included in this study. These databases are paid from a separate fund and cannot be factored into the subscription costs paid by the Faculty of Science.

1.12 Structure of the study

Having outlined the research problem and purpose and parameters of the study, the next chapter will provide the background to the study. The literature relevant to the study is reviewed in Chapter 3, the research methods used for the study are explained in Chapter 4 and the results of the survey and interview are described in Chapter 5. Interpretation of the results follows in the next chapter and the final chapter deals with the conclusions and recommendations. Appendices are situated after the list of works cited.

1.13 Summary of the chapter

In the introduction, the problem area with which the study concerns itself has been articulated and the purpose of the study, objectives, hypotheses, research questions were delineated. The justification for the study, the assumptions on which it is based and the limits and delimits have been described. Brief definitions of terms used in the study have been provided and the structure of the study briefly delineated. This chapter outlined what will be investigated, the focus, limits, the methods used and the next chapter is intended to give a context to the research and justification for the research.

Chapter Two : Background to the study

2.1 Introduction

Aspects of the environment in which the present study is situated are examined in this chapter in order to provide the context for the study.

In terms of their mission, the libraries of the University of Natal provided resources and information services to support the learning, teaching, research and development endeavours of the University community. The vision of the Libraries was : "in support of the University's strategy of quality with equity, the Libraries will have balanced collections and access to current information services to encourage excellence in learning, teaching and research, facilitated by innovative and resourceful library staff who are also dedicated to empowering learners to equip themselves for life-long learning". (University of Natal 2003b : 2)

The University of Natal had four main campuses, three in the greater Durban area (Howard College campus, Nelson R Mandela School of Health Sciences and Edgewood in Pinetown) and one in Pietermaritzburg. The Libraries of the University of Natal in Durban consisted of six libraries. the E G Malherbe Library (Main Library), and its three branch libraries on the Howard College campus, namely the Barrie Bierman Architecture Library, the Eleanor Bonnar Music Library, and the G M J Sweeney Law Library; the Edminson Education Library (Edgewood campus) and the Medical Library in Umbilo Road.

The Pietermaritzburg campus libraries consists of the Cecil Renaud Library (Main library) and the four branch libraries, namely the Alan Paton Centre, Law Library, Life Sciences Library and the University Archives.

The focus of this study was the E G Malherbe Library which will be referred to in the study as the EGM Library. This study will not focus on the Pietermaritzburg campus libraries, the Edminson Education Library or the Medical library. The present study will focus on the ex-University of Natal and its Libraries on the Durban campus which will be referred to as the UND Libraries.

2.2 University of KwaZulu-Natal

The University of KwaZulu-Natal was formed on 1 January 2004 as a result of a merger between the University of Durban-Westville and the University of Natal. The two KwaZulu-Natal universities were among the first batch of South African institutions to merge in 2004 in accordance with the government's higher educational restructuring plan which will eventually see the number of higher educational institutions in South Africa reduced from 36 to 21. The University of KwaZulu-Natal brings together the teaching and research strengths of two major tertiary institutions in the province. (University of KwaZulu-Natal. 2004a : 1)

The University of Durban-Westville was established in the 1960s as the University College for Indians on Salisbury Island in Durban Bay. With student numbers growing, in 1971 the College was granted University status. In 1972, the newly-named University of Durban-Westville moved to its modern campus in Westville. In 1984 it became an autonomous institution and admitted students of all races. (University of KwaZulu-Natal 2004 : 1)

The Natal University College was founded in 1910 in Pietermaritzburg. The University of Natal was granted independent University status in 1949 owing to its rapid growth in student numbers, its wide range of courses and its achievements and opportunities in research. The distinctive Howard College building was opened in Durban in 1931 and was followed by the establishment of the other buildings on the campus. In 1946, the government approved the Faculty of Agriculture in Pietermaritzburg and, in 1947, the Medical School was opened in Umbilo Road and at that time admitted Indian, African and Coloured students. (University of KwaZulu-Natal 2004 : 1)

2.3 University of Natal, Durban Libraries

The Library was started in 1931 when the Engineering Department of Natal University College was established in the newly built Howard College. This was the nucleus of the Durban campus and its new campus library. The UND Library took fifty years to reach nearly 200 000 journal volumes and then only twenty more to double its holdings. (University of Natal 2003c : 2)

2.3.1 E G Malherbe Library or Main Library

The Main Library, which changed its location a number of times, was finally named the E G Malherbe Library when it occupied its own building in 1987. It was named after the university principal who guided the University to full University status in 1949, and supports the learning, teaching and research needs of staff and students of the Faculties of Community and Development Disciplines, Engineering, Human Sciences, Management Studies and Science. It was the administrative centre of the UND library system. (University of Natal 2003c : 2)

The collection consists of 448 863 volumes (consisting of books, journals and other items), ranging from a collection of medieval manuscripts to access to full-text databases through the World Wide Web. Special collections include a collection of first editions of important early scientific and engineering books, an African studies collection focusing on local content, an important audio-visual collection supporting the teaching programmes, and a collection of South African art works some of which were commissioned for the building. (University of Natal 2003c : 2)

2.3.2 Barrie Bierman Architecture Library

This library was established in 1969 and was named after an influential lecturer and architect. The library is located in the Shepstone Building and serves the needs of the staff and students of the School of Architecture, Planning and Housing. The collection consists of 33 117 volumes of book, journals, plans, models, and rare early architectural books. Housed in the Architecture Library is a Technical reference library of trade literature, ephemera, drawings, including local drawings of historical value and slides. (University of Natal 2003c : 2)

2.3.3 Edminson Library

The library on the Edgewood campus in Pinetown specializes in serving the needs of students and staff in the Faculty of Education. The library dates from 1971, when Edgewood College of Education was founded; the present library building was opened in 1980 and named after Eric Edminson, Edgewood's first rector. In 2001, when the College

was incorporated into the University of Natal, the Library became part of UND Libraries. The collection consists of 73 421 items. Its collections of books and journals are excellent, but its special strength lies in its audio-visual collections : audio- and videotapes, CD-ROM's, charts, models, illustrations, teaching packs, slides and transparencies which support foundation, primary and high-school programmes. The Library also serves the postgraduate students in the Faculty of Education. (University of Natal 2003c : 2)

2.3.4 Eleanor Bonnar Music Library

This library is unique to the Province. It was established in 1972 and is named after the donor of the core collection. It is one of the largest music libraries in Africa and one of the finest in the southern Hemisphere. The library serves the Music programme in the Faculty of Human Sciences and the provincial orchestra, and is housed in the School of Music. The collection consists of 33 608 items, and covers a wide range of cultures. The Music Library houses books, journals, scores (including a valuable collection of historical sets and complete editions), microfilms, tapes, long playing records, compact discs, CD-ROMs and video cassettes. Of special interest are five collections : a rare archival collection of black South African popular music, the Malcolm Hunter Collection of recordings of early jazz and swing from 1895-1980, the Wilf Lowe Collection of bebop and post-World War 2 styles, a large ethnographic record collection and a valuable opera collection. (University of Natal 2003c : 2)

2.3.5 G M J Sweeney Library

This library was established in 1972 and was named after a distinguished professor of Law. It is located in the historic Howard College Building and serves the needs of the staff and students of the Faculty of Law, as well as the legal fraternity of greater Durban. The collection consists of 35 189 volumes of books, journals, and law reports, including good collections of early law books and environmental law. (University of Natal 2003c : 2)

2.3.6 Medical Library and Doris Duke Medical Research Institute

The Medical Library was established in 1951 as part of the new Medical School with a donation of books from the Medical Association of South Africa (MASA). It is located in the

Nelson R Mandela School of Health Sciences in Umbilo Road, and serves the needs of the medical students, staff and associated members of the medical and related professions. The collections consists of 75 762 volumes of books and journals. Access to full-text electronic resources is available, including a teaching database which supports problem-based learning. Undergraduate and postgraduate computer laboratories and a skills practice laboratory form an integral part of the library, unique in the province of KwaZulu-Natal. (University of Natal 2003c : 2)

The Doris Duke Medical Research Institute is a state-of-the-art research facility at the Nelson R Mandela School of Health Sciences. This research facility was officially opened on 29 July 2003. The Institute provides the infrastructure for strategic research and focuses on diseases affecting the poor and vulnerable in South Africa The project received funding from the Doris Duke Charitable Foundation and in addition, (Pfizer) SA, the 13th World Aids Conference Trust, the governments of Flanders and Japan, the Victor Daitz Foundation, Investec Securities and the Stella and Paul Lowenstein Trust. The University has invested R6.5 million in the project. The Research Institute has its own information centre (library) which is managed by the staff of the Medical Library. (University of Natal 2003a : 1)

2.4 Facilities and services

The UND Libraries provide a wide variety of information products and services such as information services, interlibrary loans, user education, literature searches, alerting services, circulation, technical services and so on. The libraries are open to the local community and to visitors for reference purposes. Visitors and postgraduate students from other tertiary institutions may apply for membership, which entitles them to borrowing privileges, while individuals and firms in industry and commerce are catered for by the Gateway Information Service (GIS). The function of GIS is to make available to individuals and firms involved in industry and commerce in KwaZulu-Natal the business, scientific and technical information resources of the University of KwaZulu-Natal through the existing library infrastructure The Library employs a staff of eighty eight, twenty one professional staff members, sixty support staff and seven bindery staff members.

The library currently holds 184 000 bound journals and subscribes to approximately 3 200 current periodicals. While most of UND Library services are provided free-of-charge, a number of value-added services are fee-based.

The technologies used at UND Libraries are the Sun 20 SparcServer with 512 MB of memory and 18.2 GB disk space. This server was purchased in September 2001 and the library's database (URICA) was moved from the old SunSparc 20. The server is housed in the computer room in the E G Malherbe Library. The first computer terminals were introduced into UND Libraries in 1984 when the card catalogue was closed and the first personal computers (PCs) in 1987.

The library uses the URICA software package. The Library is changing the system to a new integrated library system – Sirsi (Unicorn) but URICA was the system in use at the time of the study. The URICA catalogue offers access to more than five million library items encompassing a spectrum of library material including law, medical and special collections. The URICA catalogue is also available to outside users through the Internet – the WebOPAC. In addition to the URICA catalogue users can access electronic research databases including a variety of full-text resources. However access to the databases is restricted to UND users. There are about 70 databases covering many academic areas at varying levels. Some are citation indexes. UND's electronic full-text resources include online encyclopedias, dictionaries, handbooks and journal articles.

In 1997 the Library introduced its own home page with links to the UND Library catalogue, a number of other South African library catalogues, the Library of Congress gateway and various other useful links. The UND Libraries home page represents a new and useful way of integrating the delivery of library services. It allows the library to collect in one place (albeit virtual) all aspects of the service offered.

In 1998 electronic versions of the UND Libraries *Newsletter* and the New Acquisitions listings were also developed and posted on the home page. In 2000 the Home Page Working Group designed an updated version. It has been expanded to incorporate online tutorials in certain subjects and numerous useful links to electronic databases and reference works. A notable new feature on the home page is the Electronic Journal page with an A-Z

listing of available titles, a subject list of titles and a list of titles by journal publisher or vendor.

The access points for users in the Library are the Audio-Visual Room which houses five stand-alone personal computers (PCs) and four PCs on the ground floor of the Library. These PCs have Internet access and CD-ROM drives. They are used to access the Library catalogue, the Library Home page as well as other Library resources such as databases, e-journals, and e-books. (University of Natal 2002a : 4)

2.5 The budget

The University's total budget for 2003 was R 719 080.0 million and 3.4 percent was allocated to the Library. The total budget for the Library for the 2003 year was R 15 490 000. (University of KwaZulu-Natal 2004b : 1)

2.5.1 The Library budget

Previously the libraries were funded under a different formula. The allocation was incremental, whereby the library received about three percent more than the previous year. Currently the policy of the new University is to top slice 3.4 percent of the University budget for the Library. This amount is then divided between the Durban (including Medical and Edgewood) and the Pietermaritzburg centres in the ratio of 63:37. (Walker 2003 : 4)

The Library budget is further divided between the Materials budget , Supplies and Services, and Furniture and Equipment. The Supplies and Services budget covers the running expenses of the Library, such as operating expenses, photocopy costs, small building repairs, licences to URICA and so on. The Pietermaritzburg and Durban libraries then allocate the resources from the Materials budget between Faculties on the basis of formulae. Within Faculties the amount is divided between books and journals for each School in a variety of ways. (University of Natal Annual Report 2003b : 5)

2.5.1.1 The funding formula

The distribution of the Materials budget by UND Libraries took place in accordance with the Mulholland formula. The formula was devised by Professor M.M. Mulholland of the Faculty of Engineering to determine the distribution of funds between the Faculties. It is based firstly upon the collation of a large amount of statistical data and the identification and definition from these of certain key parameters. It takes into consideration the following: total journal cost, research output, research staff numbers, academic staff numbers, student numbers, average book price, average journal price, and faculty income. All quantities are expressed as a percentage. (Hey 2000 : 3)

A component of the government's subsidy to Universities is a subsidy for Library purchase of books and journals. The subsidy was six percent in 2002 and 2003, which increased sharply from the four percent in 2000. The Department of Education made allowances for the increase in costs of Library materials. But the University income that was allocated to the Library was two percent in 2002 and three percent in 2003. This figure was calculated with respect to actual university income rather than budgeted income. In 2003 the books and journal allocation to the library was 3.4% of the budgeted income. (Walker 2003 : 12) The Faculty of Science was allocated 21.5% of the Library Materials budget for 2003 according to the Mulholland formula. The formulae used in Durban and Pietermaritzburg are different but produce similar effects. (Hey 2000 : 3)

Before the allocations are made an amount is first top sliced for general reference, electronic databases and customs charges. Thereafter the balance of the Library allocation is divided between the Faculties, according to the Mulholland formula. An estimated amount for journal subscriptions for each Faculty is first top sliced off each Faculty's materials allocation. Negotiations then commence with the Faculties as to how their book allocations are to be spent. The Materials budget has to be approved by the Durban Library Advisory Committee. The University Librarian advises the Library representative of each Faculty of their share of the budget. Throughout the year, the Acquisitions department provides the subject librarians with the expenditure statements or month-ends for book purchases.

The total amount of the Library grant for 2003 was R 15 490 000. This was made up of R 14 102 000 (10% standard increase) and R1 388 000 Natal University Development Foundation (NUDF) bridging funds. The amount available for distribution was R 14 102 000. The general and reference materials budget of R 1 500 000 was deducted from the grant, leaving a balance of R 12 602 000 to be distributed between the various Faculties. The amount allocated to Science was R 2 709 430.00 for the period 2003, 21.5% of the total amount for distribution. Ten percent of this allocation was top-sliced for books (R 270 943) leaving the journal allocation at R 2 438 487.00.

The estimated cost of the journals for 2003 was R 3 258 264. This meant that, in effect, the Faculty of Science would be overspent by R 548 834 for 2003 (University of Natal 2003b : 5).

2.5.1.2 How and when journals are paid for

The Library budget is only physically awarded to the Library between April to May of each year, but the library pays for the journals in advance, in October to November of each year. The journals received in 2004 were paid for in October 2003, from the 2003 April budget. Likewise the journals received in 2003 were paid in October 2002, from the 2002 budget. So the current subscriptions refer to journals that will be received in the following year.

The estimated cost of the journals for 2003 was R 3 258 264. This figure was arrived at by taking the amount paid for the 2002 journal subscriptions, and adding 18 percent for inflation and other charges. As the Faculty of Science would be overspent for the period of 2003, as noted in section 2.5.1.1, Professor Karim, to whom the Library (University Librarian) reported, advised the Library that the University would cover the shortfall for the journal expenditure for 2003. This was reflected in the Budget as the NUDF funding. Professor Karim indicated that his office was committed to find ways to fund the libraries and had therefore halted any process of journal cancellations for budgetary reasons. (Karim 2003 : 1)

As a result of Professor Karim's intervention, in 2003, the Faculty of Science was given the opportunity to examine its journal subscriptions, cancel those titles not required and re-instate or take out new subscriptions for the titles required. The year 2003 was an

exceptional year for the Library journal cancellation procedure. But in 2002, the Faculty of Science received an allocation of R 2 226 756 and (theoretically) spent R 2 833 273 on journals. It was overspent by R 606 517.00. The library was therefore forced to cancel titles to this value at the end of 2002 for budgetary reasons.

2.6 Faculty of Science

The Faculty of Science covers a wide range of the sciences and their applications, and has pioneered in offering scope both for discipline-based specialisation and for broader interdisciplinary studies. Research plays a vital role in the Faculty, and many of the academics have considerable international recognition as researchers. Students and their supervisors carry out fieldwork in distant locations such as the Antarctica.

The Faculty of Science in Durban has 1510 students : 1192 undergraduates, 318 postgraduates. It has 120 academic staff members. The Durban campus (as at 30 June 2003) had a total of 18 199 students, of which 12 287 are undergraduate students, 5912 postgraduate students. Science students form eight percent of the total student population. (University of Natal 2003d : 1)

The Faculty consists of five Schools:

- School of Geological and Computer Sciences (incorporates the discipline of Geology and Computer Science)
- School of Life and Environmental Sciences which encompasses the disciplines of Biology, Geography and Environmental Sciences.
- School of Mathematical and Statistical Sciences which includes the disciplines of Mathematics, Applied Mathematics, Actuarial Science and Statistics
- School of Pure and Applied Chemistry
- School of Pure and Applied Physics

2.7 The Internet

The personal computer was invented in the second half of the twentieth century and the Internet followed in its wake with the successful laying of the undersea transatlantic cables in 1866. The cables were, in fact, designed to allow telegraph signals to travel from

continent to continent but the success of the transatlantic cables showed that it was possible to link up to continents to allow immediate communication between them. (Sherman 2003 : 7)

The Internet came about because of the rivalry between the United States (US) and the Union of Soviet Socialist Republics (USSR). The rivalry remained intense from the late 1940s through the early 1990s. From the beginning of the Cold War, an idea had been proposed on and off by the US military to create some sort of electronic network. The military wanted a network that could electronically link up United States military computers in case a Soviet attack knocked out ordinary means of communication. Until the end of the 1950's, there did not seem any real urgency about getting such a network up and running. (Sherman 2003 : 8)

Then, in 1957, the Soviets launched the first artificial satellite, Sputnik 1, and everything changed. The US was stunned. No one had dreamed that the Soviet Union was so technologically advanced. (Sherman 2003 : 8) In 1954, President Dwight Eisenhower had commissioned the Department of Defence to create the Advanced Research Projects Agency – (ARPA). The parent agency, Defence Advanced Research Projects Agency, or DARPA, still exists, and is the main research and development branch of the Department of Defense. ARPA's original mission was to design the first electronic network. Dr J.C.R. Licklider of the Massachusetts Institute of Technology (MIT) was chosen to run ARPA. He had the idea for what he called the "Galactic Network". This would be a linked set of computers around the world through which anyone with a computer could quickly access information. (Sherman 2003 : 9)

In late 1966, a MIT scholar, Lawrence Roberts, joined the ARPA team to help develop the concept of a computer network. This network was officially christened ARPANET. ARPANET quickly outgrew the initial idea of a strictly military network. The scientists at ARPA thought that it would become far more useful if some universities were added to the network so that the best scientific minds could help the military. Universities were among the few institutions which could afford computers at the time.

By 1971, nineteen universities and other organizations, including the National Aeronautics and Space Administration (NASA) were added to ARPANET. A small number of university

students soon discovered ARPANET. They could send messages back and forth to each other and even friends at other universities. The students and a few academics turned ARPANET from its original purpose into a high speed electronic postal system. The electronic mail (e-mail) revolution had begun. Everyone with access to ARPANET was sending messages back and forth. (Sherman 2003 : 18)

ARPANET continued to grow with amazing speed. However, there were still problems to be worked out. Every computer system had to use the right protocol, or network communications program, if they were all to stay connected. Changes continued to come. In the 1970s a system called Telnet appeared. This was a new and more efficient way of connecting to computers on ARPANET. Telnet was originally intended to be a library system. It was designed to allow easy access to information from libraries around the country and, later from around the world. But since it was designed so that it could be used by almost all systems, Telnet became an excellent way to access information on the general ARPANET.

By 1981, ARPANET had grown to more than 213 hosts with a new one added every twenty days. And a whole new language was springing up around it. No one knows exactly who first invented or used the word “Internet”. No one was even using the word ARPANET anymore when it was officially decommissioned in 1990 and the true Internet was born. (Sherman 2003 : 32)

The modern Internet is an extensive system of interlinked yet independent computer networks. In less than two decades, it has evolved from a highly specialized communications network used mostly for military and academic purposes into a massive electronic bazaar. (McGuire 2000 : 3)

By the late 1990s, the Internet obtained an organizer, the World Wide Web. An official description defines the Web as “a wide-area hypermedia information retrieval initiative aiming to give universal access to a large universe of documents.” (McGuire 2000 : 9) The World Wide Web is a vast collection of text, graphics, sound and increasingly video files.

Among the millions of Web pages you will find up-to-the-minute news stories, online museum exhibits, art gallery displays, government information and services, distance

learning courses, electronic databases and online banking, to name just a few possibilities. Special computer languages, such as Hyper Text Markup Language, or HTML is used to create Websites. HTML allows anyone who knew the codes to design a Website and create the Web-content, the words on the site. (Sherman 2003 : 35) By the beginning of the new millennium, the Internet had become a familiar word to practically everyone in the world.

To access to the World Wide Web, a computer user needs a Web browser, a program that retrieves from the Web the information requested by the user, typically in the form of an HTML document. It then interprets the HTML tags and displays the formatted text. Netscape Navigator and Internet Explorer are the two most popular Web browsers in use. (Sherman 2003 : 47) With this software you can view the material on the Web by pointing the cursor and clicking your mouse button. The Web browser can also be used as a communications tool, for example, to send electronic mail or to participate in online discussions. (Mcguire 2000 : 10)

2.8 The scholarly journal

The leading role of journals among scholarly publications is well established. A journal article is generally the first report of new research findings, which is permanent, indexed and widely available. Journal publishing is the most expensive mode found in the published literature and represents the greatest amount of resources, in terms of value, currency of information and is a primary method of communication. (Zahray 1990 : 2) The journal is fundamental to formal scholarly communication. Journals have long been a major vehicle for formal scholarly communication, by serving as the primary means of establishing priority and authority in a field and providing an archival record. Print journals that serve this function successfully have been stable in form and content for a long period of time, although the continued viability of this format has been questioned for almost as long, particularly in terms of timeliness, quality, accessibility and cost. (DeFelice 2001 : 1) Journals do not compete on price, since that is not what determines their success. There are four principal group of players. The first consists of scholars as producers of the information that makes journals valuable. The second consists of scholars as users of that information. However, as users, they gain access to journals primarily through the third group – the library. The library purchases journals from the fourth group – the publishers, usually in response to requests from scholars. These requests are based overwhelmingly

on the perceived quality of the journal and price seldom plays a role. The budgets for libraries come from different sources than the budgets for academic departments. (Odlyzko 1997 : 9)

Scholars as writers determine what journals their work will appear in, and thus how much it will cost to publish their work. Most authors write not for profit but to make their research and ideas more widely known. (Cornish 1999 : 34) What matters most is the prestige of the journals they publish in. No matter how small their circulation, since prestige is what counts in tenure and promotion decisions, contributions will still be sent to only a certain small group of well-respected journals. In book publishing, royalties align the authors' interests with those of publishers, as both wish to maximize revenues. In journal publishing, this is not the case. (Odlyzko 1997 : 10)

Electronic journals, developed as alternatives, supplements or replicas of print journals, have the potential to fundamentally change scholarly communication by offering an interactive environment, rapid dissemination, access to large data sets and the ability to manipulate data, as well as other features. The Internet and electronic publishing developments provide an opportunity for publishers to re-think how they 'package' and disseminate scholarly information. (Prior 2001 : 1)

Scholarly journals have several functions. They communicate research findings thus avoiding repetition of expensive research work. They establish priority for these findings as indicated by submission, revision and acceptance dates on published papers. They filter high quality research papers from the mass through a process of peer review. Finally, they represent a record of all quality research in a specific field. (Halliday 2001 : 261)

2.9 The electronic journal

In 1994/95, with the development of the Web, the emergence of full-text electronic journals really began, with publishers such as the Institute of Physics and Chapman and Hall being the pioneers in the area. Judged in the wake of the phenomenal growth of the World Wide Web and in relation to the number of print-based scholarly journals, the number of scholarly science journals available electronically is significant. Now all leading science, technology and medical (STM) publishers offer Internet-based electronic journals and it is estimated

that there are some 12 000 peer-reviewed electronic titles available on the Web. (Prior 2001 : 64)

Whilst electronic journals offer a whole range of benefits for users, such as desktop delivery and multiple access, their arrival presents new challenges for libraries in terms of access and management. It is often necessary for libraries to work with each individual publisher to arrange access – obtaining and distributing passwords, handling registration and licence agreements and so on. (Prior 2001 : 64)

Print journals in the field of science tend to be among the most expensive of all scholarly journals and therefore would seem to have the most to gain from the cost reductions that electronic publishing could achieve. STM journals contain specialised terminology, they frequently include detailed mathematics and often have complex artwork and tabular data, and so are usually regarded as the most difficult journals to produce, in any form. (Hitchcock 2001 : 3) This move from print to online represents savings in paper, printing and postage for the publisher. The savings are not passed on to the customer – the library. (Van Orsdel 2003 : 54) Print scholarly journals have the defining feature that they report full and novel research results, are supported by literature references and are subjected to rigorous peer review. Electronic journals can be differentiated according to delivery formats. The three formats for electronic publication are online, CD-ROM and networked. Online refers to those available over the Internet, invariably through the World Wide Web. Electronic journals offer opportunities to broaden the nature and functionality of the journal, for example through links to related information, the inclusion of multimedia features and so on. (Prior 1999 : 1)

Fisher points out that from 1989 there has been a growing demand for e-journals first from librarians, then from researchers. Journals in this new form are expected to improve the speed of communication of research and enhance informal discussion. If scholarly e-journals are to disseminate the highest quality research, they must have many of the same qualities required of print journals in order to be accepted by other researchers : good organisation and presentation of content, peer-review, inclusion in indexing and abstracting services consulted by researchers in the field, and a reputable editor and editorial board. Without these, e-journals will remain out of the mainstream of scholarly research. Because of their method of dissemination, e-journals distributed online have some additional

requirements that do not exist for print journals. The scholarly journal must be able to ensure the authenticity of the article's text and long-term availability and accessibility of the materials (archiving), which has traditionally been the responsibility of libraries. (Fisher 2000 : 235)

STM journals come from three main sources : commercial publishers, learned societies which are themselves invariably highly commercial, if non-profit, organisations and other research institutions. These three sources are fairly evenly represented as producers of electronic journals, with the commercial publishers producing, by a small margin, most titles. (Hitchcock 2001 : 3)

2.10 Summary of the chapter

In this chapter, background information that provides the context for the study has been provided including significant information on the library budget and the funding formula. The current financial situation with the journals at UND Libraries have given rise to this research study. The libraries' current knowledge of certain journal issues is inadequate.

Journal literature constitutes a major part of the library collection and typically accounts for more than half of expenditure on library materials. There are a number of complexities in journal budgeting and financial control. This is compounded by the fact that journals are paid for well in advance of publication because the library pays for one year's issues towards the end of the preceding year. Budget formulation takes place even earlier.

By the late 1980s the Internet was born whereby anyone with a computer could quickly access information and universities were some of the few places that had computers. The Internet evolved from a highly specialized communication network into a massive electronic bazaar.

The journal is fundamental to formal scholarly communication. Most authors contribute to these journals not for gain but to make their research and ideas known. These journals have several functions and with the development of the Internet, the emergence of the full-text electronic journal began.

Chapter Three: Literature review

3.1 Introduction

Many libraries are finding themselves faced with the difficult decision of whether or not to cancel print journal subscriptions for titles that they also receive electronically. The cost of acquiring both formats of the same title is often the driving factor behind this decision. Reflecting upon the short history and fast development of electronic journals (e-journals), there is no doubt that e-journals open up many exciting service opportunities for university libraries. However, e-journals bring issues with them which merit careful consideration as they are complex, interdependent and have considerable consequences.

This technology possesses both advantages and disadvantages. Over the last ten years, serial review and cancellation strategies have occupied a prominent place in library literature. Not surprisingly, although the impetus for most cancellation projects is a combination of reduced growth in funding and increasing periodical subscription costs, the consensus is that there is no monetary solution to the problem. Even if funding increases it will likely never match increases in costs, because journal prices have risen so dramatically in the last few years, as much as 215%. Consequently, the emphasis is now on redesigning and restructuring serial collections. The widespread and increasing availability of full-text serials has added a new twist to the process. (Frazer 1999: 1)

There is a large and growing amount of literature on electronic publishing and even more specific subtopic of electronic scholarly journals. Most of this is recent, having being written in the last five to seven years. While the literature covers a wide range of topics such as how to start an e-journal, pricing and cost, cataloguing, and the relationship between print and e-journals, hardly any of the literature consists of reports on research studies or surveys on e-scholarly journals. Much has been written on e-journals and even on the selection of electronic resources for a library collection, but little has been written on reducing duplication between print and electronic formats of journals and the factors libraries should consider when making these decisions. (Rupp-Serrano 2002 : 370)

As a literature review, this chapter identifies various trends and issues surrounding electronic journals. A major survey of the literature on this topic is needed, as over 250 new publications have appeared in the last year. (Veldsman 2004 : 2) Much of the research about e-journals has been driven by technology rather than being led by demand. Another peculiarity is that it is being driven almost entirely by its authors rather than its readers. (Woodward 1997 : 144) A significant proportion of the recent literature has concentrated on the views of authors and the scholarly community in general and has emphasized the scholar's role as author. Librarians' concerns have focused on the difficulties of providing access to e-journals for users, and archiving them for future access. The views of journal users have been accorded comparatively little attention. (Woodward 1997 : 144)

A survey of the South African literature reveals that no local studies have been done on comparison of costs and benefits of journal collections, both print and electronic. Presently there is no published research on cost-benefit studies of a journal collection. As stated in section 1.10 Dr Nicole Geslin, a researcher at the University, undertook a study on the alternatives and challenges to commercial journal publishing. She investigated the acquisition of scholarly resources (journals) at the University of Natal libraries. Her investigations are in-house and not yet published. She looked into the University of Natal library budgets and past and current measures to try to cope with the journal crisis and so on and has also established contact with the six South African library consortia. (Geslin 2002 : 10) Her investigation focused on the current situation and possible measures to overcome its problems, but is not a cost benefit study.

A study of the relevant international literature also indicates that there were no comparable studies on journal analysis, to the one the researcher intends doing. The literature on comparative studies has covered other areas but nothing has been done on journal collections, print or electronic. Most work has concentrated on three topics : technical or technological developments; the conversion from print only to a dual format; and an examination of input and handling requirements. User studies have necessarily lagged behind, since they could not readily be carried out until e-journals became more generally available. Much of the early research in this area simulated real usage to the extent that it was possible to do so. (Woodward 1998 : 2)

A review of the literature specifically on the measurement of e-journal collections yielded very little. The literature has focused on evolving standards for e-journal statistics rather than on their applications. Instead of responding to the need for data to create effective metrics for assessing titles or collections, existing standards for e-journal statistics appear strongly derivative of database statistics. Without this information on e-content, measures of value of e-journals become difficult to create because the context needed to understand the available data is missing. Some currently available e-journal usage statistics illustrate new possibilities for assessing relative value and suggest how a broad set of usage statstics could be useful for collection management. (Hahn 2002 : 217) A recent development has been the Association of Research Libraries (ARL) E-metrics project launched in June 2000 to determine how to develop statistics and performance measures for e-journals. (Degener 2000 : 5)

A number of studies have looked at the options for accessing e-journals and various access-related issues. (Blagden 1998; Brin 1994; Cain 1995; Evan 1996; Gossen 1995; Hawbaker 1996; Kane 1997). Cost benefit studies in librarianship have focused on library services and not products. More attempts at cost benefit analysis have been applied to industrial libraries than to libraries of other kinds. (White 1998 : 503)

The literature covers the various approaches to measuring the benefits of an information service and the attempts made by libraries to justify the existence of their services by doing a cost-benefit analysis. The different services provided by a library compete with each other for limited funds. The question of whether it is better for the library to provide the service through an in-house library or in some other way is presently under consideration. (Lancaster 1988 : 157) A similar approach could be to make a comparison between the cost of the librarian providing some service and the cost of the librarian's customers undertaking the activity for themselves. In order to calculate the cost of a library service, all components of the cost must be identified.

Various studies have concentrated on costs such as personnel, materials consumed, equipment use, space occupied, leasing of databases and purchase and maintenance of collections. (Kingma 1996, 1998; Kingma and Mouravieva 2000) Some studies have looked at the true cost-effectiveness of journals. Varian (1996) investigated the pricing of journals.

He suggested that a possible solution was to use differential pricing by packaging the products in two different forms to meet each market. Halliday (2000) on the other hand developed three models based on a literature review and on personal communication with practitioners. The results of that study indicated that journals can be produced and distributed at a modest fee as long as the subscriber base is greater than 500.

Other cost studies of journals have focused on cost per use, or interlibrary loans. (Blagden 1998 : 141; Evans 1996; Halliday 2001; Kidd 1998; Milne 1991) These cost studies have compared the cost of subscribing to a journal compared to the cost of canceling a subscription in favour of interlibrary loans or cost-per-use. These studies have tried to determine which titles could be acquired more economically through interlibrary loans or document delivery rather than by journal subscriptions or as an alternative to maintaining subscriptions. With e-journals, using interlibrary loans is only an option in a limited number of cases.

Among the first to devise a formula to determine cost-per-use using data from a serial survey, Milne and Tiffany (1991) introduced the tagging method as a way to track serial use. For each journal title, a paper tag was affixed to the front cover of every bound and unbound volume that had a publication date within five years of the beginning of the date of the survey. Gossen and Irving (1995) described a periodical use study and compared their derived cost-per-use to the Association for Research Libraries/ Research Libraries Group (ARL/RLG) figure for an interlibrary loan. Kingma (1996, 1998; Kingma and Mouravieva 2000) offered a detailed examination of the costs and benefits of maintaining journal subscriptions compared with acquiring articles from an external source. Others have looked at the cost of subsidized document delivery compared to the cost of maintaining journal subscriptions. These studies have found that it was more cost-effective to use document delivery for high cost low use journals than maintain journal subscriptions. Most of these studies have concluded that each library would have to carry out its own evaluation because what may be cost-effective in one library may not be cost-effective in another library. (Blagden 1998; 141; Evans 1996; Halliday 2001; Kidd 1998)

These studies have focused on an analysis of library services such as document delivery, literature searches, or the development of new products or the identification of ways to reduce

costs of existing products but not an analysis of electronic journals or print journals. (Lancaster 1988 : 157)

Very few analyses of the cost-effectiveness of participation in network or consortium or resource sharing have been published. (Brin 1994 : 209) In the opinion of this author, no completely credible or definitive cost-benefit studies have been applied to university libraries. Several surveys give a valuable analysis of the developments in scholarly communication. (Cargille 1999; McCabe 1997; Milne 1999; Kent 1999; Keller 2001; Oppenheim 2000; Sosteric 1996). However, none of these studies focused exclusively on scholarly journals. The place of the e-journal in the electronic future is hotly debated. Much of this debate is not new and has little to do with the issue of print versus electronic access. The continuing rise of journal prices has perhaps become the biggest factor driving the demands for change. Explanations for these rises in prices vary, and have been a source of much dispute. (Mobley 1998 : 5) There are many predictions on how far-reaching e-journals can be.

3.2 Theoretical framework

A collection of assumptions, definitions and propositions which explains a group of observed facts or phenomena in a field or discipline is known as theory. (Busha & Harter 1980 : 13) Ideally, all elements of a theory are logically interrelated, involving both inductive and deductive reasoning processes. Although insight and intuition can be used in the development of a body of theoretical knowledge, scientific theories are based primarily upon partially verified data, or those that are subject to verification. From a body of the theory, various hypotheses can be deduced, based upon expected relationships between particular variables. (Busha & Harter 1980 : 13-14)

Complete bodies of theory do not exist in many areas of social and behavioural sciences. When a researcher is cognisant of the theoretical implications of a study, more pertinent and potentially significant research questions are likely to be posed. On the basis of appropriate theory, researchers are inclined to pose exacting hypotheses at a level of abstraction permitted by the theory. Thus, theory can serve as a guide to the form, range and clarity of

hypothesis formulation. Theoretical knowledge often provides scholars with standards for weighing the validity of their research findings. (Busha & Harter 1980 : 17)

Theory plays a crucial role in research. Theory helps to make research more productive in that it organizes a number of "unassorted facts, laws, concepts, constructs and principles into a meaningful and manageable form." (Powell 1997 : 25) Theory can explain a group of phenomena, suggest relationships between facts, structure concepts, organize facts into a meaningful pattern and provide logical explanations for facts. If certain facts or variables appear to be causally related, theory can help to explain the nature of the relationship. Sound theoretical knowledge of the problem area from which the research task originated is necessary to conduct a meaningful inquiry. A thorough familiarity with the current literature relevant to the facets of a problem to be investigated can help research workers compile a list of important issues, theories or questions that can then be categorized and utilized according to their value in the frame of reference of a particular inquiry. (Busha & Harter 1980: 17)

It has been observed, and previous research has indicated, that certain facts are related to electronic journals. The main purchasers of scientific journals have been universities. For at least a decade, the price of scientific journals has been escalating above the levels of inflation. There appears to be no relationship between production costs and subscription prices of scholarly journals. Journals are priced according to what the market is estimated to bear, but at the same time, the market is inelastic. (Cornish 1999 : 33) As a result, prices have consistently increased annually at a rate well above the general inflation rate for the last two decades.

As Cornish (1999 : 34) points out the publishers were in an enviable position, as journals are not substitutable. Scientists need to be able to publish in what they consider to be the leading titles in their field, and to be able to read these titles at their desks. The library is a crucial element in the publishing industry as such. It is an arguable fact that publishers publish for profit; the basis for the activities of the industry is to make the creativity of authors more widely known to the public. (Halliday 2001 : 260) But authors on the other hand write not for profit but to disseminate their research and make their ideas more widely known. Both these groups cannot reach all potential readers of any work and need intermediaries. The library provides the interface between the publisher and the public. Publishers cannot hope to

reach every potential outlet for their products because they do not have direct contact with the necessary groups to achieve this. Publishers are also limited in what they can provide in terms of a repertoire, which will normally be limited to their own products or those of associated companies. Libraries, however can, and do, reach a wide audience as they have direct access to a very broadly based user community. They can also offer a much wider range of products than the publisher or even other intermediaries (booksellers, publishing agents and database hosts) as they are not motivated primarily by financial incentives, although they may need to limit the range of resources because of financial constraints. (Cornish 1999 : 35)

Odlyzko (2001 : 9) maintains that the inertia of the scholarly community is partly to blame for the journal crisis. Scholars do not see themselves in any way responsible for the situation. They have no incentives not to publish in the high-priced prestigious journals. From their perspective, they provide research findings freely to journals and expect their libraries to enable them to read other research findings just as freely.

Naturally, libraries, as major resources of information, and valuing their unique role to reach so many users, want and need to be able to exploit new possibilities. However, budgets have not been rising at the same rate as journal prices. The result was that by the mid-1990s libraries had to make some hard decisions about journal cancellations. If they are no longer going to rely on a print-based industry, the alternative will be to use materials in electronic formats of many kinds.

Publishers are required to make very large investments in new technologies in order to remain competitive. For publishers, electronic delivery is a way of differentiating their titles from those of other publishers by providing innovative ways of searching and displaying each paper. As a result, each publisher has developed his or her own user interface. The groups of companies in the middle of this are the subscription agents who have provided a valuable service in providing a commercial interface between librarians and publishers. In the electronic world, the subscription agents have now started to provide integration services, providing libraries with a consistent interface to a wide range of different publishers. All these parties are strongly affected by changes in the area of scholarly publishing. (Keller 2001 : 388)

There are a great number of publications dealing with the future development of scholarly communication. Most of them can be described as scenarios or forecasts of individuals presenting their own ideas of the future to their peers. (Halliday 2001 : 661)

3.3 Methodologies employed in the literature

A substantial body of literature dealing with methodologies for the measurement of serial use exists. The international study done by Sridhar (1988 : 138) is a simplified cost-benefit analysis (CBA) of a random sample of journals. He illustrates the difficulties there are in applying a CBA in libraries. His sample of journals indicates that such a study does not answer all questions, but provides an additional dimension over and above what appears in a simple use study, that is an understanding of journal usage. The sample of journals was picked by selecting every fifteenth title from the alphabetical list of current journals. His study was restricted to 33 titles. The subscription cost of the titles as well as the periodicity were noted to determine cost per issue. The titles were analysed and compared for their cost per use. The use data was extracted from an earlier use study the author had completed on current journals. He concluded that a CBA may not provide a completely satisfactory solution to problems of journal cancellations and retention, but it does, however, provide some clues as to how to proceed over and above those provided by a simple use study. He felt that a CBA can increase the awareness of librarians, administrators and others concerning costs and journal use patterns.

A study done at the University of Arizona Library analysed use patterns of the University's masters theses and doctoral dissertations. A random sample of theses and dissertations from 1985 – 1989 were selected and the cited references were analysed. The references for each college were averaged and sorted by the categories of books, journals and unpublished materials and further divided into date ranges (indicating age of material) of 1-10, 11-20 and over 21 years. Some results were that graduate students in all disciplines consider current journals important, use of foreign language materials was limited to very few disciplines and graduate students in humanities relied more heavily on monographic material than graduate students in other disciplines. (Brin 1994 : 209)

A study of note is the one by Henry Barschall and the University of Wisconsin-Madison Libraries. In December 1986, Henry Barschall, University of Wisconsin-Madison published a brief article in *Physics Today* in which he looked at the costs of a small sample of physics journals (20 titles), as well as an even smaller number of philosophy and mathematics journals. Barschall compared the cost per 1000 characters across journals – a methodology previously used by the American Mathematical Society and others. His conclusion quoted by Case (1998 : 3) is:

> While one would expect journals published for not-for-profit publishers to be less expensive than those published by commercial publishers, the cost-per-character ratio of over 40 between the most expensive commercial and least expensive not-for-profit publication is larger than one might have expected.

Two years later, Barschall conducted another study with a much larger sample of over 200 physics journals. In addition to expanding the sample, Barschall added the Institute for Scientific Information (ISI) impact factor to his analysis. The ISI impact factor is a measure of the frequency with which the average article in a journal has been cited in a particular year. The data indicate cost effectiveness in two ways: cost per quantity of content and cost as related to value apparently placed on the publication by others in the field. (Case 1998 : 3)

Barschall drew some important conclusions from this study. He found that, for example, the cost per 1000 characters did not vary greatly for journals published by the same publisher. He concluded that all publishers whose journals have low average costs per character or low ratios of cost to impact are scientific societies or associations, while the publishers whose journals have high costs per character or high ratios of cost to impact are commercial firms. One other conclusion he arrived at was the need to perform comparisons, as much as possible, within comparable sets of journals. These studies indicated that there was a discrepancy in cost effectiveness between not-for-profit and commercially published journals. Not-for-profit journals were lower in cost. (Case 1998 : 4) He examined price in the context of a journal's content.

More recently the University of Wisconsin-Madison Libraries have updated Barschall's studies using the same methodology. The basic method for collecting data was the journal cost-per-use data. The data gathering method was that all journal issues and volumes were bar-coded. As items were re-shelved, after-use counts were made by scanning the data. The purpose was to identify low-use journals and to provide an alternative to the Faculty in

the form of speedy document delivery and electronic versions of journals. Staff were asked if this was an acceptable alternative to the Library holding the journal. This study revealed that cost alone should not be the sole means of assessing a journal. The measurable differences between journal costs and usage are huge. The study confirmed that the high costs journals cancelled were so rarely used and marginally significant in their impact. (Case 1998 : 4) This approach examined value in the context of use of the journal. The University of Wisconsin-Madison Library has used this analysis to make journal cancellation decisions since 1995.

The objective of the study done at the Queensland University of Technology (QUT) reported by Newell in 1992 was first to identify the preferred method to locate journal information and secondly to assess the perceived level of demand for current journals and back issues and finally to evaluate the success of QUT collections and document supply services. To do this, she conducted a survey on the four campuses. The Faculties of Arts, Built Environment, Engineering, Business, Education, Health, Information Technology, Law and Science were targeted. The user groups were the undergraduates, postgraduates and staff. Survey forms were distributed to those who actually entered the Library. These forms were made available at the issue desk on all campuses. A systematic distribution was intended to capture academic staff with a random mail-out. In addition, class groups were targeted through liaison with academic staff in order to capture both library and non-library users. The results of the survey were analysed by running SPSS software. (Newell 1992 : 49) Her findings revealed that traditional serial suppliers are branching into document supply services and that there had been increased regional cooperation with the libraries in the Queensland area. The survey revealed that the users resisted the cancellation of print journals but would use the full-text CD-ROM databases as well, indicating that they would like both. (Newell 1992 : 67)

The methodology used in the Commercial and Free Electronic Journals User Study (Café Jus) project was a detailed study of users' reactions to e-journals at Loughborough University in the United Kingdom. The study was funded by the British Library Research and Innovation Centre. Its main aim was to examine what problems readers with differing subject and computing backgrounds experienced when using e-journals. The study concentrated primarily on students taking Masters courses. A structured questionnaire was developed to be used in conjunction with access to an e-journal. The questions were arranged under three headings : journal content; journal appearance; and facilities offered by the journal. The

questionnaire was tested with volunteers in four departments, namely Computer Studies, Information and Library Studies, Physical Education and Sports Science. The students were introduced to the e-journals in groups, which met in the computer-based laboratories. An initial presentation on the project together with documentation was provided, then each student accessed an e-journal, noting down responses to the questionnaire as their reading progressed. Dealing with the students in groups made it possible to provide advice and help in real time and also ensured completion of the questionnaire.

The pilot study indicated that the planned organization of the investigation was acceptable, but that there were minor ambiguities in some of the questions. After some modifications to the questionnaire, it was launched on the following years' Masters students. For comparison, it was decided to obtain feedback on e-journal usage from research students and academic staff. The method of obtaining data was via a log sheet on which respondents were asked to keep a record of their usage. Volunteers were sought mainly via e-mail inviting participation, but this proved to be less effective as a recruiting tool than the group approach. (Halliday 2001 : 2; Woodward 1997 : 145-146) The survey results revealed that low-level technical problems are still a deterrent to use of e-journals and that commercial publishers tend to follow the lead of technology rather than consider the convenience of their users.

In 2000 and 2001 Tenopir and King conducted a series of surveys to measure specifically how much scientists are using e-journals and other electronic sources of articles. They surveyed a sample of scientists and engineers at the Oak Ridge National Laboratory (ORNL) in Tennessee, US and the academic and research staff at the University of Tennessee. In their survey they asked questions about the scientist's relative use of print and electronic sources of journal articles. They concluded that scholarly journals are well read and that they are extremely useful, whether it be for teaching, research, administration or other activities. Furthermore, the value of the information provided is clearly established, whether measured by what users are willing to pay for it (purchase value) or by the benefits derived from its use (use value). Scientists in all disciplines and different places of work are reading more articles than books and a higher percentage of current articles are mostly electronic. Scientists use many sources for e-journals, including institutional subscriptions, authors' Websites and e-print archives, such as PubScience, but they continue to rely on traditional journals in both print and electronic formats. Finally, information-seeking and use patterns vary dramatically

among journals, articles within a journal, user groups and channels of dissemination. (Tenopir 2002a : 25; Tenopir and King 2002b : 261- 265) For these reasons, this study of two particular groups of users, the postgraduate students and academic staff in the Faculty of Science at UND Libraries, has a contribution to make.

At Drexel University in the United States, a comprehensive analysis of a readership survey covering the number of reading outcomes from reading and reading patterns following implementation of the nearly exclusive e-journal collection was undertaken. The readership survey of the staff and doctoral students was based on a questionnaire design that has been applied since 1977. It was a paper based questionnaire. The self-administered questionnaire was distributed to the entire academic staff. The key component of the questionnaire dealt with a critical incident : the most recent reading of a scholarly article. Critical incident questions included : the form of the article read; time spent reading; how the respondent found out about the article; and the source of the article. The critical incident method proved not only a means of observing reading from non-library sources, but also from three library collection services, that is, e-journals, current journals and bound journal volumes. (Montgomery 2002 : 2)

The critical incident observation method is potentially biased since the population now sampled is the readings done and no longer of the people sampled. Each sampled, critical incident reading has a different probability of selection, that is, the most recent reading of a respondent who reads a great deal has a higher probability of entering the sample than the last reading of someone who reads little. (Montgomery 2000 : 2) Key findings of the readership survey were that the amount of reading remains high, and only 42% of faculty reading is from library-provided articles because they still rely on readings from personal subscriptions. Most of the library-provided readings are from electronic articles and less time is spent locating and obtaining these articles.

Journal use studies were conducted at the University of Illinois at Urbana-Champaign Chemistry Library in 1988, 1993 and 1996. The purpose of the survey was to determine use and cost-use ratio of a large and expensive serial collection in order to cancel subscriptions and balance the budget on quantitative data.

The same simple method for measuring use of journal subscriptions was employed in three separate use studies. Use was recorded by title as journals were re-shelved, returned from interlibrary loans or a two-hour loan period. An alphabetical list of journals was kept to tally those used manually for three months and six months in the most recent study (1996). Each use study relied upon student and staff to conduct and complete the data collection. Very little environmental change took place during the eight years of the study periods. There was no dramatic rise in the number of students, staff or faculty members. (Chrzastowski 1997 : 1) The journal use data confirmed the 80/20 rule, that is that 84% of use was generated by the top 100 journals in 1996, approximately 20% of the collection. Approximately 40% of all use in 1996 was generated by the top ten titles.

However, in a study of the usage of e-journals done at Texas A & M University, US, Gyeszly (2001 : 6) found that usage of e-journals by their patrons was not enough to warrant or justify canceling the print for titles carried in both electronic and print formats. She compared the annual subscription prices and the percentage increases of the 203 core printed journals with their electronic counterparts in the disciplines of political science and economics during the 1998 – 2000 academic years. The complete list of electronically available titles were identified and priced and the titles costing more than $500 were separated. The electronic use statistics were examined for the expensive serials, based upon the numbers of hits cumulated by users' requests via the Website of the University. The data indicated that the subscription price of the 203 core journals increased by 11 percent during the study period. No use data of print journals were collected. (Gyeszly 2001 : 6)

Regardless of the method used, it is common cause that all researchers have agreed that a journals value cannot be assessed by content evaluation alone, the journals value must be placed in the context of the amount of content it offers and the users it potentially serves. From the point of view of a scientist, librarian or publisher it is of great importance to have an idea of which developments and trends will dominate the journal system during the next ten years.

3.4 Trends

There are various trends that are shaping the developments in scholarly communication and will give an insight into possible future developments. The central trends identified in the literature thus far are:

3.4.1 Trend one: electronic journals may not replace print journals any time soon; pricing is the biggest threat to print subscriptions not e-journal technology per se.

This section addresses the serials crisis, the current and future pricing models, and the different pricing structures.

3.4.1.1 The serials crisis

The electronic journal movement ought not to be seen as revolutionary in that it will dramatically change or improve everything about science journals in libraries. It is certainly true that many librarians are constantly battling a crisis of funding caused largely by high prices of conventional print scholarly journals in the sciences. What role do libraries play in this serials crisis? Libraries do not publish in these journals, read them, edit them, use them in research, nor do they sit on the editorial boards of science journals. Libraries are facilitators to connect users with the journals that serve their needs. Libraries have been trying and will continue to try cancellations, shared buying, traditional interlibrary loans and document delivery in an effort to regain control of their print journal situation. (Mobley 1998 : 5)

Recent literature on serials pricing has focused on the nature of commercial publishers. The price of science and technology (sci-tech) journals have always been higher than other disciplines. Significant price increases have occurred over the last few years and these increases have been far greater than for any other disciplines. Between the disciplines, the ratios show a very different picture. Average price increases for sci-tech titles published by societies have been lower than increases for commercially produced titles. The increases tend to be double or triple general inflation amounts. (Mobley 1998 : 5)

Established publishers have been reluctant to move to online-only publication of journals because the traditional business model for journals subscriptions has been based on print subscriptions. These print subscriptions have been showing a steady decline. Halliday points out that the number of subscriptions has been reduced by half. This resulted in price rises, as publishers have attempted to recover the same or greater funds from a smaller number of subscribers. As a result libraries have cancelled their subscriptions due to prices rises, combined with a significant increase in the volume of research published and restricted library budgets. This cycle has exacerbated the problem. (Halliday 2001 : 262; Mobley 1998 : 5)

The literature suggests that e-journals in their present form will not eliminate the deficiencies within the journal system, although e-journals could offer a partial solution to the serials pricing crisis. The implementation of new technologies could solve problems in specific areas. Publishers are facing a growing demand from library subscribers for new pricing models and strategies. To avoid the risks inherent in the new pricing models, most publishers have attempted to retain the traditional pricing mechanism by bundling print and electronic journals. Until the digital format is preferred throughout the international market, publishers must continue to produce print. The production of print journals is expensive and, as electronic use expands, print costs are difficult to recover from a limited print-only subscriber base. (Rosenblum 2000 : 2)

King as reported by Rosenblum (2000 : 2) made an important point at the PEAK 2000 conference that publishers and libraries should not think in either/or terms when it comes to choosing between digital and print formats but should look at models that incorporate both. There are certain advantages to both formats, and it is important to take advantage of them. In any case, there will be a varied market of print, microform and online journals for at least several more years. (Rosenblum 2002 : 2) Tensions between the publishers and the users of scholarly communication coupled with technological advances have prompted proposals for alternative ways to organize the system. Research indicates that digital technology is not a cost-saving revolution, but a value-adding one. The costs to libraries and content providers are significantly greater than they expected, and greater than working in a traditional print environment. But the high usage of such material suggests that while the total cost has remained high or even increased the cost per use has decreased. (Rosenblum 2000 : 2)

3.4.1.2 Pricing models

In a period of considerable uncertainty and change, publishers and producers of e-journals are developing a variety of pricing formulae and charging mechanisms to sell their products. The pricing relationship with paper formats is important during the transition. Over the last decade, the research community has become increasingly aware of the economic structure of scholarly journal production and its relationship to the 'serials crisis'. Publishers are determined that their profits will not be diminished by whatever new scenarios emerge while libraries hope for an opportunity to break the cycle of price increases and cancellations. The pricing models have emerged to illustrate this dichotomy. Several alternative models and initiatives for producing journals have been proposed to address the problem. Varian (1999: 3) contends that while technology changes, economic laws do not. These generally involve role changes.

One such initiative with more immediate impact is the Scholarly Publishing and Academic Resources Coalition (SPARC), which is an alliance of research libraries which aims to 'inject competition into the scholarly publishing market by facilitating the start-up of low-cost/high-quality academic publications', as an alternative to the prohibitively priced commercial journals. In 1989, the Association of Research Libraries (ARL) commissioned an Economics Consulting firm to analyse scholarly publishing trends. Their report pointed to a lack of competition in this market, as a major contributing factor to spiralling costs. With large publishing conglomerates driving the prices of scholarly journals higher and higher, librarians find themselves spending more and more money to purchase fewer and fewer titles. The report stated that journal prices were spiraling out of control as early as a decade ago. SPARC was created in 1997 by ARL to address this. (Rambler 1999 : 2)

How does it work? SPARC offers new journals a guaranteed subscription base and in some cases, start-up capital. The subscribers include those libraries that belong to SPARC. The funding helps ambitious journal entrepreneurs pay for personnel and venues where the editorial activities and printing operations take place. These entrepreneurs will still have to take care of the details like typesetting, proofreading, printing and distributing a journal, that academics have been gladly handing over to commercial publishers. SPARC's challenge is to succeed at breaking the hold of conglomerates and bringing down journal prices. It has

already demonstrated the remarkable impact it has had with a variety of new publications and its outreach programmes, for example Create Change, that have encouraged academics to re-think their approach to commercial publishing and their role in solving the scholarly communication crisis. (Geslin 2002 : 2)

Another new initiative is HighWire Press, which is based at Stanford University in the US. It was established in 1995. Its aims were to enhance scholarly communication by effectively utilizing the new technologies to 'correct' the marketplace for scholarly articles. It did this by establishing partnerships with publishers whose primary interest was scholarly communication rather than profit. HighWire publishes and archives digital formats. It does not impose business models or strategies on its partners. Each publisher determines these business models or strategies itself. Small society publishers are generally unable to invest in development of digital production. HighWire aims to assist those publishers to migrate from the current dysfunctional scholarly journal market to a functional market. HighWire has claimed to have improved access to content through a number of developments. The first development was the introduction of 'toll free' linking which allows readers to link to citations in journals, to which they have no access rights. The reader must be authorized to use the journal in which the citation is published, but may link to full-text of citations without payment as long as the cited article is within the HighWire domain. Secondly, HighWire encourages the use of back issues which are free of charge. There are currently about 146,000 such articles available. Thirdly, HighWire addressed the problem of international use at time when bandwidth is congested by users by delivering content to certain remote locations by dedicated bandwidth. (Mercer 2000 : 3)

In 2001, nearly 30 000 scientists signed the Public Library of Science pledge to boycott journals that do not make their content free online, or accessible to a server like PubMed Central, after six months. All this exercise achieved was to raise awareness of the issues among a considerable number of scientists. (Geslin 2002 : 7)

The emergence of 'non-publisher' e-journals demonstrates how the scholar has begun to organise and manage the dissemination of information. The best known example of this is Ginsparg's preprint server in the field of physics. In 1991, Paul Ginsparg of the Los Alamos National Laboratory in the US began a new database that has since become one of the

largest on the Internet, archiving un-refereed papers on high energy physics and about 25 additional disciplines. Access is available though the World Wide Web and through anonymous file-transfer-protocol (FTP). Ginsparg also maintains a listserv so that subscribers can receive a daily update of new titles and abstracts. Ginsparg believes that 'electronic dissemination of unrefereed articles was accepted by physicists because they long ago concluded that traditional refereed journals were irrelevant to ongoing research'. These un-refereed articles indicate the work in progress in the field of physics.

Since the mid-1970s, physicists kept up with current developments by reading preprints of articles that were submitted to journals for publication. The preprints were made available through professional associations at about the same time as they were submitted for publication. But this may differ in other disciplines in Science. The mathematics research community, on the other hand values print and the historical record more than immediacy. (Odlyzko 1997 : 9)

In the study done by Halliday and Oppenheim (2000 : 663) three models were developed to explore the economic aspects of electronic journal production. The models are based on the premise that there is a significant drop in journal production costs in the digital environment. An overall decision on the issue is difficult because publishers are reluctant to reveal their costs, or simply do not know them. Furthermore the activities involved in digital publishing and their related costs have yet to stabilize. The authors concluded in their study that it is unlikely that an acceptable e-journal is significantly cheaper to produce than a print journal. However, this does not preclude a price reduction. The correlation between production cost and price is not strong, and commercial publishers are highly profitable and the facts suggest that there is scope to reduce prices.

The first model investigated was the 'traditional model', which is similar to that of print journals in that production costs are recovered through sales of subscriptions. The results showed that a non-commercial journal making a modest profit and recovering full costs can be supplied to users for a modest fee as long as the subscription base consists of at least 500 subscribers. The authors revised the model to explore the proposal that both authors and subscribers should contribute to costs. The rate of overhead applied to production costs, the level of author submission fee, the profit margin and the rejection rate determined the effect

on subscription prices. The results showed that if authors contribute a modest submission fee and the subscription base is at least 500, the publisher can recover full production costs and make a small profit.

The second model, the 'free-access' model was based on the work by Stephen Harnard, who claimed that the primary aim of academics submitting papers to journals for publication is widespread dissemination of their research. In a print environment, authors are forced to accept access restrictions because publication and distribution are expensive, and therefore authors rely on publishers, who, in turn, recover their costs by selling journals to subscribers. Harnard cited by Henderson (1995 : 46) argues that the electronic environment can liberate authors because the cost of digital publications, is at most, 30 percent of that of print publication. Harnard suggests that academics should bypass commercial publishers and produce journals themselves. But, as authors are primarily interested in the dissemination of their research rather than the production of the journal, they would be willing to pay publication fees so that end users could access their work free of charge.

The results of this study show that if the free-access model is revised where rather than recovering production costs from all authors, they would only be recovered from authors of accepted papers, then the submission fee would decrease as the rejection rate increases. With this model each author would cover the cost of producing his or her own paper and in this way contribute to fixed costs. As the number of authors' increases, each will contribute less to fixed costs. If fees are paid only by authors of accepted papers, however, these increase as the rejection rate increases because authors of accepted papers must contribute not only to fixed costs and costs associated with their own papers but also to costs incurred by rejected papers.

The third model developed was the 'free-market' model based on a supporting study commissioned by the UK Electronic Libraries Programme in 1998. (Halliday 2000 : 669) The study surveyed the number of alternative cost-recovery and pricing models and concluded that the academic information delivery chain is inefficient owing to a number of distortions in the supply-demand chain. Among these are: firstly the demand for publications comes at least as much from authors as from readers, yet authors make no contribution to publication costs; secondly those using the information, that is, the readers, seldom pay for it, preferring

instead to obtain it from libraries; and thirdly a substantial proportion of journal publication work is done by editors and referees. Their work is without payment and sometimes for minimal honoraria. The free market model proposes that publications would be funded by a combination of author and subscriber fees. It was further proposed that this system should support those authors who cannot make payment. Editors and referees would have to be paid too as this would encourage efficiency. The downside of this model is that access to articles is restricted, forcing end-users to prioritize their needs. Authors are paid on a royalty basis, which is supposed to provide them with an incentive to publish higher-quality work.

Halliday concluded that the results indicate that staff costs and overheads are the most substantial costs incurred when producing e-journals. Any contribution by the host institution reduces production costs. Halliday (2000 : 669) states that

> 'a model that relies on voluntary contribution by academics appears, superficially, to be significantly cheaper than one paying professional publishing staff. It is unlikely, however, that a significant proportion of the journal literature could be produced by volunteer academics without having a detrimental effect on their core responsibilities'.

Furthermore the study has no evidence that academics would wish to be paid for editing and refereeing. Nevertheless, the results of the study suggest that e-journals can be produced and distributed at reasonable prices as long as there are 500 subscribers or more per journal.

The study by Halliday concluded that the most efficient model would be the free-access model. A model that shares production costs between authors and subscribers may appear to be fair but it would increase costs by requiring administration of two sets of fees. Clearly, administration and maintenance of subscription fees would be more expensive than administration of author fees. However, appreciation of the free-access model requires a system-wide view of the costs and benefits of journal production and delivery as it affects all parts of the organization including the library. (Halliday 2000 : 669)

The practical impact of these proposed pricing models has been limited. They are based on the assumption that e-journals can be produced at a lower cost than print journals and that plain text is sufficient to meet user needs. Varian (1996 : 2) contends that while the technology changes, economic laws do not. The inevitability of electronic delivery has

required publishers to experiment with the technology, offering many features such as multimedia, audio and video. Pricing is an area where there is considerable experimentation by publishers. Pricing of e-journals is more complex than print since the format allows a number of different options. (Prior 2001 : 63) These models were all in their initial stage, and Halliday thought it was necessary to review and revise the models and try to define more clearly the production, administrative, maintenance and staff costs. (Halliday 2000 : 670) These models were, however, helpful in understanding the process of digital journal production and delivery.

Although there are successes such as HighWire, the processes of acquisition and delivery of e-journals are still in a state of change, as are the roles of different stakeholders in the scholarly information delivery chain. All stakeholders have a significant economic interest in stabilizing the journal production and delivery chain and in ensuring the establishment of a viable business model; however, a win/win scenario for all stakeholders may not be possible. It is not clear what an acceptable model would look like as a large number of interacting factors make cost/benefit comparisons difficult. Of relevance to this study is that these models may not be acceptable in other disciplines as well, because scholars in other disciplines may favour different communication practices and the results cannot be generalized. (Halliday 2001 : 272)

3.4.1.3 Future pricing models

Recent library experiences suggest a trend towards pricing and purchasing at the article level. As the mechanisms of electronic commerce become more commonplace, publishers and even aggregators are offering the online purchase of individual articles by non-subscribers, with online payment by credit card. This has become known as the pay-per-view or pay-per-use approach. (Halliday 2001 : 263) Electronic commerce will simplify the mechanics of purchasing at this level, although it is likely that the bundling together of packages at more attractive rates will predominate for larger customers. The growth of the Web as a marketing tool complements this and allows content providers to target potential markets in a sophisticated manner. Although not all experts are very enthusiastic about pay-per-use or pay-per-view systems, it seems obvious that this access model will become increasingly more important in future. When asked who will pay for pay-per-use access, librarians and non-

librarians disagree. All librarians agree that users will pay part – if not all – the costs. This model allows end users to access titles from a wider range of titles than the library subscriptions, but it is also shifting the costs to the end users. (Halliday 2001 : 262) The PEAK project also suggests a trend towards the purchasing at the article level. Preliminary feedback from the project supports the view that users will prefer the pay-per-view approach. (Rosenblum 2000 : 2)

Halliday's research suggests that in the future users will no longer have to subscribe to a whole journal in order to get the few articles that really interest them. Articles can be delivered electronically, individually or in packages, customized to match requirements of different user groups and, possibly, with add-on services if required. Varian (1996 : 3) states that pricing models are largely associated with individual subscriptions. Charging by usage may seem a fair way of arranging payment as it satisfies the basic principle that one pays for what one uses and only for what one uses. This is the publisher's point of view that charging at article level may be much fairer, but from the library's point of view, such a scheme would be complex and too costly to maintain. (Halliday 2000 : 370)

The literature (Halliday 2000; Rosenblum 2000) suggests that with the growth of more sophisticated current awareness and alerting tools, and trends towards multi-disciplinary research, the market will seek to purchase information from a wider array of sources and the traditional subscription to a specific title will decline. At present journals are the main focus of attention between publishers and libraries. Many are relatively high cost, low print-run publications for which electronic publishing is suitable.

An important consideration in moving to electronic delivery is ongoing access to data. Archiving and access to information in the future, when perhaps the library no longer subscribes to the title, are key concerns for libraries. Libraries want the assurance that they will retain the right to access volumes of e-journals for which they have paid, even if they cancel their subscriptions at a later date. Where the data resides (that is, at the publishers', customers' or third party's site) therefore becomes relevant. Most electronic information is leased and if the customers want perpetual access this must generally be negotiated at a premium price, thereby affecting the pricing model. The assumption is that one is using the

most current journal issues but users still require the back-files. This is one of the flaws of e-journals.

As with all other studies reviewed, these studies are useful for developing understanding, eliciting feedback, and providing a framework for future research. (Rosenblum 2000 : 3)

3.4.1.4 Different pricing structures

There are many different pricing models for e-journals. Hal Varian (1996 : 2) of the University of California is of the view that, the fundamental problem facing publishers is how to recover costs. This view is shared by society publishers Fischer of MIT Press cited by Robnett (1998 : 56) reports that the overall costs of e-journals are quite comparable to those of the press's print journals. It is cheaper to produce journals in paper than electronically, if the circulation is small, that is, if subscribers are less than 500. For electronic journals, everything that is done for print is done, as well as some additional tasks. The process includes the traditional function of peer-review, manuscript editing, typesetting, printing and mailing. But e-journals add new functions and new costs for the typesetting and the management of the electronic service. (Ekman 1999 : 169)

Varian (1996 : 2) believes that a basic characteristic of digital documents is that it is very costly to produce the first copy, but quite inexpensive to produce subsequent copies. For most publishers of scientific scholarly journals, processing and support are fixed costs, and form the largest part of the total publishing costs. Tenopir and King estimated that the fixed costs of a typical journal are about $420,000 while production and distribution costs average about $40 per subscriber. A publisher with five hundred subscribers must charge $840 per subscription in order to recover those costs. But a publisher with ten thousand subscribers need charge only $80 per subscription to recover the costs of production and distribution. In this way, the price approaches an asymptote at the production and distribution cost of $40 per subscription. That model helps explain why some journals must charge a high price, while others charge much less. A publisher would have to charge less, even half the price if its subscriber base is more than five hundred. (Tenopir 2002 : 21)

There are two classes of readers of journals produced by professional societies: members of the society and non-members. In most pricing schemes, members either get the journals as part of their membership fee or pay special individual rates. Non-members are serviced by the libraries who pay a different, and normally higher rate. Members also have access to the library copy of the journal. But the convenience of having their own copy for ready access is more attractive than the inconvenience of accessing the library's copy. (Varian 1996 : 3)

Someone who expresses this point very well is Varian (1996 : 3) in the striking question, 'But what happens if the library subscribes to an electronic version of the journal that it mounts on the campus network?' It is then no longer inconvenient to access the library copy, and some members may decide to cancel their membership of the society, or their journal subscription, thereby reducing the revenue of the publisher.

This financial risk is very apparent to many professional societies and academic publishers, and it makes them reluctant to offer electronic versions of their journals. The way to deal with this is to make the member's subscription sufficiently more attractive than accessing the library's subscription so that the member finds it worthwhile to continue to pay the membership fee or individual subscription charge.

Varian points out that publishers have a variety of ways to do this. The simplest is to require that the library provide access to the journal only on its physical premises (site). This makes the library's electronic version of the journal essentially as inconvenient as the paper version. The second is to enhance the members' subscription. This can be done by adding extra enhancements and services such as hypertext links, powerful search engines, current awareness notification, opportunity to view online articles prior to release or pre-prints of the site licence versions. (Varian 1996 : 3)

The key issue is to provide sufficient enhancements so that the members are willing to continue to pay their subscription fee. Different pricing strategies will be relevant for different disciplines and applications. Not all services will be available to all categories of users and in general, publishers – even nonprofit publishers – will want to provide different services to different classes of users. (Varian 1996: 3) In the researcher's opinion, however, to date

there appear to be no significant differences between e-journals available to institutions compared with those accessible by the membership.

3.4.2 Trend two: electronic journals will not be substantially cheaper than print. Mergers and partnerships among publishers and access models will increase to spread technology costs.

For any given merger between publishers the choice of market definition depends on the power that could be exercised by the monopolist in the defined market. The library demand for journals is unlike most markets. Libraries do not only subscribe to the journal offering the best value. There is demand for a 'portfolio of titles' where the cost-per-use criterion is applied broadly. Thus, journal titles in a library compete with one another over an entire field rather than across a narrow sub-field. In a simple economic model, all else being equal, publishers set prices so that higher use or quality journals, exhibit lower cost-per-use ratios. Thus, higher use journals that have a lower cost per use are purchased by most libraries.

3.4.2.1 Mergers

Using this model it is also possible to show that mergers are profitable for journal publishers. A merged publisher is able to internalize certain pricing externalities. This cannot be done when they act independently. Larger publishers are able to capture these benefits and therefore, all else being equal, set prices at higher levels. (Stankus 1999 : 7)

The literature has shown, especially the study by Mark McCabe, that a company's portfolio size is related to journal prices and that past mergers are associated with higher prices. During the ten-year study period 1988 – 1998, two significant mergers occurred: those were between Elsevier and Pergamon, and between Lippincott and Kluwer. For example, the Elsevier deal resulted in an average price increase of 22 percent for former Pergamon titles. According to the study, each of these mergers was associated with substantial price increases. These results also contain a likely explanation for the persistent journal increases. The sensitivity of library demand to price increases is very small by normal standards (1 percent increase in price results in a 0.3 percent decline in subscriptions). Given this inelastic demand, publishers have a strong incentive to increase prices faster than the growth of library budgets. (McCabe 1999 : 3)

Responses from the survey done by Keller (2001 : 384) indicate that in the future there will be a variety of pricing and access models. It is assumed that different models of subscription, licensing and pay-per-view will co-exist.

3.4.2.2 Access : licensing agreements

Access to an e-journal is bought via a licence for a specific period of time against a negotiated price. These licences are regulated by contract law and the content is protected by copyright law. The licenses also allow degrees of access and permitted use such as interlibrary loans or course packs for the content. The licence determines who can use the journal and what can and cannot be done in terms of printing and downloading articles. (Veldman 2004 : 4)

While most e-journals are not priced according to the number of simultaneous users, gateways to those journals, such as the Online Computer Library Center Electronic Collections Online (OCLC ECO), have adopted the simultaneous-user approach, and the add-on costs must be considered. A variant of the simultaneous-user approach is charging for access according to user population size. When looking at the effect of e-journals on staffing and activities library-wide, other costs apart from journal subscription fees become apparent. Negotiating contracts and managing change is a time-intensive and costly exercise that is not factored into the journal price. Due to the nature of e-journals, price negotiations would be the primary activity of the library acquisitions department in the future. An additional cost to be considered are the annual salary costs that will also increase due to the technical nature of system maintenance requirements. (Veldman 2004 : 4)

3.4.2.3 Partnerships : consortia

Another trend identified in the literature is that e-journals offer new opportunities for cooperative licensing, that is, consortial agreements. They also open new paths for electronic document delivery. The most important new access model to scholarly journal literature is, of course, the pay-per-view system. This new economic model is expected to have a great impact on publishers and libraries.

With the growth of library consortia, library purchasing methods are currently undergoing considerable changes. These library consortia are growing worldwide and increasingly negotiate with publishers for consortia-based pricing for e-journal access for their members. Pricing is made additionally complex when libraries enter into consortial agreements, in which multiple institutions combine their purchasing power to attain what they hope will be a reduced cost per institution for access to the electronic publication. Prior points out that the libraries within the consortia delegate the task to the subscription agents in administration and management of licence agreements, including the maintenance of up-to-date databases of publisher options and prices; the availability of individual publishers' licence agreements and forms; liaising with publishers regarding changes to the agreements; handling of renewals of licences; acting as distribution point for passwords and Internet protocol (IP) numbers and assisting with access. (Prior 2001: 64)

In South Africa at present academic libraries are learning to cooperate with each other in new ways, both regionally and nationally, and to avoid costly and wasteful duplication of effort and resources. Since 1992 cooperative ventures have started and the five regional academic library consortia, Cape Library Consortium (CALICO); Eastern Seaboard Association of Libraries (eSAL); Free State Library and Information Consortium (FRELICO); and Gauteng and Environs Library Consortium (GAELIC) decided to establish a national coalition, Coalition of South African Library Consortia (COSALC). COSALC was established in 1999 to share information resources among 35 libraries as well as to effect economies of scale. To achieve this, a South African Site Licencing Initiative (SASLI) was established. SASLI was modeled on similar national initiatives overseas such as the British National Electronic Site Licence Initiative (NESLI) where these initiatives are seen as a smart solution to provide equity of access. SASLI's role is to investigate overseas experiences, negotiate licences with publishers, pricing, co-ordinating of access and delivery and other issues related to the cost-effective use of electronic information. (Veldsman 2004 : 5)

A number of major publishers have developed consortia pricing policies as a result. But many librarians believe that consortia do not solve their financial problems, and publishers are worried about losing print subscriptions and income through such agreements. The survey of the literature, for example from Van Orsdel (2000 : 6) has shown that librarians are more critical about the actual benefit of consortia than non-librarians.

3.4.2.4 Access model : PEAK Project

The literature reviewed has identified that there are other approaches that could be used to price electronic content in the scholarly area. One such approach is the PEAK experiment which is looking at a variety of pricing models. In 1995 researchers at the University of Michigan offered to study the economic issues of electronic journals in a test project known as Pricing Electronic Access to Knowledge (PEAK). Twelve colleges and universities took part in an experiment with Elsevier Science to test a new model for pricing electronic journals and user behaviour. These institutions received access to all the content from 1,200 Elsevier Science titles using a variety of pricing and subscription models. The models allowed libraries to pay a package rate for access to a specified number of articles from anywhere in the Elsevier Science database. Elsevier offered the institutions up to three payment options for its scholarly journals that they could combine, however they saw fit: the new package rate, as well as the more standard options of purchasing unlimited access to an entire journal and the document-delivery method of paying on a per article basis. (Rosenblum 2000 : 4; Thomes 2001 : 1)

The first focus point of the PEAK research was the library decision-making process. The libraries participating in the project buy a certain number of articles in advance; they then allow the university's faculty, researchers, and students to decide which articles to select. Once the article is chosen by a user, it is available to everyone else in the system at no extra cost. The downside of the bulk-rate model is that librarians must accurately predict how many articles to buy. If they buy too many, they pay for articles that will go unread. If they buy too few, they pay a higher rate for additional articles.

The intention of the PEAK project was to learn more about individual behaviour of journal users. There is a growing awareness that users want collections of articles rather than a collection of journals. Data from the study show the 80/20 rule in action: 80 percent of the use came from 20 percent of the articles. Library patrons used articles from non-subscribed journals to a higher degree than anticipated. Research findings from the PEAK project support this conclusion. Information gained from this user behaviour will help librarians determine if the experimental pricing structure would really work for them. A research opportunity offered by the project was that data collection capabilities from digital collections

are far more sophisticated, reliable and precise than from print collections, providing abundant opportunities for research on usage and user behaviour. (Weiser 1998 :1)

3.4.3 Trend three : middle-people can still make some money: aggregators will continue to do well in the e-journal world, largely by doing more than their traditional job.

Most major subscription agents have available and are touting the benefits of what are known as 'aggregator systems'. In these systems, the serial vendor licences the full-text of journals published by a variety of publishers and makes them available through a standard interface. Aggregators, for example Swets/Blackwell, conglomerate journals of several publishers under one interface and search system. Many publishers who do not operate their own e-journal Website, provide access to their journals via a journal aggregator. Journal aggregator services provide access to a large number of e-journals from a range of different publishers. Aggregators offer additional value-added services such as advance articles, personalized home pages, favourite journals and the like. The questions remains, however, what value-added services will be required in the future and what new business opportunities will emerge. (Robnett 1998 : 60)

There is a second type of aggregator or intermediary which also brokers access to e-journals of many publishers through a common interface. These new players such as Catchword, a UK based company, OCLC Electronic Collections Online (ECO) and Swets/Blackwell's Electronic Journal Navigator manage the complete electronic publication process for publishers – including data collection, conversion to Internet formats, server provision, user acess and management information for publishers. (Robnett 1998 : 56)

The noteworthy feature of this type of aggregator is that the subscribing library negotiates the price of the electronic periodical subscription directly with the publisher or through a subscription agent. The costs of the gateway must be considered in the price of access to e-journals. As users have access to citations for all publications available, there is an added-value that may justify the cost of using the services of an aggregator. In this type of aggregator the library lets the aggregator handle the administration, technical support and subscription of the journals. (Brooks 2003 : 248)

3.4.4. Trend four: usage studies

Monitoring print journal usage in the library has always been a difficult task. In some libraries it may be possible to use loan statistics to provide information on usage, but many libraries do not loan journals, and even if they do, users will often prefer to consult this kind of material in the library. Therefore, loan statistics tend not to be a very reliable indicator of use. Monitoring usage can also be a time-consuming process.

The aims of user studies are to establish the usefulness of the material to the research community and understand what users require from an electronic document delivery service. Various methods have been employed apart from the loan statistics, namely in-depth interviews and online questionnaires. (Case 1998 : 6) Appropriate data enable librarians to better understand how users use journal collections; gain better knowledge of which journals are consulted and the intensity of their use and gauge low and high use titles. (Jenkins 1997 : 356)

Results of findings and conclusions in the many usage studies done (Chrzastowski 1997; Gyeszly 2001; Montgomery 2002; Tenopir 2002a; Tenopir and King 2002b; Woodward 1997) indicate that:

- The majority of users believe that journals are very important for research
- The number of journals read on a regular basis varies
- The use of journals varies – most people combine some current awareness with searching for particular articles
- Specific references are most frequently obtained from colleagues

The following section, 3.4.5, has some details on use but in relation to document delivery.

3.4.5 Trend five : document delivery as a way–out of high serial costs

Libraries have of necessity begun to redefine themselves, looking towards resource sharing, interlibrary loan and document delivery to compensate for reduced subscriptions. While libraries are changing, they are somewhere in the middle of the process. It will take a long time for an 'access' environment to be complete. In this transition period, a major challenge will be to develop sensible plans which allow libraries to take steps forward. Many studies

have been undertaken to assess whether a library's journal subscription or providing access to journal articles by interlibrary loan is more cost-effective. Models have been based on estimating the cost per use for journal subscriptions and comparing it with the cost per request for interlibrary loan.

The study by Kingma (1996) and Kingma and Mouravieva (2000) estimated the costs of journal subscriptions and library and consortium interlibrary loans for the Library centres of the State of New York at Albany, Binghamton, Buffalo and Stony Brook in the US. The use study method was employed to track the use of both bound and unbound volumes for a one-year period. Use of the bound journals was recorded as part of the shelving process, with every re-shelving being defined as one use. Use of unbound journals were recorded on labels affixed to the front cover of all issues. All titles that received a total of five or fewer uses were defined as low-use titles and were considered candidates for cancellation. The cost per use of these low-use titles were based on the subscription price. The figure was then compared with access cost for these titles, derived using the ARL/RLG cost study figure of $18.62 of the average cost per interlibrary loan transaction. The ARL/RLG conducted an interlibrary loan cost study in the same time period. The ARL/RLG studied 1991 borrowing and lending operations costs of twenty-six research libraries in the US and Canada. The survey instrument measured the costs directly involved in interlibrary loans, factoring in staff, networking charges, photocopying fees, delivery charges and suppliers. This study found that in 1991 research libraries spent an average of $18.62 to borrow a research document and $10.93 to lend a document. Analysis of the data from the use study revealed that in fact $8.20 was the average cost per use of all titles while the average cost per use of low-used titles were $93.46. (Goosen & Irving 1995 : 45-48) It was revealed in the study that low-use titles are an expensive proposition.

The study showed a significant potential savings from an increased reliance on interlibrary loan. Interlibrary loan and document delivery services provide a way of accessing the documents not available on site. Electronic access and electronic communication between libraries have made interlibrary loan more convenient and time-saving. However, providing access is costly and it is therefore necessary to understand thoroughly the costs involved. (Kingma and Mouravieva 2000 : 20)

From the point of view of the library, given the current situation, the choice between one alternative or the other, that is, between acquisition through subscription or by interlibrary loan should be based on cost/efficiency criteria, that is the availability of access to a greater number of journals at the same cost. The costs, once they have been identified, are then compared with a certain degree of efficiency.

An economic model for acquisition is used to determine the most cost-effective method of access. Patrons can access a journal article by interlibrary loan or by the library's subscribing to the journal. The costs of access by interlibrary loan include salaries, supplies, and equipment for the lending and borrowing library as well as any document delivery fees. These costs are incurred each time an article is requested. The cost to the patron of interlibrary loan includes the period of waiting for delivery. Kingma (1996 : 23) showed that for most patrons of academic libraries this cost is, on average, trivial because the response time is two weeks rather than three months. The cost of ownership includes the cost of the journal subscription as well as the cost of cataloguing and shelving. Unlike the costs of interlibrary loan, the cost of a journal subscription is, for the most part, fixed and not incurred with each use.

A simple way of determining the most cost-effective method of access is to compare the cost of the journal subscription to the cost of each request multiplied by the number of requests. The most cost-effective method of access is the one with the lowest total costs over the lifetime of the journal: for example, if the cost of the subscription is R100 and the cost of the interlibrary loan is R10 for a single use. Only if the patron uses the journal ten times or more in its lifetime will a subscription be more cost-effective. In other words if there are ten or more requests for an article from the subscription, would the subscription be cost-effective. If the requests were under ten times then the most cost-effective method would be access via interlibrary loan. The cost of interlibrary loan, level of use, and the cost of the journal subscription must be estimated. (Kingma and Mouravieva 2000 : 23)

A survey of the literature has indicated that there is likely to be a gradual shift from a substantial ownership to an increasing emphasis on access for some categories of material. E-journals will have a strong impact but a relatively unimportant one because the function that they will take over is not that of the printed journal but that of an efficient means of

communication within the research community. In terms of measuring the cost-effectiveness of these new alternatives, it is clear that many libraries are lacking use-data in relation to their own journal collections and it will not be easy to assess the cost-effectiveness of alternative approaches.

Document delivery would be an economic solution for less requested periodicals. However, the commercial suppliers of document delivery, together with the increasing possibility of having e-journals available, make it increasingly possible for libraries to eliminate subscriptions to less-used journals by access to individual articles at the time of request. (Kingma and Mouravieva 2000 : 23)

From the analysis of the literature, it could be said that: access via document delivery becomes a possible alternative for all those journals where the possibility of obtaining an article quickly costs less than the price of subscription (including all costs) divided by the number of anticipated uses in a year.

Access can be based on subscription prices or cost per transaction. Pricing is negotiated directly with the aggregator. Such systems have opened entire new horizons about the actual usage of journals and particularly the individual articles within a journal. These systems are able to track what journals are used, which articles within those journals are used, and by whom.

3.4.6 Trend six: archiving and back-files

According to White (2001 : 508) in addition to rising costs, the problem that is being discussed in the literature is the issue of digital preservation and long term availability – who should be responsible for archiving? Who should pay for the establishment of an electronic archive? As e-journals become more mainstream and move to supplant or complement print journals, the formidable obstacle of how to ensure long term access stands in the way. Rapid obsolescence and uncertainty about the physical longevity of digital documents are major concerns. In the past, the library maintained an archive of paper copies, but now some libraries are discontinuing their paper subscriptions and relying on electronic versions. (White

2001: 508) Should it be the library that maintains an electronic archive or the publisher? Digital preservation will be more cost-intensive than the maintenance and storage of printed journals, especially preserving access long term with the technology changing.

Naturally, it is difficult to allocate responsibilities before more is known about the exact costs and long-term implications of digital archives. There first is a need to define international standards, for instance standard generalized markup language (SGML), portable document format (PDF) and document object identifier (DOI). The adherence to such standards is an important prerequisite for long-term availability and readability of any electronic document.

JSTOR (an acronym for Journal Storage) offers a solution to this. JSTOR is a unique case in the e-journals arena. Originally funded by the Mellon Foundation, it is now moving towards self-support through development and annual access fees to subscribers. JSTOR purchases copyright of back-issues of journals and is mounting these as bit-mapped images with searchable text files of the contents. Only back-files are available, and generally there is a five-year rolling time period between the current year and the first available year of the journal title from JSTOR. A major feature is its goal of building absolutely complete backfiles of the journal titles selected for digitization. (Rosenblum 2000 : 3)

3.4.7 Trend seven : changing role of the journal in the scholarly communication

Many e-journals are produced by academics bypassing commercial publishers and are available free on the Internet. However, very few of these are science journals which tend to be more expensive than journals in other fields. No subscription fee or publication fee is levied and the journals include no advertisements. Presumably these journals are based on voluntary contributions from academics and the use of institutional resources. Furthermore, academics are probably less efficient at producing journals than professional publishing staff who have the required business, design and technical skills. It is also questionable whether academics receiving no funding for the purpose could guarantee preservation and long-term access to their journals.

Experts still allocate journals a key position in scholarly communication. Experts recognize that distribution and communication of research findings can be achieved more quickly and effectively by other services. The advantages of journals remain, mainly in the areas of quality control, reward and recognition and enabling citation.

The Minister of Education's National Plan for Higher Education of February 2001 (Walker 2003 : 11) states that Universities will be evaluated on certain research outputs, that is the number of academic publications per annum, the research productivity of individual researchers in the higher education system and the number of postgraduate registrations. The primary South African Post Secondary Education (SAPSE) measure is academic publications, particularly articles published in international and national peer-reviewed journals. The acceptance of articles in journals appearing in the indices of the Institute for Scientific Information (ISI) has been recognized as a relevant output measure by the Department of Education.

The University of Natal Senate at its meeting of 20 November 2002 approved the allocation of Research Productivity Awards within the framework of an incentive driven research policy. An article in a journal is fifteen productivity units, sixty units if it is in a SAPSE journal and fifteen for a chapter in a book. The most productive faculties during 1996 – 2002 have been Science and Agriculture with over 100 SAPSE units per annum. The University has maintained a position in the middle rank of comparative national research output statistics, with an upward trend relative to other universities in the mid-1990s and a downward trend relative to leading universities in the late 1990s and in 2000. (University of Natal 2003d : 4)

During the massive restructuring of the University in the 1990s student numbers increased and teaching loads became substantially heavier, impacting critically on academics' ability to undertake research. Rewards to staff were allocated in recognition of excellence in teaching while research output may not have been equivalently rewarded. There have been insufficient incentives to motivate individuals to apply for competitive research funding in the international arena or to undertake cutting edge high risk research projects. (University of Natal 2003d : 2)

A new trend with scholarly communication is the open access initiative. Open access is an alternative to the traditional subscription-based publishing model made possible by new digital technologies and networked communications. Open access refers to works that are created with no expectation of direct monetary return and made available at no cost to the reader on the Internet for purposes of education and research. Open access operates within the current legal framework of copyright law and is intended to be free for readers, not free for producers. Open access focuses on academic research and is concerned with scientific and research texts that scholars give to the community without expectation of direct monetary return, including peer-reviewed journal articles, preprints, preliminary findings, and data sets. (Association of Research Libraries 2005 : 2)

There are many open access initiatives in place, namely the Budapest Open Access Initiative, which has been signed by a growing number of researchers, universities, laboratories, libraries, fourndations, journals, publishers, learned societies and scholars from around the world. A second such initiative is SPARC which is actively promoting both open access journals and the development of institutional repositories. The Public Library of Science (PLoS) is a grassroots initiative signed by over 30 000 scientists to encourage publishers to deposit their journals in central archives, like PubMed Central, within six months of publication. (Association of Research Libraries 2005 : 5)

3.5 Summary of the chapter

Various aspects of the subject of the study have been surveyed in this literature review. The purpose of the review was to establish the theoretical framework of the research and to indicate where the present study fits into these broader debates, thereby justifying the significance of the study. The aim of this literature review is not to give a detailed picture of the developments with e-journals. It rather tries to assess points of view, evaluate trends, study short and long-term implications and describe possible scenarios for the future. However a comprehensive review of the literature would give some indication of future developments.

As to the electronic journal itself, many developments as reported in the literature are currently taking place that give an insight into how things will evolve. Where relevant,

significant points identified in the literature review will be drawn on in the interpretation of the results of this study. The important issues that were identified were the existence of different pricing models, document delivery or interlibrary loans as a solution, access – simultaneous and off-campus access and finally archiving and digital preservation. Various solutions to the pricing dilemma were attempted, for example access instead of ownership, that is using document delivery to provide articles instead of subscribing to a journal. Another solution was putting together a consortia of libraries to negotiate better prices and provide access to sets of e-journals. A third solution is the creation and maintenance of electronic archives without reference to commercial publishers.

Chapter Four : Research methodology

4.1. Introduction

In this chapter, the research methods chosen to investigate the costs and benefits of journals are described and evaluated. The purpose of the study was to do a comparative analysis of the print and electronic journal collection in Science at the EGM Libraries, in terms of costs and benefits. The findings were intended to provide guidance for the library in dealing with the journal crisis and to inform the UND Libraries' decision-making processes, chiefly with regard to journal cancellation decisions and possible choices between print and electronic full-text journals. It was hoped that the findings would provide academics and other users of journal literature with information about the options available in this very expensive sector of scholarly publication and add to discussions about the implications of changing the scholarly communication system.

The means, techniques and frames of reference by which researchers approach and carry out inquiry is known as methodology. Thus methodology could be viewed as the essence of scientific investigation. One of the most widely used methods is observation, the direct surveillance and recording of dimensions of a phenomenon that is to be measured or evaluated. Data collection usually involves measuring some research phenomenon, whether it is a process, an object, or a human subject's behaviour. The instruments used include such tools as a questionnaire. (Busha & Harter 1980 : 11-12)

4.2. Research design

The research design measured the variables in the hypothesis and identified which groups of people the hypothesis should be tested on. (Bailey 1987 : 14) The research design is the plan or blueprint according to which data are collected to investigate the research. This includes the procedure for collecting data, measurement issues and data analysis plans. Conclusions are made based on the data collected and systematically presented and analysed. (De Vos 2002 : 137)

The study was intended to add to our understanding of the broad range of value that journals adds for students, academics and researchers across a range of scholarly activities including, reading, writing, searching the literature and creative thinking.

An objective of the study was to conduct a cost analysis of the Science print and electronic journals subscribed to by EGM Libraries and compare the cost of access to printed journals and the cost of full-text access to electronic journals. Another objective was to determine the benefits of print and electronic journals, and compare these benefits and weigh them against the costs. The other objective was to determine which of the two, journal ownership or full-text electronic access is most cost beneficial at UND Libraries.

Data was required about the journal collection in Science hence an analysis was done. Both qualitative and quantitative data was collected. To achieve this data was collected in many different ways. The methods of data collection for this study were: a literature review, use of documentary sources, analysis of journal data and surveys by self-administered questionnaires of the population of academic staff and postgraduate students as well as an interview with the Acting University Librarian, Ms Nora Buchanan.

Survey research is used to gather contemporary data. The main method of collecting information is by asking people questions, their answers constitute the data to be analysed. (Fowler 1984 : 1) The method employed for this research was surveys through using questionnaires of the user populations and interviews using a structured interview schedule. The main reason for selecting the survey method is that survey research can be defined as "the research strategy where one collects data from all or part of a population to assess a relative incidence, distribution, and interrelations of naturally occurring variables." (Powell 1997 : 57) The basic purpose of surveys is to describe the characteristics of the population being studied, estimate proportions in the population, make specific predictions and, test associational relationships. (Powell 1997 : 61)

Powell (1997: 61) states that "after identifying characteristics of the population, it then becomes important to estimate their proportions in the population. Without such data, one can say little about the significance of the traits." Information regarding characteristics or proportions is also necessary to make predictions about specific relationships. The main reason for using surveys is to collect information that is available from no other source. (Fowler 1984 : 12) The responses of the Faculty academic staff and students were obtained through this method. The strength of this method is the value of statistical sampling, consistent measurement, and the ability to obtain information not systematically available elsewhere or in the form needed for analysis.

4.3. Populations

The first step is to specify the group of persons or things to be studied. The objects of the study are called the units of analysis. The units of analysis most often used is the individual person. The universe refers to all potential subjects who possess the attributes in which the researcher is interested. Population on the other hand, refers to the sum total of all the units of analysis. The concept of a population is fundamental to survey research because it sets the boundaries on the study units. "Population" refers to any group of persons, objects or institutions that have at least one characteristic in common and all the measurements of interest to the research are represented. (Busha & Harter 1980 : 56; Bailey 1987 : 81)

The research population constitutes of four components namely the journals, the Acting University Librarian - Ms Nora Buchanan and the users of UND Libraries – postgraduate students and the academic staff in the Faculty of Science.

4.3.1 The journals

The criterion for selecting the journals was that they should be titles that were subscribed to by the Faculty of Science. As science, technology and medical journals costs are the highest, it was appropriate to select the population of Science journals to study. There were also likely to be more electronic journals in the Science field. Science has also had e-journals, for example, in Physics titles were in existence since the 1980's. The journal titles fall into broad subject disciplines, that is, Biology, Chemistry, Computer Science, Geography, Geology, Mathematics, Statistics and Physics that coincided with the University departments or Schools. The annual subscription prices and the percentage increase of the print journals with their electronic counterparts in the disciplines of Science during the academic year 2002 to 2003 were studied. In 2001 the UND Libraries subscribed to approximately 235 Science journal titles. (University of Natal Annual report 2001)

The total number of current journals held by UND Libraries as at the end of 2003 was 6733 current journals and approximately 320 electronic journals.

These holdings include:

- Unique print journal titles received
- Unique electronic full-text journal titles

- Unique current journal titles
- Overlap current journal titles – titles received both in print and electronically
- Total electronic full-text journal title
- Titles whose costs are shared – through a consortium or inter/intra campus

The bound journals were not considered for this study because these titles are not current but are archival and consist of the back issues of journals that are older than three months. The present study concentrated on the most current, Internet or online editions of journal titles. This study focused on the Internet-based current subscriptions. Other types of publications - newsletters, e-zines, and the like are not subjects of study. All electronic journals that are available on CD-ROM or diskette will not be considered because these are once again back issues or archival copies. Back issues further complicate the matter because there are a number of problems related to them, such as who has the responsibility to maintain an archive and provide access. While these issues are touched upon in the analysis of costs and benefits, they are not the direct focus of the study.

There are several ways of categorizing print journals. These are :

- number of print journal volumes;
- number of paid subscriptions and
- number of gift subscriptions or donations.

In the print environment, the library either pays or does not pay for a subscription. For electronic journals, it can be assumed that "paid" describes any monetary transaction that results in having access to an electronic journal, the current environment allows the following variations:

- The electronic journal comes free with the paid print subscription
- The electronic journal costs extra with the paid print subscription
- The electronic journal is purchased separately from the print or has no print counterpart.

The electronic environment also requires that we consider at least two possible variations for 'gift' journals: the electronic journal is free to all; or another party has paid for access to the electronic journal that patrons may also use.

4.3.2 Acting University Librarian - Ms Nora Buchanan

Ms Buchanan is responsible for the Materials budget and budget allocations to the Faculties on the Durban campus. She oversees the Technical Services Department which is responsible for acquiring and cataloguing the journals. The Librarian signs licence agreements, sets up access to electronic journal titles and negotiates package deals with publishers and vendors.

4.3.3 The users

The third and fourth populations to be studied were the populations of user groups : postgraduate students and academic staff in the Faculty of Science. In this study in both cases the entire population was studied. The population consists of 248 postgraduates (University of Natal 2003e : 3) and 97 academic staff. (University of Natal 2003f : i- vii)

4.3.3.1 Postgraduate students

A postgraduate student is defined as an individual who is busy with postgraduate education and is affiliated with the Faculty. These students are registered for Postgraduate Diplomas, Honours (BSc. Honours) Masters (MSc) and Doctorates (PhD or DSc.). Most postgraduate students have a computer workstation in their office, or have access to the campus computer network (LANs). Most of the electronic resources can be accessed from these various locations. Postgraduate students conduct some of their studies on campus and also work out in the field, laboratories and from their offices.

4.3.3.2 Academic staff in the Faculty of Science

All 97 academic staff in the Faculty of Science were studied. The Faculty of Science consists of the School of Life and Environmental Sciences, the School of Geological and Computer Sciences, the School of Pure and Applied Chemistry, the School of Pure and Applied Physics and the Schools of Mathematical and Statistical Sciences. The core responsibilities of academic staff are research and teaching. All academic staff have a computer workstation in their offices, or have access to the campus computer network (LANs). Most of the electronic resources can be accessed from these various locations.

4. 4. Procedures for data collection

Having selected the basic methodologies to be used, the next step was to select or design the specific technique or techniques to be used to collect the necessary data. One of the most far-reaching decisions a researcher must make is the way in which the data will be collected. This stage is a critical point at which safeguards against bias and unreliability should be introduced. (Powell 1997 : 62) Bias can be defined as "any influence, condition, or set of conditions that singly or together distort the data from what may have been obtained under the conditions of pure chance." (Leedy 1993 : 213) Although a majority of surveys utilize a single data collection method, for this study a combination of methods were used.

4.4.1 Triangulation

Triangulation means that the data is gathered by comparison of the results of two or more methods. (Bailey 1987 : 263) By this method, several different types of sources can provide insights about the same events or relationships. A multi-pronged method of data collection was adopted for this study. The use of multiple data gathering techniques in a study enhances precision. Two or more research processes can be used to compensate for inherent weaknesses in a primary data gathering instrument, thereby producing supplementary research data that can be used to minimize error. When data is collected by several strategies, the researcher can be more certain of his or her findings and can draw more reliable conclusions. (Busha & Harter 1980 : 88; De Vos 2002 : 341) A more complete picture of the setting is yielded because different viewpoints are represented. (Clarke 2003 : 86) Perhaps the greatest use of triangulation according to Cohen centres around validity rather than reliability checks. This method would check out the extent of divergence in the data collected. If data divergence is minimal, then the researcher will feel confident in the data's validity. If the data is significantly different, then the researcher has an idea as to possible sources of biased measurement, which should be further investigated. (Cohen 1994 : 238)

4.4.2. Literature review

A review of the literature is aimed at contributing towards a clearer understanding of the nature and meaning of the problem that has been identified. The search for relevant literature

enables the researcher to find out what has already been done in relation to the problem to be investigated and makes duplication of existing studies less likely. (Aitchison 1998 : 58) Research methods used and evaluated in similar studies can be examined and their suitability for the study in hand can be assessed.

The literature review of the relevant professional and scholarly literature was carefully planned and synthesized. The literature review clearly delineated the research problem, uncovered methodologies that were used successfully by other researchers. It also helped to determine what research had already been completed on the subject and allowed the researcher to gain a better understanding of the many facets of the problem at hand. (De Vos 2002 : 128; Mason 2002 : 52)

4.4.3 Documentary sources

The second method of data collection was the study of documentary sources. These are text-based documents. This method could usefully inform qualitative projects where interviews are chosen as a method. The interview helped the researcher to understand some elements of the documentary sources. The process of reading, understanding, translating and interpreting, selecting and comparing documentary sources and interview responses added a further dimension of construction as well as reflexivity. Documentary sources may be in a private and confidential form and it can be difficult to establish informed consent for their use because they may refer to or implicate people other than their keepers or owners. These sources were not written with a view to research. (Mason 2002 : 105)

The data was gathered by using the Durban Library Advisory Committees (DLAC) agenda and minutes for the period 1999 to 2004. The Durban Library Committee is a body which sets library policy and consists of the University Librarian and Deputy University Librarian, representatives from each Faculty who report to their Board meetings, and a student representative. The committee meets to discuss Library policy issues, budget matters and Faculty book and journal allocation.

The data from the South African Post Secondary Education (SAPSE) files for the same period were also gathered. SAPSE files provide a range of statistics which records the number of full-time equivalents (fte) students of the University, the number of publications by academic

staff, the number of publications both books and journals that the Library adds to its collection and various other statistics. It is the framework according to which the subsidy is granted by the Government. It is a reflection of the teaching and research at the University.

Relevant data was collected from the minutes of meetings of the University Council and Senate, UND Libraries financial statements, University Webpages, archival records, published statistics, institutional publications and budget releases to indicate budget allocations and journal expenditure. Descriptive statistics are published regularly by the Library, for example, the number of journals catalogued per month, the number of interlibrary loans requests received and so on. These were also examined.

4.4.4 Analysis of journal data

As data was required about the journal collection in Science, a number of lists was collected. The costs for the lists of Science journal titles were generated in three ways:

- The print and electronic journal costs were derived from the URICA Library acquisitions module. Only titles for which all 2003 issues had been received by the University Libraries by the end of December 2003 were included. These costs indicated the definitive price paid by the Library for each subscription. The institutional subscription prices were recorded from the first available issue of the 2003 volume for each title.

- In those cases where print journals do not make subscription prices available, *Ulrich's International Periodicals Directory* were consulted. This directory contains information on nearly 165,000 serials published throughout the world arranged under subject headings. Included in this directory are journals that have ceased, have been suspended, new serial titles, currently available serials and serials available in electronic formats, either online (either in addition to printed) or CD-ROM. For journals providing their subscription prices in foreign currencies, prices were converted into South African Rands.

- In those cases where electronic journals do not make their subscription prices available, the Association of Research Libraries (ARL) Directory of Electronic

Journals, newsletters and academic discussion lists were checked for those titles that are available electronically with their subscription and associated costs. This directory provides lists of electronic journals categorized according to discipline.

The lists were combined and duplicates removed. The annual subscription prices and the cost increases of the print journals with their electronic counterparts in the Faculty of Science during 2002 to 2003 academic year were compared. Costs in the broad areas of space, systems, services, supplies and staff were collected and then allocated to either current print journals or electronic journals.

No usage data of print or electronic journals were collected except for those obtained in the surveys. Usage data refers to circulation, interlibrary loans, reserved book room and shelving statistics. The library does not compile usage data for electronic and print journal usage except issue statistics for bound volumes, which were not part of the study. The Library also does not collect statistics of the photocopying of print journals.

4.4.5 Interview with the Acting University Librarian - Ms Nora Buchanan

In survey research, the search for new information is by no means limited to the use of questions. As the purpose of surveys is to acquire current information about such factors as the experience and opinions of people, the interview also serves as a useful survey tool. Interviewing is the predominant mode of data collection. Verbal communications with research subjects elicit significantly more complete answers to questions than a printed survey instrument. When researchers conduct interviews, they are attempting to gain information from persons who are able to provide research data. Verbal responses often provide valuable original evidence. (Busha & Harter 1980 : 78)

The Acting University Librarian's views, understandings, interpretations and experiences were considered useful for elucidating the research questions of the study. The interview added an additional dimension, and helped the researcher to approach the questions from a different angle. Mason (2002 : 62 – 67) reported that the interview can be used in tandem with documentary sources to corroborate the other sources of data. In some cases the data provided in the interview was not available in any other form.

A series of structured interviews in March 2004 were conducted with the Acting University Librarian. These focused interviews had a selection of carefully prepared questions or topics which was used to make sure that the required ground was covered. This information given by the Librarian covered what she had experienced in her two years of Acting University Librarian, what she knew, that is factual information and insight into what happens at present regarding the relevant library operations. In short, she provided insight into the journal situation at the EGM Libraries.

4.4.6. Survey of the user populations

This study was intended to explore the behaviour of the users of both print and electronic journals. Given the nature of the research problem and the purpose of the study, the most appropriate methodological approach was to conduct a survey.

The survey was conducted to gather recorded and unrecorded data about the various facets of the library's community. Survey research is characterized by the selection of the population to obtain empirical knowledge of a contemporary nature. This knowledge allowed generalizations to be made about characteristics, opinions, beliefs, attitudes and so on, of the entire population being studied.

The field methods used to obtain survey research data generally consist of a combination of techniques such as questionnaires, interviews with respondents and participant observation. Because the purpose of most field studies is to obtain data that will allow accurate descriptions of situations or relationships between certain variables, informational inadequacy and efficiency are usually major considerations in survey research. (Busha & Harter 1980 : 53)

4.4.6.1 Questionnaires

Questionnaires are often used in survey research as the primary data collection instrument. The purpose of the research was to obtain valid and reliable information so that specific hypotheses could be tested or research questions answered. The advantage of the questionnaire is that it provides an opportunity for the respondents to give frank, anonymous

answers. It facilitates the collection of large amounts of data in a short period of time. It can be completed at the leisure of respondents within time limits set by the researcher without imposing on research subjects. (Busha & Harter 1980 : 61, De Vos 2002 : 173)

To determine the benefit derived, a ten page self-administered electronic questionnaire (see Appendix C and D) was used to elicit responses from the postgraduate students - the users of the print and electronic journals. The questionnaire as a method of data collection was chosen because it suited the nature of the problem, namely to obtain factual information. This method is useful for dealing with large populations. (Fowler 1984 : 100) A similar questionnaire was used to elicit responses from the academic staff.

The questionnaire was intended to investigate usage behaviour and preferences of users regarding a variety of journal features, to measure current usage of journals, problems users encounter, searching behaviour of users, what users prefer – print or electronic journals - and subscription-related behaviours. In order to use the computer in data analysis, the questionnaire was compiled in a certain manner. Mr Jeethend Ranjith from Information Technology Division (ITD) assisted with the compilation of the question using the software PHP Surveyor. The questions were divided into six sections in order to facilitate the eventual processing of the data. A variety of response systems or question types were used.

4.4.6.1.1. Forms of questions

Designing a good questionnaire involves selecting the questions needed to meet the research objectives, testing them to make sure they can be asked and answered as planned, then putting them into a form to maximize the ease with which respondents and interviewers can do their jobs. The variables to be measured should be listed in categories or areas that make sense. An analysis plan should be developed to go with the list of variables to be measured. (Fowler 1984 : 100)

Hence, the preparation of an effective questionnaire entails writing questions or items that elicit required information. Several types of questions were utilised, including factual, opinion and attitude, information, self-perception and standards of action. Factual questions pertaining to the respondent's gender, age and area of study were posed.

4.4.6.1.2 Rating scales, attitudinal statements and checklists

Attitudinal questions or statements are mostly used to obtain data of a subjective nature, for example about disposition, feelings, values and related concepts, attitudes and opinions. A variety of statements are presented simultaneously and response options are offered dichotomously or scaled. (De Vos 2002 : 182) An attitude has been defined as 'a relatively enduring organisation of interrelated beliefs that describe, evaluate and advocate action with respect to an object or situation, with each belief having cognitive, affective and behavioural components.' Opinion and attitude questions were included in the survey to determine the respondents' ideas, inclinations, prejudices and convictions. (Busha & Harter 1980 : 66)

A variety of questions utilise scales in order to measure the intensity of views held by people. Many structured questionnaires are multiple choice items and respondents are asked to choose the 'best' or 'most appropriate' of several options. One kind of scale is the rating scale. The response categories were designed in such a way that the respondents mark a certain point on the scale.

4.4.6.1.3 Information questions

Information questions are utilised when researchers want to determine what respondents know about a given topic and how or when their research subjects gained that knowledge. There were also information questions to measure the respondents' knowledge of the library and its services, computer expertise and usage of journals. Standard and action questions provide valuable information about future respondents behaviour. The latter determined how the respondent would act in certain circumstances. Questions about actual past and present behaviour which can be used to predict future behaviour were asked. (Busha & Harter 1980 : 66)

Questions relating to computer skill were asked especially Windows-based skills. Certain questions can be asked to determine their skill and what kind of computer equipment is being used. In an ideal situation a physical test would have to be conducted to test this computer skill, therefore to overcome this certain questions were asked to test this skill.

4.4.6.1.4 Closed or fixed questions

Generally speaking, if a self-administered questionnaire is to be used, closed questions are preferred, that is, questions that can be answered by simply checking a box or circling the proper response from a set provided by the researcher. Asking people to answer questions in their own words increases the difficulty of the task, which could affect the rate of non-response for many types of respondents. The closed questions make the questionnaire easier to administer, uniform in answers and easily processed and analysed. (Coombes 2001 : 124)

Structured or closed questions are characterized by a group of fixed responses; survey respondents are allowed to choose among several answers, designed to reflect various views, beliefs and feelings. The structured questions are closed because they do not elicit unpredictable responses. Closed questions limit the responses of the respondents to stated alternatives. The possible responses may range from a simple 'yes' or 'no' to a checklist of possible replies, to a scale indicating various degrees of a particular response.
(Fowler 1984 : 65)

A closed question may force a statement of opinion on an issue about which the respondent does not have one. To cater for responses that were not anticipated, another category was added to give the respondent the opportunity to express a personal opinion. The inclusion of "uncertain" or "no opinion" type responses can also help to provide an indication of no opinion, but again the respondent is inclined to give a more definite answer. These offered the respondents the opportunity of selecting (according to instructions) one or more responses from a number provided. The question can be answered within the same framework and facilitates comparison of responses. Providing possible answers can also help the respondent cover up a certain amount of ignorance and provide a reasonable answer even when he/she knows nothing about the subject. This to some extent will be avoided in this study because the questions progress from one to another. If there is a certain amount of ignorance – this will be indicated. (Busha & Harter 1987 : 70; De Vos 2002 : 179)

Second, and more important, self-administered open-answers often do not produce useful data. With no interviewer present to probe incomplete answers for clarity and for meeting consistent question objectives, the answers will not be comparable across respondents, and they will be difficult to code. (Fowler 1984 : 64)

Special attention was paid to the library terminology and the questionnaire determined:

1. whether the patron uses journals that are:
    a. electronic only;
    b. print only;
    c. both print and electronic and
    d. neither print nor electronic?
2. whether the decision to discontinue use of print titles had been influenced by the availability of electronic access?
3. what the preference is – print or electronic and why?
4. what the kind of access is – Internet or CD-ROM or other?
5. difficulties of this access?
6. whether users are satisfied with the present service?
7. how satisfied users are with access to the Library's print subscriptions?

4.4.6.1.5 Open questions

There were some open or unstructured questions which ascertained what the respondents felt to be important, to the extent that they were truthful, but they did not indicate the degree or strength of feelings in any consistent way. This allowed the respondents to answer in their own words. Particularly where attitudes of different groups are to be compared, some element of objective measurement is desirable.

4.4.6.1.6 Electronic questionnaires

A design decision cutting across all areas is the mode of data collection, whether the researcher will collect the data by telephone, electronic mail, personal interview or some other way. One of the advantages of using electronic mail is that it is an almost instantaneous communication between researcher and subject. E-mail has a very favourable response rate when compared to conventional mail. (Coombes 2001 : 147)

The questionnaire, especially the mail questionnaire, tends to encourage frank answers. This is in large part due to the fact that it is easier for the researcher to guarantee anonymity for the respondent when using a mail questionnaire. In addition, the respondent could complete the questionnaire without the researcher being present. The fixed format of the questionnaire tends to eliminate variation in the questioning process and allows well-thought out and accurate responses. The questionnaire also facilitates the collection of large amounts of data, which was the researcher's intention and this data was relatively easy to collect and analyse. (Powell 1997 : 91) Self-administered procedures are thought to be best because the respondent does not have to admit directly to an interviewer a socially undesirable or negatively valued characteristic or behaviour. In addition, a certain amount of space for free text can be allocated in the hope that respondents will expand on issues. (Powell 1997 : 91)

The disadvantages of the questionnaire are that the personal contact between researcher and respondent is eliminated. The respondent will not be able to qualify answers or seek clarity on questions, for those respondents who are not familiar with the subject matter, or are opinionated regarding the subject matter, may be biased. (Powell 1997 : 91)

The main advantage of creating questionnaires on a Webpage is that layout can look very professional and when returned, the answers are clearly indicated. In the survey instrument for this study, an important feature of the electronic questionnaire was that the participant could only enter the data where the researcher indicated. A number of mandatory questions were included which respondents were required to answer before they progressed to the next question. A deadline for answers was set after which responses would not be included. (Coombes 2000 : 147)

The questionnaire was administered by electronic mail to multiple addresses. The message had a link to the survey which was on the university's edon server. The respondents clicked on the link to access the questionnaire. It was available at address : http://edon.nu.ac.za/phpsurveyor/index.php?sid=12

With the university's computer infrastructure, all the respondents have access to electronic mail and the Internet. Most electronic mail software offers speed and immediacy. Subjects

can respond as and when they feel comfortable. The disadvantage is that the message can be deleted just as quickly as it is sent. (Miller 2003 : 86)

4.4.6.1.7 Questionnaire for postgraduate students

A ten-page self-administered questionnaire was sent via electronic mail to postgraduate students. It had four categories of information, namely : demographics, library usage, computer expertise and usage and the journal experience. The final category – journals was in two parts : print journals and electronic journals. The questionnaire sent to postgraduate students requested information on the degree or diploma they were registered for and their primary research field.

4.4.6.1.8 Questionnaire for academic staff

A separate and slightly different ten-page self-administered questionnaire was sent via electronic mail to academic staff. It had four categories of information, namely : demographics, library usage, computer expertise and usage and the journal experience. The final category – journals - were in two parts : print journals and electronic journals. The questionnaire sent to staff requested, in addition, information on their position or equivalent status at the University, primary research field and their primary responsibility.

4.4.6.1.9 Pre-testing the questionnaires

Once researchers have developed an instrument and are satisfied with its general wording and sequencing of questions, they must pre-test the questionnaire. Every questionnaire must be pre-tested no matter how skilled the researcher. Virtually every questionnaire could be changed in some way to make it easier for respondents and interviewers to meet the researcher's objectives. Obviously, the closer the final instrument is to perfection, the better the research process. Once the final questionnaires are printed and data collection has begun, changes are expensive and very difficult to make. (Fowler 1984 : 103)

Newly developed questionnaires should be pre-tested among respondents who are similar to the population that is targeted for the anticipated survey. A pre-test gives the researcher an opportunity to identify questions that tend to be misunderstood by the respondents, do not

obtain information that is needed and so on. Careful examination of the research questions when pre-testing will give the researcher some measure of the reliability of the research technique. (Powell 1997 : 95)

Researchers should not begin the main inquiry unless they are confident that the chosen procedures are suitable, valid, reliable, effective and free from problems and errors, or at least that they have taken all possible precautions to avoid any problems that might arise during the study. (De Vos 2002 : 210) The pre-testing of a measuring instrument consists of 'trying' it out on a small number of persons having characteristics similar to those of the target group of respondents. Newell (1992 : 112-113) suggests that a ten percent sample is adequate. A minimum pre-test would involve ten to fifteen respondents. Although a representative sample is not needed, the pre-test sample should exhibit the characteristics of the final sample as closely as possible.

This questionnaire was pre-tested in October 2003 on a sample of postgraduate students and academic staff at the Medical School to examine the clarity, content, validity and relevance of the questions. The staff and students at Medical School were considered sufficiently similar to the population under study. The sample for the pre-test was one member of staff from each category of academic staff, that is, Head of School, Senior Lecturer, Junior Lecturer and Tutor and five postgraduate students. The total number of respondents was ten. The respondents were informed that the purpose of the questionnaire was to ensure that the questions and procedures worked properly. A covering letter was sent with the questionnaire with instructions, the purpose of the survey and the potential helpfulness of the study. Respondents were asked to identify confusing and difficult questions. Particular attention was focused on the instructions. The questionnaire was sent to the respondents in the University's internal mail and respondents were given the option of returning it via the same route or handing it to the Medical Subject Librarian, Ms Rani Moodley. All the completed questionnaires were handed to Ms Moodley. A comment sheet was provided with the questionnaire. Respondents were given a week to complete the questionnaire. The pre-test did not test the Web-based questionnaires.

4.4.6.1.10 Changes made after the pre-test

Changes were made to the instrument and the research plan as a result of the pre-test. The only changes required concerned the use of terminology. These changes were:

- The re-wording of computer to personal computer
- Respondents did not know the difference between databases and online indexes and an example of each was included for clarity.

Only after the necessary modifications following the pre-test, was the questionnaire presented to the full population.

4.4.6.1.11 Administering the questionnaires

The survey questionnaire was administered by electronic mail with a clickable link to the survey to both postgraduate students and academic staff. PHP Surveyor was used for the questionnaire. It is a multi-question surveying tool. PHP Surveyor is a set of PHP scripts that interact with MySQL to develop surveys, publish surveys and collect responses to surveys. It is software that is freely available on the Internet, but is supported by the Information Technology Division of the University of Natal.

Once the survey was created it was published as an online survey. The responses resided on the University network server edon in a database. This enabled the respondents to complete the questionnaire and click on submit. Respondents were also given the option of requesting (by e-mail) the delivery of a hard copy or printed copy of the questionnaire by campus internal mail or printing out the survey and returning it via internal campus mail. The data was entered by the respondents.

A systematic distribution was intended to capture academic staff. In addition, postgraduates were targeted through liaison with the Library Representative in each School in the Faculty of Science. In an attempt to minimize the drawbacks of the Web-based questionnaire, a covering letter accompanied the questionnaire to explain the purpose, timing and proposed outcomes of the study. The importance of the research study was given and that the object of the survey was to improve the library service, in this way encouraging respondents to view the survey as being of importance to them.

The questionnaire was sent out during the last semester of the 2003 academic year, on 25 November 2003 and respondents were given two weeks to respond. Fourteen days later, the questionnaire was sent out again and respondents were given a week to respond. One week later the questionnaire was sent out for the third and final time, giving the respondents four weeks to respond to the three requests.

4.5 Method of analysis and coding of data

Data analysis entails the breakdown of data into constituent parts to obtain answers to research questions and to test the hypothesis. The analysis of research data, however does not in itself provide the answers to research questions. Interpretation of the data is necessary. The purpose of analysis is to reduce data to an intelligible and interpretable form so that the relations of research problems can be studied, tested and conclusions drawn. (De Vos 2002 : 223)

The coding was done after the data was collected. The responses to the survey were exported into Microsoft Excel. The data was manually checked and cleared of any errors. Once the data was collected, it was coded and presented in tabulated form, cross-tabulated analytical table. Cross tabulation is a way of representing how categories of one variable (independent variable), traditionally the column heading, are distributed across the categories of another variable, dependent variable, normally found in a row. The researcher is then able to see whether there are any patterns of association between the variables.

Most of the data were recorded using numerical values such as 1 and 2. Saunders et al (2000 : 334) noted that "each variable for each case in [the] data set should have a code." These codes were assigned to closed questions that required a "Yes" or "No" answer as well as for multiple response questions. Numerical values of each of the variables were assigned in a numerical sequence according to the order in which they were arranged in the questionnaire. A total count of the frequency of occurrence of each variable was made to determine the frequency of use of each source and compared with the next variable.

Qualitative data were obtained from the open-ended questions. Content analysis was done for the open-ended questions after the data was collected. These responses were manually

analysed and similar responses were grouped together to facilitate the counting of the frequency of occurrence of the similar responses. Content analysis is the technique for making inferences by systematically and objectively identifying specified characteristics of responses. Miller (2003 : 43) defines content analysis as

> 'the description and analysis of text in order to represent its content. This takes the form of enumeration, such as counting the frequency. It establishes the meaning only in what is explicit in the words used and what is implied by their use from a range of alternatives'.

In simple, it is describing the context of text. The frequency of the words used were counted, with its variants. Tables and graphs were used to establish relationships between variables.

During the interview with Ms Buchanan, her responses to the questions were summarized and later analysed. An analysis of the responses was carried out by examining all the responses and determining similar responses and numerically coding accordingly. Preliminary coding was used. A summary of the interview was given to Ms Buchanan for perusal.

4.6 Evaluation of the method

The key issue to consider before adopting any method of research is whether the research is likely to be reliable and valid. In order for the data to have meaning, it needs to be reliable. Reliability refers to how well the survey instrument can be used to generate similar results in different situations.

Validity refers to how well the research instrument measures what it is supposed to measure and whether the findings are really about what they appear to be about (Coombes 2001 : 32-33; Saunders 2000 : 101) The research results confirmed the validity of the instrument and the only drawback was the low response rate. The reliability of this study was enhanced by the use of triangulation and the data was collected from the following sources : documentary sources, analysis of journal data, interview with the Acting University Librarian and the survey of the user populations, and was used to corroborate the findings. By this method several different types of sources could provide insights about the same events or relationships.

In all research that elicits information from a study population, and particularly if it depends on the population to remember behaviours they performed in the past, the factor of human error has to be taken into account. In the researchers' opinion e-mail does not have a favourable response. In spite of the researcher's best efforts at clarity and comprehensiveness, the following problems were apparent.

With the online survey, the researcher had little control over who responded to the questionnaire and it was also anonymous. Follow-up was therefore difficult and the survey had to be sent to all respondents on all three occasions.

The online questionnaire was used in order to minimise the effects of subject bias, observer bias and observer error. A questionnaire such as this, removes the possibility of influencing the respondents' responses. Respondents may not feel free to express their opinion about the library service and journal experience.

4.7 Summary of the chapter

This chapter presented and discussed the research methodology that was employed by this study. The study surveyed the entire population of academic staff and postgraduate students in the Faculty of Science. The method employed was surveys through an electronic questionnaire and an interview with the Acting University Librarian, which have been described in this chapter. The electronic questionnaire was preferred mainly for its speed of communication and its internal validity strength.

The research results confirmed the validity of the instrument but the only drawback was a low response rate. The researcher had little control over who responded.

Chapter Five: Findings of the study

5.1 Introduction

This chapter discusses the results of the survey, of the analysis of the journal data, and the interview responses of Ms Nora Buchanan.

5.2 Background to the survey

The results of the survey of the population of postgraduate students and academic staff by means of an electronic questionnaire are reported. The data collected was analysed and interpreted using Microsoft Excel. This entailed using simple tables, which show frequencies of occurrence through establishing statistical relationships between variables. The purpose behind each question that was asked is explained and the results are reported.

In December 2003, 345 self-administered surveys were sent to the Faculty of Science postgraduate students and academic staff. Out of a total of 345 questionnaires distributed, 98 were returned indicating a response rate of 28 percent. The population of academic staff was 97 and 38 of the academic staff responded indicating a response rate of 39%. The population of postgraduate students was 248, of whom 60 responded indicating a response rate of 24%. The total number of respondents who answered each question is used as the basis for the percentages.

In survey research, it is generally accepted that it is important to gain the people's co-operation so that they can provide the data that is required for the purpose of meeting the requirements of the study. Adequate data collection will enable the researcher to make meaningful generalisations about the group of people being studied. Response rates of electronic questionnaires are likely to be very low, and there are considerable problems of non-response bias as the participant has to take extra steps to locate and complete the questionnaire. Conflicting views were found on the successful use of e-mail. This survey tended to confirm that the response rate for Web-based questionnaires was not good. A good response is also dependent on the recipient being motivated to answer the questionnaire and to complete the questionnaire and submit. (Saunders 2000 : 312) Owen and Jones in Saunders (2000 : 158) observe that response rates in surveys can be as low as

40% and that a response rate of approximately 30% is reasonable, as in the case of this study with an overall response rate of 28%.

A possible reason for the low response in this study was the timing of the questionnaire. In normal circumstances December would have been an ideal time to administer the questionnaire. But due to the impending merger of the University of Natal with the University of Durban-Westville, examination and graduation dates were brought forward. As a result, when the questionnaire was administered in December, postgraduate students were completing their theses, preparing for examinations and so on and may have not responded for these reasons. Academic staff were busy with examination marking and finalisation of results for the graduation ceremonies held in early December.

However, given the size of the population investigated, the researcher believed the response rate could, with some caution, be used to make generalisations about the total population.

5.3 Questionnaire results

The questionnaire was arranged to cover the six main areas of the research as outlined in Chapter 4. The areas covered are and will be reported under these broad headings, namely : demographic data (5.3.1), library usage (5.3.2), computer expertise and usage (5.3.3) and journal experience (5.3.4). Journal experience is further discussed in two parts : print journal experience (5.3.4.1) and electronic journal experience (5.3.4.2). As two separate questionnaires were administered, a distinction will be made between the responses of the academic staff and those of the postgraduate students, but in some instances the responses will be discussed as a whole.

As this was a Web-based questionnaire, it had filters and the questions were laid out in a branch formation. Respondents had to answer questions in the four main sections. The first section on demographics was mandatory and all respondents had to answer these to progress to the next section. For the next three sections, if respondents did not use the library, or personal computers or journals, the survey took them to the end of the questionnaire. Questions in these three sections were either mandatory and optional. Each section progressed onto the other. But all the respondents, 38 academics and 60

postgraduates progressed through each section. None of the respondents indicated that they had not used the library, personal computer or journals.

5.3.1 Demographic data for academic staff and postgraduate students in the Faculty of Science, UND

The questionnaire contained five items for postgraduate students and six items for academic staff in this section, to gather background data and experiential data on respondents. The background data collected on respondents were their names (which were optional), gender, age range, degree/diploma currently enrolled for and primary research field for postgraduate students. The name, gender, age range, position at the university, primary research field and primary responsibility was collected for the academic staff.

5.3.1.1 Gender and age profiles

According to the Faculty of Science handbook (University of Natal 2003f : 5), there are 97 academic staff, of whom 78 are male and 19 are female as at December 2003. Of the academic staff 29 (76.3%) male respondents answered and 9 (23.6%) were female staff, hence the male respondents were in the majority in the academic staff grouping. For the postgraduate students the gender distribution was almost evenly distributed with 29 (48.3%) male and 31 (51.6%) female. Respondents ages were recorded using ranges so they would not feel uncomfortable disclosing their ages. Table I represents the summary of demographic data.

Table 1 : Gender and age of respondents

Gender	Frequency	Percent	Age	Frequency	Percent
Academic staff n=38					
Male	29	76.3	18-23	0	0
Female	9	23.6	24-29	1	2.6
			30-39	11	28.9
			40-49	13	34.2
			50 and over	13	34.2
Postgraduate students n=60					
Male	29	48.3	18-23	11	18.3
Female	31	51.6	24-29	33	55
			30-39	13	21.6
			40-49	3	5
			50 and over	0	0

Responses were received from 38 (39%) academic staff and 60 (24%) postgraduate students. A question was asked to find out the position or equivalent status of academics at the University. The positions ranged from Professor to Junior Lecturer. There were two (5%) Junior Lecturers, two (5.2%) Lecturers, 12 (31.5%) Senior Lecturers, five (13%) Associate Professors, 11 (28%) Professors and eight (21%) respondents indicated other and this included one (2.6%) Pro-Vice Chancellor, one (2.6%) Research assistant, and four (10.5%) Senior tutors. Other also included the two lecturers omitted in error as a category from the survey. The responses indicated that 29 (76%) respondents occupied senior posts (Senior lecturer and above). The majority of the responses were from the age groups 40 to 49 and 50 and over of the academic staff.

5.3.1.2 Primary research field

Respondents were asked to indicate their primary research field. This would give an indication of the field the respondents were mainly involved in and also to which School or Department the participant belonged. Of the 38 academic respondents who completed the questionnaire, the majority, seven (18.4%) had their primary research field as Mathematics. There were six (15.7%) respondents from Chemistry, six (15.7%) from Physics and six

(15.7%) indicated other, and these were one from each of the following fields: Education, Electronic Engineering, Forestry, Human Geography, Linguistics and Tourism studies.

Of the postgraduate respondents 20 (33.3%) were from Environmental Sciences, followed by 15 (25%) from Biology and 12 (20%) from Chemistry. There were three (5%) other responses and these were from the fields of Chemical Transformations, Education and Remote Sensing. As Science is a multi-disciplinary subject, there is an overlap in disciplines. Table 2 and 3 indicate responses from the academic staff and postgraduate students on their primary research field.

Table 2 : Primary research field : Academic staff n=38

Research field	Frequency	Percent
Mathematics and applied mathematics	7	18.4
Physics and applied physics	6	15.7
Chemistry and applied chemistry	6	15.7
Other includes Education, Remote Sensing & Chemical Transformations	6	15.7
Biological sciences	5	13.1
Environmental sciences	3	7.8
Statistics	2	5.2
Computer science	2	5.2
Geology	1	2.6
Bio-medical sciences	0	0

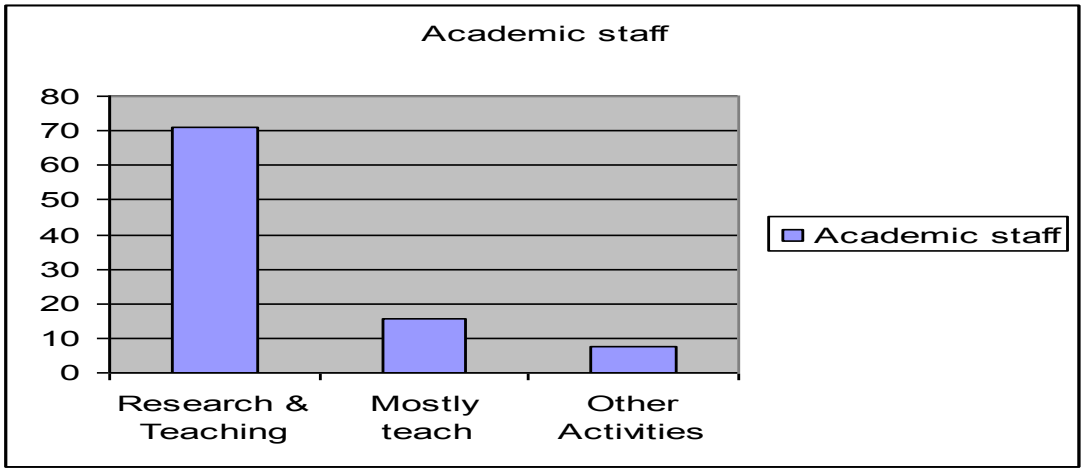
Table 3 : Primary research field : Postgraduate students n=60

Research field	Frequency	Percent
Environmental sciences	20	33.3
Biological sciences	15	25
Chemistry and applied chemistry	12	20
Geology and earth sciences	4	6.6
Physics and applied physics	3	5
Computer science	2	3.3
Bio-medical sciences	1	1.6
Mathematics and applied mathematics	0	0
Other	3	5

5.3.1.3 Primary responsibility at the University of the academic staff

The final question in the demographics section to the academic staff was asked to ascertain their primary responsibility at the University. This was an optional field. As Figure 1 shows academics are involved in teaching or lecturing and research. This question was asked to ascertain what they spent most of their time doing as this would influence their use of the library and journals. An overwhelming 27 (71%) are involved with both research and teaching. This was followed by six (15.7%) academic staff who indicated that they mostly teach, but conduct some research and three (7.8%) who indicated that they are involved in activities other than teaching and research. None of the respondents indicated that they are involved in research only.

Figure 1 : Primary responsibility of academic staff n=38

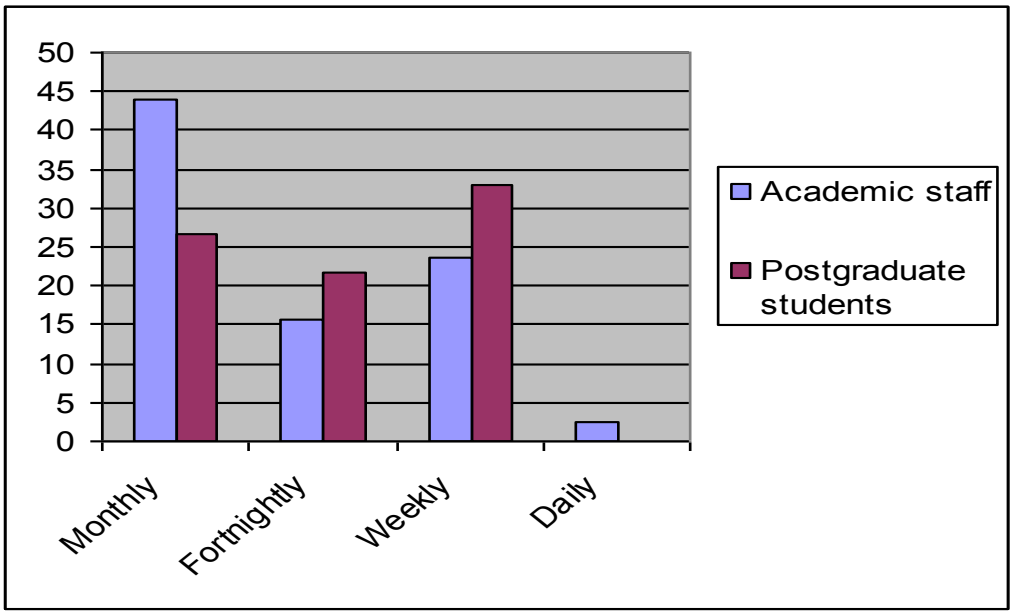


The demographic data from the survey confirm the demographic data of the Faculty of Science in that there were more male academic staff between the ages of 40 – 49. These academics are predominantly involved in research and teaching as Figure 1 reveals.

5.3.2 Library usage

Three questions were asked in this section to ascertain how often the respondents visited the library, the purpose of the visit and how dependent they were on the library for the research they conduct. Figure 2 represents how often the respondents used the library.

Figure 2: Frequency of library usage by academic staff n=38 and postgraduate students n=60



The majority of the academic staff, 17 (44.7%) visit the library on a monthly basis. This was followed by nine (23.6%) weekly and six (15.7%) fortnightly visits. Just one academic staff member visited the library daily. From the total of 60 postgraduate students, 20 (33%) visited the library on a weekly basis followed by 16 (26.6%) monthly and 13 (21.6%) fortnightly. Just one respondent visited the library on a daily basis with the majority using it monthly and weekly. It is possible that more time was spent accessing electronic resources on a daily basis, with users then visiting the library monthly, fortnightly or weekly to retrieve material they had identified over the network. The visiting pattern was likely influenced by ease of access.

5.3.2.1 Dependency on the library

This question was asked to ascertain how dependent the respondent was on the library for the research they conduct. The majority of the academic respondents were very dependent on the library for the research they conduct. They were 22 (57%) academic staff and 22 (36.6%) postgraduate students that indicated so. The majority of the postgraduate students, 31 (51.6%) indicated that they were somewhat dependent on the library. Only two (5.2%) academic staff and seven (11.6%) postgraduate students indicated that they were not dependent on the library for the research they conduct. As this question only focused on their research needs, the responses did not indicate if they were dependent on the library for the preparation of their lectures, communication, and so on.

5.3.2.2 Main reasons for visiting the library

Respondents were asked to list the main reasons for visiting the library, and arrange them in order of importance. This was an open question and a number of respondents chose not to answer the question. Respondents said much the same thing but in different words and the predominant responses for the academic staff and postgraduate students in order of importance were :

The academic staff reported the following reasons for visiting the library:

- To obtain, consult and photocopy journal articles 19 (50%)
- To consult, return or take out books on loan 13 (34%)

- To browse recent or current issues of journals 8 (21%)
- To place and fetch interlibrary loans 5 (13%)
- Course or lecture preparation 3 (8%)

The postgraduate students reported the following reasons for visiting the library:

- To obtain, consult and photocopy journal articles 38 (63%)
- To consult, return or take out books on loan 21 (35%)
- To browse recent or current issues of journals 7 (12%)
- To place and fetch interlibrary loans 4 (7%)

There were a variety of further responses about: quiet study space, photocopy facilities, editorial work, book binding, placing book orders and consulting theses at a rate of one each.

5.3.3 Computer expertise and usage

This section asked respondents if they used a personal computer in the course of their studies, tasks or duties; how often they used a personal computer and if they were able to perform a number of functions on the computer. This question was asked in an effort to determine their level of expertise in using the computer as this factor could influence their usage of electronic journals, for instance and could help identify major differences that might affect their handling of electronic journals. To use electronic journals, respondents must have had a fairly good command of the computer, Internet and electronic mail. Because no criteria were given against which to rate their skill, respondents provided their individual opinions or perceptions.

5.3.3.1 Usage and frequency of usage of personal computers

All academic staff members used the personal computer in their daily tasks. An overwhelming majority of 58 (96.6%) postgraduate student respondents stated that they do use the personal computer in their studies and just two (3.3%) indicated that they do not use the personal computer. Most of the academic staff respondents, 36 (94.7%) use the personal computer on a daily basis and two (5.2%) staff members indicated that they use it weekly. Postgraduate student respondents use a personal computer predominantly on a daily basis,

54 (90%) and the other six (3.3%) respondents indicated that they use it weekly and fortnightly. The results indicated a very high acceptance and use of personal computers among the respondents.

5.3.3.2 Computer functions and programs

A question about the functions and software programs the respondents could perform on the computer was asked, to determine the computing experience of respondents. Electronic journals require the respondents to have a good knowledge of the Internet, browsers and security features of the computer. The response to this question was not surprising. All of the options available were selected by a majority of the respondents except for setup, maintenance and troubleshooting. Respondents could select more than one category. With regard to the student responses, a possible reason for their competency is that at the student LANs a full-time computer technician is employed by the university to oversee the LANs and to assist the students if there is a problem and if the setup needed to be changed. A full-time technician is employed to oversee the computers in the offices of the academic staff.

All of the respondents indicated that they performed the full range of functions or used the programs listed in the survey. Table 4 and 5 indicated the responses of the academic staff and postgraduate students. Respondents could select more than one function and program. The most frequently listed reason for using the computer amongst the academic staff and postgraduate students was electronic mail and to access the Internet or World Wide Web (WWW). This was followed by Windows software, and word-processing. The response to using the Windows software was expected because the software is required to use the Internet and most programs on the computer. As electronic mail is an important and popular medium of communication, the overwhelming response is not surprising. Respondents could obviously select more than one response.

Table 4 : Computer functions and programs : academic staff n=38

Function / Program	Count	Percentage
Electronic mail	38	100
Internet	38	100
Windows-based software	37	97.3
Word processing	37	97.3
Management of files and folders	37	97.3
Electronic / Online Database searching	32	84.2
Spreadsheets	30	78.9
Setup, maintenance and troubleshooting	26	68.4
Use Dos software	26	68.4

Table 5 : Computer functions and programs : postgraduate students n=60

Function / Program	Count	Percentage
Electronic mail	58	96.6
Internet	58	96.6
Word processing	57	95
Windows-based software	56	93.3
Management of files and folders	53	88.3
Electronic / Online Database searching	51	85
Spreadsheets	49	81.6
Use DOS software	33	55
Setup, maintenance and troubleshooting	31	51.6

5.3.3.3 Online resource experience

The respondents were asked what experience they had with various online resources and how often the resource was used. The responses to this question would indicate their usage of online resources. Table 6 indicates the responses from academic staff and is arranged by frequency for the daily usage from the highest use to lowest use.

Table 6 : Online resource usage : academic staff n=38

Resource	Daily	Weekly	Fortnightly	Monthly	Rarely / Never	No answer
Electronic mail	36 94.7%	0	0	0	0	2 5.3%
Windows-based software	36 94.7%	1 2.6%	0	0	1 2.6%	0
Word processing	33 86.8%	3 7.8%	0	0	0	2 5.26%
World Wide Web	31 81.5%	4 10.5%	0	0	0	2 5.26%
Spreadsheets	12 31.5%	8 21%	4 10.5%	4 10.5%	3 7.89%	7 18.4%
Databases	10 26.3%	6 15.7%	7 18.4%	7 18.4%	3 7.8%	5 13%
Dos based software	4 10.5%	6 15.7%	3 7.8%	3 7.8%	10 26.3%	12 31.5%
CD-ROM databases	3 7.8%	8 21%	6 15.7%	8 21%	8 21%	5 13%
Electronic / Online indexes	2 5.2%	7 18.4%	3 7.8%	6 15.7%	12 31.5%	8 21%
WebCT	0	1 2.6%	1 2.6%	5 13%	18 47%	13 34%
Library catalogue / OPAC	0	14 36.8%	5 13%	7 18%	7 18%	5 13%

The order of the responses concerning use are not the same for the academic staff. The findings for the postgraduate students differed slightly.

Table 7 : Online resource usage : postgraduate students n=60

Resource	Daily	Weekly	Fortnightly	Monthly	Rarely / Never	No answer
Electronic mail	55 91.6%	1 1.6%	1 1.6%	0	3 5%	0
Windows-based software	53 88%	1 1.6%	1 1.6%	0	0	5 8%
World Wide Web	49 81.6%	7 11.6%	1 1.6%	0	3 5%	0
Word processing	35 58%	15 25%	4 6.6%	2 3.3%	0	4 6.6%
Spreadsheets	15 25%	17 28%	5 8.%	8 13%	8 13.3%	7 11.6%
Databases	11 18.3%	16 26.6%	8 13.3%	7 11.6%	11 18.3%	7 11.6%
Electronic / Online indexes	4 6.6%	4 6.6%	8 13.3%	17 28.3%	19 31.6%	8 13.3%
Library catalogue / OPAC	4 6.6%	19 31.6%	17 28.3%	11 18.3%	6 10%	3 5%
CD-ROM databases	3 5%	7 11.6%	11 18.3%	12 20%	21 35%	6 10%
Dos-based software	1 1.6%	5 8.3%	4 6.6%	6 10%	25 41.6%	19 31.6%
WebCT	1 1.6%	3 5%	1 1.6%	4 6.6%	33 55%	18 30%

Table 7 indicates the responses of the postgraduate students and arranged from the highest use to lowest use for daily usage. The responses to this question indicate that 55 (91.6%) postgraduate students used electronic mail, and 53 (88%) used Windows-based software and 49 (88%) used the WWW mostly on a daily basis. The use of Windows software is not surprising because the operating software for the most computer programs and the Internet is Windows.

Both academic staff and postgraduate students use electronic mail, Windows software and the World Wide Web (Internet) on a daily basis. Academic staff use word-processing software more often than postgraduate students. The results indicate that the majority of the respondents were using these new information technologies on a daily basis. Among the different applications of networking technology, electronic mail has been almost universally adopted. The library catalogue is used by four (6%) postgraduate students on a daily basis. Of the 38 academic staff 14 (36.8%) used the library catalogue on a weekly basis. The library catalogue has become an important retrieval tool, as users are able to access it remotely.

5.3.3.4 Internet usage

This question was asked to determine what the Internet was used for. The total of 36 (94.7%) academics responded that they use the Internet for electronic mail. With the postgraduate students only 56 (93%) use the Internet for electronic mail. For those respondents who did not use the Internet for electronic mail, a possible reason for this response is that these respondents use Yahoo mail or similar e-mail packages, which reside on the Internet. The University's e-mail package is Groupwise and this is on the network server and it is also accessible on the World Wide Web. All 38 (100%) of the academic staff use the World Wide Web and 58 (93%) postgraduate students use the World Wide Web on the Internet. As this question did ask respondents to indicate what on the World Wide Web, this question was open to their interpretation and could refer to electronic databases, electronic journals, search engines and so on available on the World Wide Web. Out of 38 academic staff, 26 (68%) indicated that they use databases on the Internet. Out of 60 postgraduate students 37 (61.6%) indicated they use databases. This could be the electronic databases set up by the Library through subscription or freely available databases on the Internet. As the question provided limited options, respondents could not indicate if they used the Internet for other purposes. Only 21 (55%) of the 38 academic staff used file transfer protocol (FTP) and a small number of 13 (21.6%) of the postgraduate students use FTP on the Internet.

Other reasons that respondents cited for using the Internet are electronic alerts, search engines, Web-based teaching and a mathematical network.

5.3.4 Journal experience

The results reported in this section relate to the respondents' journal experience – both print journal experience and electronic journal experience. Respondents were asked about their usage, preference and what they thought the future of print journals were. This section is dealt in two parts : print journals and electronic journals.

5.3.4.1 Journal or non-journal material

Before respondents answered questions on journal usage, they had to indicate whether they used journal or non-journal material such as monographs or theses. The survey results showed that 24 (63%) academic staff use journals and 48 (80%) students use journals. Postgraduate students are required to use more journals in the course of their studies than undergraduate students and the library's book collection is geared predominantly to undergraduate usage. Academic staff are also required to use journal and non-journal material to fulfil their role at the University. The responses could indicate the low or high usage of journals This result indicates that a high percentage of both population groups used journal material more than non-journal material.

5.3.4.2 Print journals

When respondents indicated they used journals, they proceeded to the section on print journals. In this section, questions were asked on the usage, purpose, frequency, advantages and disadvantages of print journals. These results are discussed in this section.

5.3.4.2.1 Usage of print journals

Respondents were asked if they use print journals in their studies, tasks and duties. If respondents did not use print journals, they were asked to go to the end of the questionnaire. The responses to this question indicated that 36 (94.7%) of the 38 academic staff and 57 (95%) of the 60 postgraduate students used print journals. A very high percentage of both groups of respondents used print journals.

5.3.4.2.2 Frequency of print journal use

Respondents were asked on average how often they used print journals. Table 8 indicates the responses.

Table 8 : Frequency of print journal use

Daily	Weekly	Fortnightly	Monthly	Rarely / Never	No answer
Academic staff n=38					
2 (5%)	12 (31.5%)	8 (21%)	11 (29%)	5 (13%)	0
Postgraduate students n=60					
1 (1.6%)	16 (26.6%)	15 (25%)	20 (33%)	8 (13%)	0

The majority of academic staff used print journals on a weekly basis followed by monthly. Only two (5%) academic staff use print journals daily. With the postgraduate students, 20 (33%) of the 60 students used print journals on a monthly basis followed by 16 (26.6%) who used print journals on a weekly basis and 15 (25%) students who used it on a fortnightly basis. A possible reason for this is that the print journals are housed in the Main Library and students and staff have to come from the Science block to use the Library. The location of the Library is not close to the Science block. Another possible reason for the low frequency of use, is that the current print journals cannot be taken out on loan and have to be used in the library. This requires time and effort.

5.3.4.2.3 Reasons for usage of print journals

Respondents were asked to indicate the reasons for their usage of print journals. From the total of 38 academic staff, 100% used print journals for research, followed by 24 (63%) who indicated that they used print journals for teaching and 21 (55%) academic staff indicated they used print journals for current awareness and external communication, that is, formal publications, formal presentations. Postgraduate students indicated that 100% use print journals for research followed by 23 (38%) who use print journals for current awareness and only 5 (13%) used it for teaching. Respondents could give more than one response.

Table 9 : Reasons for usage of print journals

Reason	Frequency	Percent
Academic staff n=38		
Research	38	100
Teaching	24	63
Current awareness	21	55
External communication	21	55
Postgraduate students n=60		
Research	60	100
Current awareness	23	38
External communication	18	30
Teaching / Lecturing	5	13

5.3.4.2.4 Number of years print journals have been used

This question was asked to find out the whether respondents are 'old' or 'new' users of journals. The reason this question was asked is that the length of time would influence the preference for the format of journals, print or electronic. The responses indicate that an overwhelming majority of both groups, academic staff, 36 (94.7%) and 33 (55%) postgraduate students, have used print journals for more than five years. Three to fours years were the next highest number of years that one (2.6%) academic staff and 13 (21.6%) postgraduate students used print journals.

5.3.4.2.5 Method of locating print journal articles

Respondents were asked which source, electronic or print, the respondent used to locate journal articles. Journal articles are identified in four basic ways – online searches in print and electronic indexes, citations found in the literature, recommendations from other people, and current awareness – browsing of journal issues. Respondents could give more than one method.

Table 10 : Method of locating print journals

Method	Frequency	Percent
Academic staff n=38		
Citations found in the literature	34	89
Electronic indexes	30	80
Print indexes	15	39
Recommendations from colleagues	15	39
Postgraduate students n=60		
Electronic indexes	51	85
Citations found in the literature	47	78
Recommendations from colleagues	35	58
Print indexes	12	20

Citation from articles was listed as the main method amongst 34 (89%) academic staff for locating print journal articles. Electronic indexes, on the other hand were used by 51 (85%) postgraduate students to locate journal articles. Electronic indexes were the second method used by 30 (80%) academic staff to locate articles, while citation from articles was listed as the second method of the 47 (78%) postgraduate students. Very few academic staff, only 15 (39%) used print indexes and recommendation from colleagues to locate articles. From the total of 60 postgraduate students, 35 (58%) relied on recommendations from colleagues to find articles. A possible reason for this is that postgraduate students often work in groups and word-of-mouth is an import medium of communication between them. Only 12 (20%) of the postgraduate students used print indexes or abstracts to locate print journal articles. Another possible method of locating articles from print journals is browsing the journal issues or current awareness. None of the respondents indicated this method.

5.3.4.2.6 Where and when print journals are used

This question was asked to find out where the print journals were consulted. This question was asked to determine if the location of the journal made a difference to its usage. The majority of academic staff, 27 (71%) indicated that they used the journal in their offices, followed by 18 (47%) who used the library to consult journals and 14 (36%) of the respondents used the journals at home. Print journals can be taken out on loan, possibly

explaining why the percentage for use in offices is higher. Academic staff also have ready access to photocopiers, scanners and such equipment in their offices to be able to make copies of journal articles there. The majority of postgraduate students, 33 (55%) use print journals in the library followed by 27 (45%) who use the journals in their offices and only 26 (43%) use the print journals at home.

Respondents were asked if there was a particular time of the day that they used print journals. The results indicate that 26 (68%) academic staff have a particular time that they use print journals while 54 (90%) postgraduate students indicated that there is not a particular time of day they read journals. Six (10%) of the students indicated that there is a particular time of day when they read the journals. The results indicate that the time of day does not matter greatly when it comes to the usage of print journals by students.

5.3.4.2.7 Source of subscription

Respondents were asked what the source of the print journal subscriptions was. More than one option could be selected. The majority, 24 (63%) academic staff indicated that the library's subscription, followed by interlibrary loans, 20 (53%) and only 12 (31%) indicated that their own personal subscriptions was the source. For the postgraduate students, an overwhelming majority of 51 (85%) relied on the library for the print journals they consult. The results indicated that 34 (57%) postgraduate students used interlibrary loans followed by six (10%) who relied on their personal subscriptions for the journals they used. Academic staff belong to societies and institutional bodies and their print subscriptions are by virtue of that affiliation. The respondents subscribed to fewer journals than expected possibly because they too are faced with the same economic problem as the libraries regarding the enormous increase in journal prices. The majority of respondents relied on the library for the print journals they have access to. Only three (7.8%) academic staff indicated that they rely on pre-print and e-print archives to access print journals. The results indicated that more than 50% of the academic staff and postgraduate students use interlibrary loans showing that respondents have to rely on a source other than the library subscription to obtain articles.

5.3.4.2.8 Age of the print journal articles read

This question was asked to find out whether respondents read recent or older articles. Journals are read for many years after publication. Respondents could give more than one answer. The results indicate that the majority of respondents read articles that are three to five years old. The survey results in Table 11 below show that 28 (73%) academic staff used articles that were three to five years old, 26 (68%) read articles that were between one to two years old and 25 (65%) read articles that were less than a year. A significant number, 14 (36%) read articles that were over ten years old. Postgraduate students, 50 (83%) of the total read articles that were three to five years old, followed by 50 (83%) who read articles that were one to two years old. A substantial number of postgraduate students, 33 (55%) read articles that were older than ten years old.

From the results, it is clear that articles older than six years are read by most of the respondents and a substantial number read articles older than ten years and this has implications for electronic journals because most of the older articles are not available in electronic media except in an archive like Journal Storage (JSTOR). When journals become available electronically, they are rarely made available retrospectively.

Table 11 : Age of journal articles read

Less than a year	1 – 2 years	3 – 5 years	6 – 10 years	Older than 10 years
Academic staff n=38				
25 (65%)	26 (68%)	28 (73%)	17 (44%)	14 (36%)
Postgraduate students n=60				
43 (71%)	50 (83%)	50 (83%)	39 (65%)	33 (55%)

5.3.4.2.9 Actions taken after location of journal articles

Respondents were asked what they do once an article is located. The choices were read, photocopy, take notes and other. This question ascertained whether the print format was important or not. The results indicate that 35 (92%) academic staff and 55 (91%) postgraduate students photocopied the articles. The researcher has observed that photocopying is done in order to read articles more conveniently, to permit annotation or

highlighting, for retention in personal files for future reference or to file with laboratory notes or with other documentation or to be used when travelling. Of the total of 38, 27 (71%) academic staff and 29 (48%) of the total of 60 postgraduate students read the journal in the library or elsewhere and 12 (31%) academic staff and 13 (21%) took notes. Those who took notes could also have read and photocopied the articles as the respondents were given the option to choose more than one category.

5.3.4.2.10 What respondents liked and disliked about print journals

Respondents were asked what features in print journals they liked or disliked. The question was asked to find out the possible problems respondents may have had with print journals and to probe their views on the attributes of the journals. Respondents could choose more than one category.

Table 12 : Likes and dislikes regarding print journals

Likes	Frequency	%	Dislikes	Frequency	Percent
Academic staff n=38					
Easy to read	23	60	Need to photocopy articles	26	68
Easy to browse	21	55	Publication lag time	23	60
Portability	14	37	Loan period of one week	11	29
Quality of presentation	11	29	Limited by library hours	6	15
Postgraduate students n=60					
Easy to read	41	68	Need to photocopy articles	36	60
Easy to browse	36	60	Loan period of one week	28	46
Portability	23	38	Limited by library hours	27	45
Quality of presentation	21	35	Publication lag time	25	41

The results indicated that both groups of respondents found print journals easy to read and browse and did not like having to photocopy articles more for staff than students. According to Tenopir ease of use affects whether or not a journal will be used. (Tenopir 2002b : 260) The time it took for articles to appear in the published journals was placed second as a dislike by staff and was placed last by students.

Immediacy seemed to be an issue. Academic staff felt that the publication lag time was a factor that they disliked about the print journal as compared to the 25 (41%) postgraduate students. No respondents gave other responses for their likes.

But other dislikes were :

- Collection not comprehensive or inadequate 34 (34.6%)
- Binding period 6 (6%)
- Arrangement of print journals on the shelves 4 (4%)
- Pages and volumes missing 3 (3%)

There were a variety of further responses about (at a rate of one each) : cannot reproduce colour images, weight of journals, distance from the library to access print journal, lack of index for each journal.

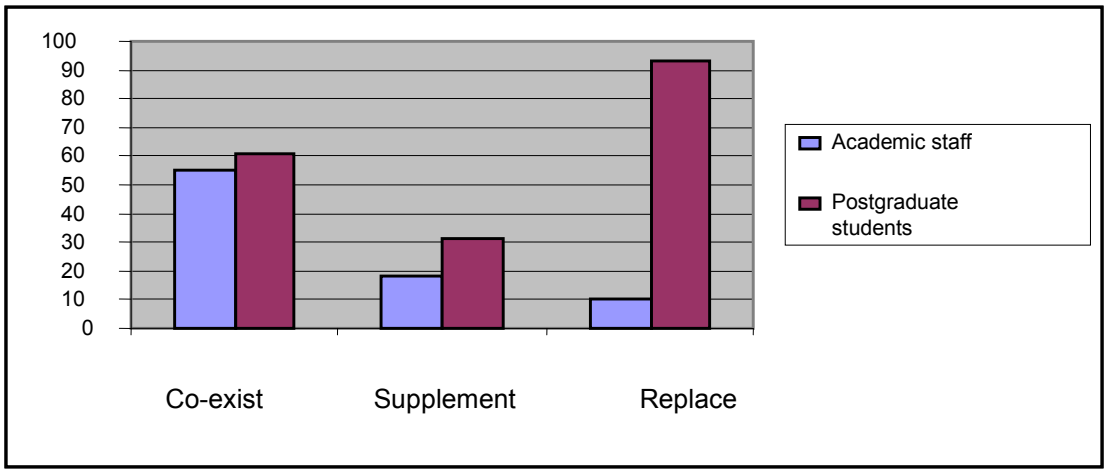
5.3.4.2.11 Access to print journals

Respondents were asked if they were satisfied with access to the print journals and then asked to give a reason for their answer. The question was intended to reveal if respondents thought that their access was limited in any way. The results of the academic staff showed that 19 (50%) and 35 (58%) postgraduate students indicated that they were happy with access and cited good service, good turnaround time that they can photocopy articles, good organization and quality binding as some of the reasons they were satisfied with the access. Of the 98 respondents who responded to this question, 19 (50%) academic staff and 25 (41%) postgraduate students indicated that they were not satisfied with access to the journals and cited the following as reasons : limited selection of journals in the library, the library does not subscribe to titles in the individual's field, binding time too long, missing issues, damaged and defaced copies, journals housed on two different floors of the library , unhappy with the borrowing period, and unavailability of current issues.

5.3.4.2.12 Future of print journals

The final question in this section asked respondents what they thought the future of print journals to be in comparison with electronic journals. The choices were: mostly replaced by electronic journals, co-existing with electronic journals or supplementing electronic journals and other. Figure 3 represents the responses from academic staff and postgraduate students

Figure 3 : Future of print journals academic staff n=38 and postgraduate students n=60



The results for the academic staff indicate that 21 (55%) of them thought that print journals would co-exist with electronic journals, seven (18%) thought that they would supplement electronic journals and four (10%) thought that they would be replaced by electronic journals. The results for the postgraduate students differed. The majority of the postgraduate students, 56 (93%) thought that print would be replaced by electronic journals, with 37 (61%) who thought that they would co-exist with electronic journals, and only 19 (31%) who thought that they supplemented electronic journals. The majority of the academic staff thought that print journals would co-exist with electronic journals while the majority of the postgraduate students thought that electronic journals would replace print journals.

5.3.4.3 Electronic journals

In this section, the purpose, frequency, advantages and disadvantages of electronic journals are discussed. The nature of electronic journals means that some headings are additional to those used for print journals and these are: gateways used for access and preferred format for reading on screen.

5.3.4.3.1 Usage of full-text electronic journals

Respondents were asked to indicate if they used electronic journals in the course of their studies, tasks and duties. If respondents indicated no, they were guided to the end of the questionnaire. A few academic staff and postgraduate students indicated that they did not use electronic journals.

Of the total of 38 academic staff, 29 (76%) indicated that they use electronic journals, nine (23%) indicated they did not use e-journals. Of the total of 60 postgraduate students, 48 (80%) indicated that they do use e-journals and only 12 (20%) indicated that they do not use e-journals. An overwhelming majority of the respondents had used electronic journals.

5.3.4.3.2 Frequency of electronic journal usage

Respondents were asked how often they used electronic journals. The options were daily, weekly, fortnightly, monthly, rarely or never. The purpose of this question was to determine the frequency of their usage.

Table 13 : Frequency of usage of electronic journals

Daily	Weekly	Fortnightly	Monthly	Rarely / Never	No answer
Academic staff n=38					
5 13%	16 42%	7 18%	1 2%	9 23%	0
Postgraduate students n=60					
3 5%	29 48%	12 20%	5 8%	11 18%	0

The responses indicate that respondents used electronic journals on a weekly basis followed by fortnightly and daily. The results indicated that the majority of the academic staff and postgraduate students used the journals on a weekly basis. The next highest period of usage by the academic staff was rarely or never, while the next highest period of usage for the

postgraduate students was on a fortnightly basis. This was followed by a fortnightly basis for the academic staff and rarely or never for the postgraduate students. So it can be concluded that the frequency of usage is almost similar for both groups.

5.3.4.3.3 Number of years electronic journals have been used

Respondents were asked to indicate the length of time in years that they had been using electronic journals. This question was asked to find out how soon users had started using the e-journals. While the library had also set up access in the last five years, respondents may have had access to before that, hence the category five years or more was included. For example, academics who were on sabbatical overseas may have had access to more than five years. Choices were less than a year, one to two years, three to four years and five years or more.

Table 14 indicates the length of time that e-journals had been used by academic staff and postgraduate students. The respondents had mostly used electronic journals for one to two years, followed by less than a year. A possible reason for this response, is that at UND Libraries access to e-journals has been a recent development and the e-journal records have only been added to the catalogue and library Home page in the last three years. Most of the academic staff and postgraduate students had used e-journals for one to two years.

Table 14 : Length of time electronic journals had been used

Less than a year	1 – 2 years	3 – 4 years	5 years or more
Academic staff n=38			
3 (8%)	19 (50%)	7 (18%)	9 (24%)
Postgraduate students n=60			
19 (31%)	27 (45%)	12 (20%)	2 (3%)

5.3.4.3.4 Method of locating electronic journals

Respondents were asked this question to find out how they learnt of the existence of electronic journals. Respondents could indicate more than one category. As electronic journals are easily available from the publishers, library Webpage and the Internet, respondents could have learnt of them from various sources.

The most popular choice for 19 (50%) academic staff were the specific journal's Website followed by 17 (44.7%) academic staff who used search engines like Yahoo to locate electronic journals. The online citation index was the next choice of 12 (31.5%) academic staff. The most popular source according to 32 (84%) postgraduate students were search engines like Yahoo, followed by 23 (60%) who felt that library staff informed them of the presence of electronic journals. Library staff could have indicated the presence of electronic journals on the library Home page and therefore that was the next source.

Very few academic staff consult the library catalogue which has active links to the electronic journal or the library Home page to locate electronic journals. Postgraduate students, on the hand were informed by library staff and the library Home page of electronic journals. The online citation index was a popular choice of academic staff but not postgraduate students. As respondents could choose more than one category, the results reflect different sources used by academic staff and postgraduate students.

Table 15 : Sources of electronic journals academic staff n=38, postgraduate students n=60

Source	Y	N
Academic staff n=38		
Specific journal's Website	19	19
Search engine like Yahoo	17	21
Online citation index	12	26
Multi-journal Website	7	31
Print journal	7	31
Library staff	6	32
Library Home page	3	35
Library catalogue	2	36
Postgraduate students n=60		
Search engine like Yahoo	32	28
Library staff	23	37
Library Home page	20	40
Specific journal's Website	20	40
Multi-journal Website	15	45
Library catalogue	13	47
Print journal	12	48
Online citation index	9	51

5.3.4.3.5 Where electronic journals are used

This question was asked to find out which of the options available for accessing electronic journals are used. The location has implications for the library. The library provides access to electronic journals on the ground floor and access to the Internet is provided at many points on the university campus. The findings revealed that most users access electronic journals in their offices and LANs rather than the library.

The results indicate that e-journals are accessed in offices of 29 (76%) academic staff, followed by access from their homes. About half of the postgraduate students, 28 (46%) accessed electronic journals in their offices followed by the student LAN and then their

homes. Only six (10%) postgraduate students access e-journals in the library. No academic staff accessed e-journals in the Library. Subscribed electronic journal titles can be accessed on-campus only according to the licence agreements signed by the Library. But there are a number of titles that are freely available. The reason for the usage at home could relate to the shortage of workstations in the Library.

5.3.4.3.6 Gateways used for access

The library provides many gateways to access electronic journals. These are the publishers' Websites, multi-journal Websites such as ScienceDirect, a specific journal Website, or an aggregated database, as well as the library Home page. Although this was not the focus of the study, a question on this was asked as a qualifier. This question was asked to determine whether respondents used any of these gateways to access e-journals set up by the University's proxy servers Internet Protocol (IP) address which require no password to access.

Table 16 indicates that 21 (55%) academic staff access the publisher's site for e-journals, followed closely by 20 (52%) using the specific journal's Website and then a multi-journal Website. The results indicate that 31 (52%) postgraduate students access e-journals from the library Home page and specific journal Website, a multi-journal Website is the next popular method of access. An overwhelming response indicates that the publishers site whether a multi-site or specific title, is the most popular choice for access to journals, but the library Home page is the favoured point of access for postgraduate students.

Table 16 : Source of access academic staff n=38, postgraduate students n=60

Source	Academic		Postgraduate	
	Y	N	Y	N
Library Home page	8 21%	30 78%	31 52%	29 48%
Electronic database	6 15%	32 84%	26 43%	34 57%
Publishers site	21 55%	17 44%	26 43%	34 57%
Multi-journal Website	13 34%	25 65%	30 50%	30 50%
Specific journal's Website	20 52%	18 47%	31 52%	29 48%

5.3.4.3.7 Source of subscription

Respondents were asked what was the source of subscription for electronic journals. Choices were library-subscription, personal subscription or a freely available title. Respondents could choose more than one category. The results indicate that 17 (44%) academic staff and 42 (70%) postgraduate students' access to e-journals was through the library subscription. The library has set up access to its subscribed titles in the library catalogue and library Home page. A number of titles are freely available on the Internet and this was the next popular choice of the 16 (42%) academic staff and 38 (63%) postgraduate students. A small percentage, seven (18%) academic staff and four (6%) postgraduate students responded that access was through a personal subscription. Neither staff nor students appeared to be aware of the subscription source of the e-journals they accessed. Possibly, the finer points of access only became important when they were unable to gain access to a title, that is, they possibly only discovered the source of subscription, when they encountered a problem and had to liaise with the library.

5.3.4.3.8 Reasons for usage of electronic journals

Respondents were asked if they used electronic journals for their special and multimedia features, to access full-text articles or because of the e-journal's searching capabilities. Respondents could choose more than one option. Full-text was the predominant choice for the 27 (71%) academic staff and 46 (76%) postgraduate students. The second choice was the searching capabilities for the 18 (47%) academic staff and 24 (40%) postgraduate students. The special and multimedia features (include animation, video and sound) did not feature strongly in their choice for using the e-journals.

5.3.4.3.9 Preferred format for reading on screen

Respondents were asked what format they preferred for viewing the article once it had been located. With print journals there is only the print format. There are more options for electronic journals. Therefore a further question was asked in this section on the preferred format of respondents.

The choices were hypertext markup language (html), portable document format (pdf), rather than reading, prefer printing from screen. The majority of academic staff, 21 (55%) preferred printing the article rather than reading it on screen. Only one (3%) academic staff member chose the html format. Of the 60 postgraduate students 28 (46%) preferred printing the article. The pdf was the next choice for 16 (42%) academic staff and 24 (40%) postgraduate students. The html format was the least preferred format of eight (3.3%) postgraduate students. The results reveal a preference for printing rather than viewing journals on screen. As respondents could only choose one of the categories, the results indicate that printing would be the preferred choice.

5.3.4.3.10 Actions after location of journal articles

Respondents were asked what actions were taken after locating an article. The responses to this question were expected to corroborate the answers to the previous question. As the majority of respondents preferred printing rather than reading on screen, the next action should be printing. From the researcher's observation apart from viewing articles on screen, articles are printed in order to read them more conveniently away from the computer, to

permit annotation or highlighting, for retention in personal files for future reference or to file with laboratory notes or other documentation.

The results are shown in Table 17. Both groups of respondents preferred printing the article and saving it to a file for use later. The highest scores were for doing both. The hardcopy or print format seems to be the popular choice for most respondents. Just as respondents preferred photocopying the print journal article which they could read more conveniently while they were travelling, or to annotate and highlight or for retention in files, the same seems to apply for e-journals from the results in the table below. With e-journals too, a hardcopy was required but the e-version was saved to a file.

Table 17 : Actions after location of article

Action	Frequency	Percent
Academic staff n=38		
Save it to a file	10	26
Print it out	7	18
Do both	12	31
Postgraduate students n=60		
Save it to a file	14	23
Print it out	12	20
Do both	27	45

5.3.4.3.11 What respondents liked and disliked about electronic journals

Respondents were asked what features of electronic journals they liked and or disliked. This question was asked to determine what problems respondents may have with electronic journals and what attributes they liked.

The results indicated that academic staff liked electronic journals because of the following features in order of preference : search facility, browsability, full-text searching and availability (24 hour access). Postgraduate students liked the following features in order of preference : full-text searching, browsability, searching facility and availability (24 hour access). Academic staff disliked their dependence on computer hardware and software,

user authentication, copyright restrictions and the downloading time in this order. Postgraduate students disliked user authentication, IP access, copyright restrictions and downloading time. These preferences are closely linked to their reasons for journal usage as reported in section 5.3.4.2.3.

The results for the academic staff and postgraduate students were very different. Although they disliked the same things, the order of preference and dislike were different. They shared some choices such as the search facility, browsability and full-text searchability of electronic journals, in that order of preference. Both groups disliked user authentication and accessing electronic journal by IP address. This response could imply that because electronic journals are only set up by IP address by the Library, the respondents disliked this choice of method. It could also mean that by setting up by IP address, the access is limited to on-campus and respondents disliked this about electronic journals.

The academic staff indicated that the dependence on computer hardware and software was a feature they disliked most. The postgraduate students disliked the user authentication feature the most. User authentication was the second highest feature that academic staff disliked.

Table 18 Likes and dislikes regarding electronic journals academic staff n=38, postgraduate students n=60

Likes	Frequency	Percent	Dislikes	Frequency	Percent
Searching facility	24 34	63 56	User authentication / Password / Usernames	17 44	21 73
Browsability	23 35	60 58	IP access	6 21	15 35
Full-text searching	19 36	50 60	Copyright restriction	8 19	21 31
Availability – 24 hour access	20 34	52 56	Downloading time	8 16	21 26
Accessibility	21 30	55 50	Difficulty reading on-screen	8 15	21 25
Convenience	17 33	44 55	Dependence on computer hardware and software	10 9	26 15
Ability to print	20 27	52 45	Speed of retrieval	6 11	15 18
Currency of document	16 23	42 38	Viewing software, like Adobe	3 11	7 18
Interactivity / Hyperlinks	11 20	28 33	Coping with individual journal interfaces	6 6	15 1
Functionality, i.e downloading	17 22	44 36	Need for scrolling	2 8	5 13
Alerting services	9 11	23 18	Difficulty with printing	3 5	7 8
Multimedia features	2 16	5 26	Lack of browseability	2 6	5 1

Key : Academic staff : 55

Postgraduate students 55

5.3.4.3.12 Online features

Respondents were asked if they actively kept abreast of new online features in e-journals, for example the citing tool. This question was asked to ascertain whether new features in e-journals were an important factor in their usage. The reason for this question is that technology is constantly changing and being updated and the intention was to find out if respondents kept abreast of these changes. The responses showed that only 22 (57%) academic staff and 18 (30%) postgraduate students kept abreast with the new features. The majority, 42 (70%) postgraduate students did not keep abreast of these new features. A possible reason for this response is that users may not be aware that there are changes, additions and revisions to features in an e-journal unless they are closely following the development and progress of the e-journal. Most of these features can go unnoticed or seem a part of the title and do not appear as new.

5.3.4.3.13 Access to electronic journals

Respondents were asked if they were satisfied with access to electronic journals. A large majority 30 (97%) of the 38 academic staff were not satisfied with access to e-journals. Of the 60 postgraduate students 36 (60%) were not satisfied with access to e-journals. As respondents were only asked to indicate if they were satisfied with access to e-journals and not whether they were satisfied with the library setting up access or how the library set up access or even if there was a problem of the access, the responses to this question must be handled cautiously.

However the reasons given below shed light on the responses.

- Insufficient coverage, too few titles or not enough are accessible at EGM 29 (29.5%)
- Insufficient access points in the Library 11 (11%)
- Slow access on campus 11 (11%)
- Difficulty in accessing from home or off-campus due to IP restrictions and or passwords and logins 2 (2%)

There were a variety of other responses : no digital archive for older issues, difficult to use – too many clicks to get to an actual article, costly to download and purchase article, more up-to-date than print journals, dependence on the library or university for access at a rate of one each.

5.3.4.3.14 Future of electronic journals

The final question in this section was asked to find out what respondents thought the future of electronic journals were in comparison with print journals. This question required that they have foresight concerning the future based on their current usage.

Table 19 : Opinions on the future of electronic journals

Opinions	Frequency	Percent
Academic staff n=38		
Co-existing with print journals	14	36
Mostly replacing print journals	14	36
Supplementing print journals	10	26
Postgraduate students n=60		
Co-existing with print journals	27	45
Mostly replacing print journals	13	21
Supplementing print journals	20	33

The academic staff responses were evenly split between thinking that the e-journals would co-exist with print journals and that they would replace print journals. Only ten (26%) academic staff thought that electronic journals should supplement print journals. The majority of the postgraduate students, 27 (45%) thought that e-journals should co-exist with print journals, followed by 20 (33%), who thought that they should supplement print journals. The response of the academic staff to the question of co-existence corresponded with 21 academic staff who thought that print journals would co-exist with electronic journals, as reflected in the responses to the similar section on print journals (see 5.3.4.2.12). The combined responses indicated co-existing with e-journals.

5.3.5 Archiving – print or electronic

The questions in this section asked respondents their views on the archiving of journals, whether there was a need for it and for how long journals should be archived. This section required the respondents to have some foresight into the future. It was suggested in the responses to 5.3.4.3.13 access to electronic journals, that there was insufficient access to back issues of electronic journals. As reported in section 5.3.4.2.8 a substantial number of the respondents of both groups read print journal articles that were over ten years old.

Respondents were asked which archive should be maintained – hard copy (print) or electronic and for how long. An archive is an important source for maintaining journals. Presently the library maintains an archive of its print journal subscription and subscribes to JSTOR, which has limited coverage, as an archive for electronic journals.

The results indicated that 17 (44%) academic staff thought that an electronic archive should be maintained, while 34 (56%) postgraduate students thought that both an electronic and print archive should be maintained. Only nine (23%) academic staff thought that both an electronic and print archive should be maintained. Responses indicated that assuming that electronic archives of journals prove to work well and are readily accessible, then they would be happy to see hard copy or print archives discarded and replaced by electronic archives.

Table 20 : Required periods for archiving journals – print and electronic

Period	1-5 years	6-10 years	11-15 years	More than 15 years
Academic staff n=38				
Print	9 23%	4 10%	3 7%	22 57%
Electronic	1 2%	6 15%	9 23%	22 57%
Postgraduate students n=60				
Print	15 25%	11 18%	8 13%	26 43%
Electronic	12 20%	14 23%	6 10%	28 46%

Table 20 indicates the period for which an archive should be maintained. The majority of respondents, that is 22 (57%) academic staff and 26 (43%) postgraduate students, thought that an archive should be maintained for journal issues older than fifteen years for both print and electronic journals. This was followed by nine (23%) academic staff who thought that an archive of 11 – 15 years should be maintained while 14 (23%) felt that an archive of 6 - 10 years should be maintained.

5.3.6 Choices between print journals and electronic journals

This final section of the questionnaire was aimed at discovering respondents' preferences. They were asked to state reasons. Respondents were also asked what they would prefer to access if they were given a choice. This question was asked to ascertain if electronic journals were found to be their choice, would they be easier to access or if print journals were their choice, would this be easier to access. The reason for this is that access would ultimately depend on what works or not.

Table 21 : Preference for electronic or print journals academic staff n=38, postgraduate students n=60

Academics	Frequency	Percent	Postgraduate Students	Frequency	Percent
Print	5	13	Print	4	6
Electronic	21	55	Electronic	34	56
Uncertain	12	31	Uncertain	22	36

The results in Table 21 indicate that respondents prefer electronic journals and consider them easier to access. Some of the reasons cited for their choice were asked in previous questions (likes and dislikes), but in addition these are the other reasons that respondents preferred the electronic journal:

- Easier to access, store, retrieve and reference 38 (38.7%)
- Can access from workstation, office, library or even a distance (like the field) 30 (30.6%)

There were various other responses at a rate of one each and they are as follows:

- Quality of printout (colour) rather than the photocopy
- No need to photocopy, can cut and paste
- Takes up less space and only print those that are required
- Access to current and pre-print issues
- Can search over a wide range of journals
- Can read material printed in the seventeenth century with the current technology, yet cannot read microfilms produced in the last two decades

5.3.7 Interlibrary loans

This question was asked to find out how often respondents had to use interlibrary loans. Responses to this question would indicate the status of the library's journal collection, whether it satisfied the needs of its users or whether its users had to go elsewhere to obtain the articles. Interlibrary loan would be requested if an item was not available in the library's print or electronic collection.

Table 22 : Frequency of interlibrary loan usage

Frequency	Frequency	Percent
Academic staff n=38		
Less than 5 times per month	25	65.7
Never use interlibrary loans	6	15
6 – 10 times per month	5	13
11 – 15 times per month	2	5
16 – 20 times per month	0	0
More than 20 times per month	0	0
Postgraduate students n=60		
Never use interlibrary loans	14	23
6 – 10 times per month	13	21.6
11 – 15 times per month	4	6.6
16 – 20 times per month	3	5
Less than 5 times per month	0	0
More than 20 times per month	0	0

Table 22 indicates that out of the total of 38 academic staff, 25 (65.7%) indicated that they use interlibrary loans less than five times per month followed by six (15%) who indicated that they never use interlibrary loans. A similar response was received from the postgraduate students who indicated that 14 (23%) never used interlibrary loans followed by 13 (21.6%) who used interlibrary loans six to ten times per month. Neither group of respondents used interlibrary loans regularly as indicated by the zero response for more than 20 times per month. In section 6.7 the reasons for this low usage is given.

5.3.8 Online publishing

This question was asked to find out from respondents if they would publish in an electronic journal. Using and retrieving information from an electronic journal is one aspect, but this question was asked to ascertain if respondents thought that electronic journals' standards were sufficiently high to be acceptable to publish in. Of the 38 academic staff, 26 (68%) indicated that they would publish in an online journal. One academic commented that the format of the journal was not a deciding factor when publishing. A possible reason for this

response is the primary criterion for rewarding publications at the University that is, simply that journals should be peer-reviewed and accepted by the Department of Education. The response from postgraduate students was quite different, 28 (46%) postgraduate students felt that they were uncertain about publishing. This response was expected from this group because publishing and teaching are not the focus of their research in their postgraduate studies. In total only nine (9%) respondents indicated that they would not publish in an electronic journal. The other respondents declined to respond. A possible reason for this is that the respondents might feel that the journal has to prove itself first and be cited in indexes and the citation index before they would submit their articles to it.

5.3.9 Summary of the survey results

The results of the survey indicate that academic staff and postgraduate students have different needs, levels of computer expertise, journal experience and likes and dislikes of journals. All respondents valued each format for its commonly known advantages.

The frequency of usage of the library differed among the two groups with academic staff favouring monthly visits and postgraduate students favouring weekly visits. Their reasons for using the library were essentially the same: to obtain, consult and photocopy journal articles, but postgraduate students also valued the library for the quiet study space it provided. With computer expertise and usage, both academic staff and students used the Internet and e-mail predominantly.

Beyond the more format-specific uses, respondents used print and e-journals in essentially the same way. Respondents used both formats to browse through journals, to check article references, and to print or to photocopy. Academic staff used print journals weekly for course and lecture preparation, teaching, and research. Postgraduate students used print journals monthly predominantly for research.

The results showed that each format facilitated certain types of uses. Respondents prefer and use e-journals because of their convenience (in particular, desktop access) and regardless of whether other sources would better suit their information needs. Respondents found that print journals were easy to read and browse and were portable. However, both groups disliked the coverage of subjects in the print and electronic journal collection.

While respondents used a mixture of print and e-journals in their reading, it is clear that they have become fully accustomed to discovering and locating that context online. Respondents thought that the future of print journals was to co-exist with electronic journals. The academic staff thought that the latter would co-exist with print journals while postgraduate students thought that e-journals would replace print journals.

5.4 Analysis of the journal data

The results of the analysis of the journal data are reported in this section. The previous section (5.3) reported the benefits of print and electronic journals respectively. The subscription costs for print and e-journals paid by the Library and compared with those for previous years will be discussed. The differences and changes will be explained and discussed here. The data in this section was reported under the Discipline, namely Biology, Chemistry, Computer Science, Geography, Geology, Mathematics, Physics and Statistics as the journal subscriptions are also paid for according to these categories. The Library pays for journals in advance. The subscription is paid in October to November of each year for the year following. The data provided below indicated the year in which the journal was received and not the year it was paid for. For example, the 2004 journal subscriptions indicate the year the journals are being received. These journals were paid for in 2003. A current subscription refers to all the journal titles that are being received in the current year.

5.4.1 Science print journal subscriptions for 2002 to 2004

Table 23 presents the print journal subscriptions from 2002 to 2004. These are the current journal titles that were received from 2002 to 2004 that are still subscribed to. The total subscription cost paid by the Library for each Discipline, with the average cost per title and the number of titles, is illustrated. The intention in Table 23 was to show how average print journal costs and total subscription costs have increased from 2002 to 2004. The most costly titles were from Chemistry in 2002 and 2003. But in 2004 the highest average cost per title was in Physics, followed very closely by Chemistry. The subscription paid in 2003 for Chemistry journals was more than twice the amount paid in 2004. (See sections below)

Table 23 : Print journal subscriptions by Discipline, their cost and average cost per title from 2002 to 2004

Print journals only	Number of titles	Total cost	Average cost per title
2004			
Biology	39	227 328.39	5 828.93
Chemistry	27	296 265.47	10 972.79
Geography	26	165 530.44	6 366.55
Geology	54	416 215.06	7 707.68
Computer Science	14	105 025.59	7 501.82
Mathematics and Statistics	30	278 132.90	9 271.09
Physics	13	171 025.46	13 155.80
2003			
Biology	48	321 023.58	6 687.99
Chemistry	29	765 426.54	26 394.01
Geography	30	193 239.53	6 441.31
Geology	56	615 482.80	10 990.76
Computer Science	12	120 190.62	10 015.88
Mathematics	22	341 567.16	15 525.78
Statistics	7	60 622.18	8 660.31
Physics	19	317 866.12	16 729.79
2002			
Biology	69	523 415.74	7 585.73
Chemistry	44	717 767.17	16 312.89
Geography	42	213 908.09	5 093.04
Geology	66	442 284.06	6 701.27
Computer Science	24	142 030.46	5 917.90
Mathematics	29	312 876.16	10 788.83
Statistics	9	43 933.60	4 881.51
Physics	31	458 350.83	14 785.00

The table indicates that in 2003 the journal subscriptions for all Disciplines were higher than in 2002 and 2004. This is due to a number of reasons which will be discussed in the next chapter. Comment on this table is provided in section 5.4.3

5.4.2 Science electronic journal subscriptions for 2003 to 2004

Table 24 presents the electronic journal subscriptions from 2003 to 2004. These are the electronic journal titles that were received in 2003 and 2004. There were no electronic journal subscriptions in 2002. The Disciplines of Biology, Geography, Geology, Computer Science and Statistics had no electronic journal subscriptions in the period 2003 to 2004. The electronic title subscribed to in the School of Mathematics is MathSciNet which is an index and is the equivalent of Mathematical Reviews in print. It is regarded as an electronic journal by the Library and is therefore included in the table.

Table 24: Electronic journal subscriptions by Discipline, their cost and average cost per title from 2003 to 2004

Electronic journals only	No. of titles	Total cost	Average cost per title
2004			
Biology	0	0	0
Chemistry	6	78 998.84	13 166.47
Geography	0	0	0
Geology	0	0	0
Computer Science	0	0	0
Mathematics & Statistics	1	21 073.37	0
Physics	23	258 696.38	11 247.66
2003			
Biology	0		0
Chemistry	6	73 671.75	12 278.62
Geography	0		0
Geology	0		0
Computer Science	0		0
Mathematics	1	21 073.37	21 073.37
Statistics	0		0
Physics	23	349 142.30	15 180.10

The Physics titles are made up of a suite of titles from the Institute of Physics (IOP) and the American Institute of Physics (AIP). The AIP subscription is shared with the UNP libraries. UND Libraries only pays half the subscription for the nine American Physical Society electronic journal titles. The consistently highly priced titles are Physics and Chemistry. Had the Library paid the full subscription, then Physics titles would have been the most costly, but despite this sharing of the costs, the subscription for Physics titles is substantially high. The most costly electronic title in 2004 was in Chemistry, as was the case with the print journals. In 2003, the most costly title was in Physics.

5.4.3 Difference in number of print and electronic journals from 2002 to 2004

Due to budgetary constraints the Library has been canceling print journals from 2002 to 2004. Table 25 shows the difference in the number of print and electronic journal titles from 2002 to 2004 and the decrease in the number of print journals from 2002 to 2004.

The print journals were cancelled for budgetary and various other reasons, which will be discussed in the next chapter. From 2002 to 2004 the number of titles for each School decreases. In 2004 the School of Mathematical and Statistical Sciences combined their journal subscriptions. From 2004 the journal subscriptions are indicated as one total. Twenty titles were cancelled from 2003 to 2004 overall. But 91 journal titles were cancelled from 2002 to 2003.

Although each School or Department had cancelled titles from 2002 to 2004 due to budgetary constraints as stated in section 5.4.1, in 2004 some Schools subscribed to new journal titles, re-instated old subscriptions as well as cancelled some journal titles. In 2004 it was decided that each School should re-look at its journal subscriptions. Schools had to indicate to the library the titles that should be renewed, cancelled and reinstated. The Schools that had done so were Geography, Biology, Geology and Mathematics. The total reinstatements were 32, six new journal subscriptions, and 58 cancellations.

As Science is a multidisciplinary field, other Faculties were informed of this cancellation exercise and were given the opportunity to take on the cancelled journal subscriptions from Science. As some of these titles are used by other Faculties, the Library gave the other Faculties the opportunity to transfer these titles before cancellation, as once a title is cancelled, it takes a while to re-instate. The Faculty of Engineering had some of the cancelled Science titles transferred to their budget. The library also transferred some titles to its General Fund, such as Chemical Abstracts, the American Institute of Physics and the Institute of Physics titles because it made economic sense to retain these titles and these titles are being used by users other than those in the Faculty of Science. The Faculty of Science could not afford these titles but because there were of a multidisciplinary nature, the Library decided to transfer them to another fund rather than canceling the title. For example, Chemical Abstracts is used by Chemical Engineering in the Faculty of Engineering and the Faculty of Health Sciences. Chemical Abstracts was a Chemistry subscription and the suite of IOP titles were a Physics subscription previously. Therefore the figures for 2004 only indicate that 20 titles were cancelled but this figure is in fact higher. With the new subscriptions the difference in titles from 2003 to 2004 are just 20.

Table 25 : Differences in number of journal titles by Discipline from 2002 to 2004

Discipline	No. of print titles 2002	No. of e-titles 2003	No. of print titles 2003	No. of e-titles 2004	No. of print titles 2004
Biology	69	0	48	0	39
Chemistry	44	6	29	6	27
Geography	42	0	30	0	26
Geology	66	0	56	0	54
Computer Science	24	0	12	0	14
Mathematics	29	1	22	1	30
Statistics	9	0	7		
Physics	31	23	19	23	13
Total	314	30	223	30	203

Table 25 indicates that there was no change in the number of electronic journals subscribed to in 2003 to 2004. The Library maintained its current electronic journal subscriptions, with no new subscriptions. The library did not subscribe to any electronic titles in 2002. Another reason for not subscribing to new e-journals is that Science could not afford its current print subscriptions and therefore was not in a position to take on new subscriptions.

5.4.4 Average price of print journal subscriptions from 2002 to 2004

The intention in Table 26 and 27 is to illustrate that from 2002 to 2004 there was a major difference in the average price of print journals. The difference in price is attributed to a number of reasons : the exchange rate, the inflation rate as well as the subscription cost of the journals. Another contributing factor was the bankruptcy of a major publishing vendor Rowecom/Faxon. As a result of their bankruptcy, a number of titles were not received and were cancelled. These subscriptions had to be taken over by the other journal vendors.

Table 26 : Average price of print journals by Discipline in 2002 and 2003

Discipline	Average price 2002	Average price 2003	Difference	% change 2002 – 2003
Biology	7 585.73	6 687.99	- 897.74	--11.8
Chemistry	16 312.89	26 394.01	10 081.12	61.7
Geography	5 093.04	6 441.31	1 348.27	26.4
Geology	6 701.27	10 990.76	4 289.49	64
Computer Science	5917.90	10 015.88	4 097.98	69.2
Mathematics	10 788.83	15 525.78	4 736.95	43.9
Statistics	12 124.00	6 276.00	- 5 848.00	--48
Physics	14 785.51	16 729.79	1 944.28	13

With the print journals, the average cost of a Chemistry journal increased by 61.7 percent from 2002 to 2003 and decreased by 58.5 percent from 2003 to 2004.

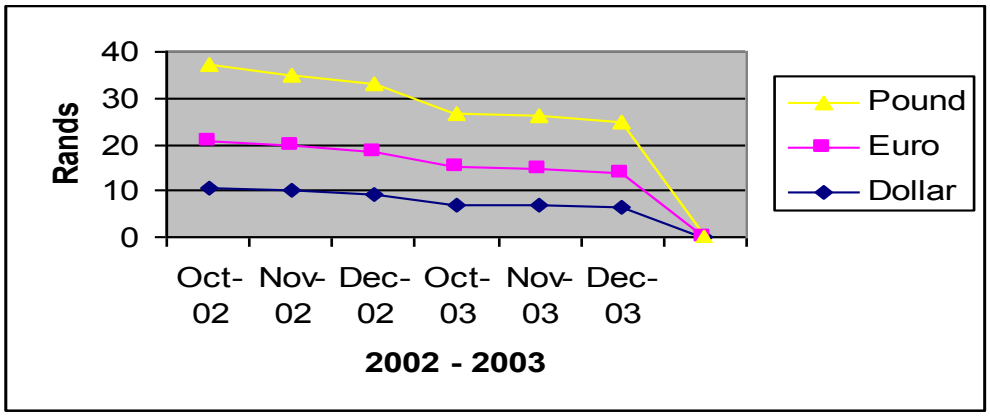
Table 27 : Average price of print journals by Discipline in 2003 and 2004

Discipline	Average price 2003	Average price 2004	Difference	% change 2003 - 2004
Biology	6 687.99	5 828.93	-- 859.06	--12.8
Chemistry	26 394.01	10 927.79	--15 466.22	--58.5
Geography	6 441.31	5 093.04	-- 1 348.27	--21
Geology	10 990.76	7 707.68	-- 3 283.08	--29.8
Computer Science	10 015.88	7 501.82	-- 2 514.06	--25
Mathematics	15 525.78	9 271.09	-- 12 530.69	--57.4
Statistics	6 276.00			
Physics	16 729.79	13 155.80	-- 3 573.99	--21.3

The exchange rate in 2002 was high and therefore when the print journals were paid in 2002 the price was high compared to the price paid at the same time in 2003. Therefore the percentage difference for Biology and Mathematics and Statistics reflect a negative. Despite this rate fluctuation there were also increases in journal prices from 2002 to 2003.

As shown in Figure 4, the pound, euro and dollar were at their highest value in relation to the rand in October 2002. As a result the percent change from 2002 to 2003 for the journal subscriptions were as high as 69.2% in Computer Science and 61.7% for Chemistry. The library was paying more than double for the same number of titles.

Figure 4 : Exchange rate fluctuation in October 2002 to December 2003.



5.4.5 Average price of electronic journals from 2003 to 2004

Table 28 illustrates the percent difference in average cost of electronic journals from 2003 to 2004. The difference between Physics titles in 2003 to 2004 was 35 percent when compared to the difference in cost for the print journal titles from 2003 to 2004, which was 21.3%. The average cost for the print journals were lower. The percentage change was almost the same for print and electronic titles in Physics for the period 2003 to 2004. With Chemistry titles the difference was 7%, but for the print journal titles the difference was 58.4% which is a substantial difference in price.

Table 28 : Average price of electronic journals by Discipline in 2003 and 2004

Discipline	Average Price 2003	Average price 2004	Difference	% change from 2003 to 2004
Chemistry	12 278.62	13 166.47	887.85	7.2%
Mathematics	21 073.37	21 073.37	0	0
Physics	15 180.10	11 247.66	-3932.44	30%

5.4.6 Effect of the funding formula

The Faculty of Science, one of the three most productive research faculties at the University of Natal, Durban, had to make substantial cuts in their journal subscriptions. In 2003 to maintain the Faculty's current subscriptions, the library would have had to spend 165% of its total allocations for books and journals. The Faculty spending the smallest fraction (28%) of its allocation on journals was the Faculty of Management Studies, University of Natal, Durban. A comparison of numbers of full-time academic staff and average cost of journals in the two faculties are shown in Table 29 below. (Walker 2003 : 9)

Table 29 : Comparison of number of academic staff and average journal costs for the Faculty of Management Studies and Science

Faculty	Academic staff	Average journal cost
Management Studies	54.0	R 1 551.00
Science	95.7	R 8 658.00

Since 2000, in round numbers Science has consistently produced about ten times more SAPSE publication units than Management Studies. On the basis of the above figures,

Management Studies is able to subscribe to 326 titles. The number of titles that the two Faculties can afford, on the basis of spending various fractions of their allocation, are shown below :

Table 30 : Comparison of budget allocations for the Faculty of Management Studies and Science

Faculty	28% of allocation	100% of allocation	Actual
Management studies	326	1153	326
Science	87	312	376

If the objective of purchasing journals is largely to support the research activity of the University, then it is clear that the formula is dysfunctional, as it does not give adequate weighting to the differing costs of journals in the various fields, or to the research outputs of the faculties. (Walker 2003 : 9)

5.4.7 Summary of the analysis of journal data

The journal cost data indicates that from 2002 to 2004 the average price of a print journal increased substantially each year for various reasons. Print journals increased much more than electronic journals. Although the Library only subscribed to 30 electronic titles, the results have indicated that the average cost of an electronic journal is lower than that of print. Even though the Library has decreased or cancelled its print journal subscription each year, the average cost per title has increased each year. Apart from the dramatic change in costs in 2004, the Library is subscribing to fewer print journals but is paying more each year for journals. The difference in cost from 2003 to 2004 for Geography print journals was very low. The subscription costs of Geography journals are much lower than journals bought by Chemistry and Physics. All Schools except Chemistry and Physics were able to cancel as well as reinstate some subscriptions and subscribe to new titles and still keep the difference to about 33 percent and under the difference paid in the period 2002 to 2003.

2002 was an exceptional year for the Library journal budget. With the increased exchange rates and the collapse of a major publishing vendor Rowecom/Faxon, the Library had to pay huge differences in journal subscriptions from 2002 to 2003.

5.5 Interview responses of Acting University Librarian - Ms Nora Buchanan

The Acting University Librarian, Ms Nora Buchanan, was interviewed using pre-determined questions. Additional questions were asked to probe answers and build on the responses and explanations were given by the interviewer. The data was recorded by note taking by the researcher. A full record of the interview was compiled soon after the interview to produce reliable data for analysis. As stated in section 4.5 a summary of the interview was given to Ms Buchanan for her perusal.

The responses to the interview are reported under the following main headings: Budget (5.5.1) , Print journals versus full-text electronic journals (5.5.2), Infrastructure (5.5.3), Staffing issues (5.5.4), Journal selection (5.5.5), Journal acquisition and management (5.5.6), Cataloguing and classification (5.5.7), Archiving (5.5.8), Providing access to end users (5.5.9), Usage (5.5.10), and the future(5.5.11).

5.5.1 Budget

The questions asked in this section where what proportion of the Library budget was allocated to the EG Malherbe Library (Main), what is spent on journals and books and what proportion of the budget is spent on Science journals and books.

5.5.1.1 The materials budget

In 2002 the library budget was two percent of the University budget, 3.4% in 2003 and 2004. The library budget is split between the Materials budget, Supplies and Services and Furniture and Equipment. Journals are paid from the Materials budget. There are no separate budgets for print journals and electronic journals. The Mulholland formula (see section 2.5.1.1) is applied and funds are allocated to the faculties. There are eight faculties, namely, Community and Development Disciplines, Education, Engineering, Human Sciences, Law, Management Studies, Medicine and Science.

In 2003, R 11 514 218.00 was spent on journals and R 1 689 310 was spent on books. The total expenditure was R 13 383 528.00. From the total budget, 86% of the budget was spent on journals, both print and electronic and 14% was spent on books.

The Faculty of Science was allocated 21.5% of the total Materials budget which was R 12 602 000. This allocation was split into 10% for books, which was R 270 900.00 and 90% for journals, both electronic and print, which was R 2 438 100.00.

5.5.1.2 Journal expenditure

Questions were then asked on the method of payment for journals, what method Ms Buchanan would prefer to use to acquire journals, if there were separate funds for print and electronic journals and if the library had reduced expenditures in order to provide journals and where that reduction was made?

Ms Buchanan responded that the Library pays for print and electronic journals by subscription only. She prefers this method because it is easier to administer and the Library has more control over its subscriptions. The format of the journal does not make a difference when paying by subscription. Other factors contribute to the difference in price.

The library has reduced expenditure on monographs in order to purchase journals. Expenditure could only be reduced for monographs in the Materials budget because there are separate budgets for supplies and services, furniture and equipment. The library cannot use these other funds to purchase materials.

5.5.2 Print journals versus full-text electronic journals

In this section of the interview schedule, Ms Buchanan was asked if print journal titles were cancelled in Science in favour of full-text electronic access, the number of print journals cancelled and the reasons for cancellation. She was asked further if the Library plans to cancel print subscriptions and how many titles it is considering canceling.

5.5.2.1 Journal cancellations

Ms Buchanan responded that no print titles were cancelled in 2003 in Science in favour of electronic journals. But in 2005, the Library plans to subscribe to Elsevier's ScienceDirect which would provide electronic access to 1900 titles across all subject disciplines. This would mean that the Library's Elsevier print journal subscriptions for the titles provided by Elsevier's ScienceDirect would be cancelled. There are about 1000 Science titles in Elsevier but the library presently subscribes to only 15 Elsevier Science print journal titles. The reason for cancellation of print journal titles is that the Library will get a ten percent discount on the ScienceDirect subscription.

5.5.2.2 Unique costs of journals

Two questions were asked on the unique costs of print and electronic journals and what were the current costs of processing print and electronic journals.

Her response to these two questions were answered in part here and were covered in detail later. The library does not charge itself for the space (library building), workstations and system costs. The system costs include the server, hardware, software and maintenance of the systems. These costs are paid for from separate university budgets and do not affect the materials budget. The computer systems are also used to perform several library functions and are not purchased solely for accessing and processing electronic journals.

The supplies and services budget covers the binding of the current unbound issues. The binding is done in-house and in her opinion, is fairly cheap. A single volume costs R38.00 to bind. This does not have a major impact on the cost of the journal. The security measure for the journals, the tattle-tape, is done by the two journal vendors Swets and Ebsco. These two vendors charge the Library a handling charge of about 13% per title and part of the service includes the tattle tape. If the library were to tattle the journals itself, the cost would be similar.

The cost incurred for the print journals was the physical handling and processing of the journals. Two full-time staff are employed to process the journals. They process all journals

and not just the Science journals and it would be difficult to calculate a percentage of their time spent processing Science journals. The Library subscribes to 3160 titles in total.

With electronic journals, it is more costly in terms of staff time to process and maintain the journals. Electronic journals require a higher Peromnes level staff to maintain them. The Peromnes level is the system used to grade staff. (Raju 1995 : 66) The staffing comes from many sections in the Library and not just two persons as with the print journals. The Technical Services manager, a cataloguer and the subject librarians are involved in the maintenance of electronic journals but only a percentage of their time is spent on electronic journals and the costs, once again, would be difficult to calculate.

5.5.2.3 Additional costs of journals

Ms Buchanan was asked if there were increased costs for journals when they have an electronic option and what effect the electronic access has on the print subscription assuming both are subscribed to.

She responded that there were additional costs for electronic journals, but each title operates differently. At the time of the interview the Library paid an additional R12 000 for electronic journal access in 2004, for titles that it had access to in 2003. These were Sage and Institute of Electrical Engineers titles. Presently with the print journal subscriptions, the Library pays an additional 13% handling charge on each title from Swets and Ebsco. At the moment, the Library has the following types of subscriptions : only electronic titles, only print titles, print and electronic free and print and a percent additional charge for electronic. The additional costs differ with each publisher but average between ten to fifteen percent.

5.5.2.4 Choice between print and electronic journals

Ms Buchanan was asked from a cost perspective, what would the Library cut to receive for the same subscription and she thought the users would prefer to receive for the same subscription. She had to provide reasons for her response.

She responded that she would cut print journals for the same subscription. Her reasons were that there would be savings in the subscription costs and additional handling charge, but most

importantly there would be a saving in the costs of two full-time staff members who are currently employed to process print journals. These functions would not be required for the electronic journals. As stated in section 5.5.2.5, however, electronic journals require more staff time in another way.

She responded that with the users it was more difficult to decide. The reason for this was that with the users, there are different choices for different reasons. Some users prefer print journals and some electronic journals.

She thought that electronic journals would be favoured because of desktop accessibility, full-text searching, 24-hour availability, and functionality. Likewise print journals would be favoured for their ease of use and portability. She stated that the Science and Engineering users are very strong on electronic journals and would most probably prefer electronic journals.

5.5.2.5 Advantages and disadvantages of print and electronic journals

A question was asked about what Ms Buchanan considered the advantages and disadvantages of the electronic journal compared with the print journal and vice versa. She responded that the advantages of electronic journals were the quick access, functionality and availability. The major disadvantages were the staffing and subscription costs.

Electronic journals do not always work smoothly and it is very time-consuming to ensure access is available all the time. The access points are the catalogue and the Library Webpage and it is very time-consuming and difficult to ensure that access is always set up. It also requires a higher level of staff and this function is spread among a number of senior staff in the Library.

5.5.2.6 Archival issues

Ms Buchanan was asked if there was a cost distinction between providing access to current issues versus archival issues electronically. She responded that there is a cost distinction between access to current issues and access to back or archival issues. Publishers charge an additional amount for access to archival issues and only provide access to current issues

for a period. This current period also differs amongst publishers, some regard one year as current and some regard five years as current. The library subscribes to JSTOR which is an archival database and provides access to journals that go as far back as the 1800s. The library has recently purchased the Institute of Physics archive at a cost of R 5864.00.

5.5.2.7 Cost comparisons between print and electronic journals

Three final questions were asked in this section on cost comparisons. Ms Buchanan was asked if cost comparisons were made between print and full-text electronic journals, what they reveal or if the library intends doing any comparisons.

She responded that the Library does cost comparisons each year at the time of journal renewals and when it has to make journal cancellations. These exercises are ongoing and are done when the need arises such as the renewal period in October of each year. The previous exercises revealed that if an e-journal subscription is shared across campuses, a multi-site campus, as in the case of UKZN, then the subscription is cheaper, there would be no shelving and binding costs and the titles would be available at all campuses. These comparisons have also led to the library subscribing to electronic only titles like the suite of Institute of Physics titles.

5.5.3 Infrastructure and demands

The questions in this section asked what resources full-text electronic journals demand, whether the library provides sufficient equipment to access electronic journals in the library and if it does not, what is required to address this.
Ms Buchanan responded that electronic journals require computer workstations with the appropriate hardware and software such as Acrobat Reader, printers and access to the Internet and university server. As the print journals are available to anyone to use in the Library, similar arrangements have to be made for users of electronic journals. The library has the technological infrastructure to support electronic journals but there are only four workstations in the Library for users to access electronic journals. This is insufficient, but presently users can access the electronic journals from the student LANs. From 2004, the Windows-based computers were planned to have thin-line client machines on the floors making it possible to access electronic journals from all computers in the Library. Without this

thin-line client installation, there were a number of problems with users accessing the Internet. Ms Buchanan has also given permission to the Information Technology Division (ITD) to install a computer LAN in the library. This will be managed by ITD but will be available to all users in the library.

5.5.4 Staffing issues

In this section, six questions were asked on staffing in the library. These questions were asked to determine if any new positions were created in the past five years to help with the acquisition and maintenance of electronic journals, or if the number of staff had increased or decreased and the staff time spent on electronic journals had increased or decreased. Ms Buchanan had to provide reasons for this. The final question asked whether Ms Buchanan considered print or electronic journals more time consuming and complex.

5.5.4.1 Number of staff

Ms Buchanan responded that staff numbers had not increased or decreased but different staff members were working on electronic journals. These additional staff members were not from the Technical services section which does the processing, handling and so on of journals but from the Information Services Division and Circulation Services.

With print journals, only the technical services section is involved in the acquisition, processing and maintenance of journals. The number of staff have not increased as there seems no difference in the work procedures of print journals.

5.5.4.2 Staff time spent on electronic journals

The acquisition and maintenance of electronic journals is specialised and time consuming and requires staffing at higher levels.

Professional staff from the Technical Services Department, which is the Technical Services manager and a cataloguer were spending some of their time on the acquisition, record creation and maintenance and licence agreements of electronic journals. Subject librarians from the Information Services section were spending a percentage of their time on public

relations to communicate with users about electronic journals, in the form of the library newsletter, displays, signs, library user education and current awareness. Subject librarians were also providing a reference service and teaching users how to use electronic journals. The complexity of the electronic environment makes end-user searching more difficult and the need for user education is a necessity. The Webmaster and subject librarians spent time on designing the electronic journal Webpage and creating lists of titles and creating links to access these titles. These staff members performed these tasks in addition to their daily tasks.

Ms Buchanan stated that electronic journals are more time consuming and complex to handle than print journals and require attention on a daily basis. The professional staff need the technical competence to refer problems to ITD, advise users on browser configurations and know how to deal with faults and follow-up on these. Creating and maintaining the library Webpage is time consuming and the Webmaster has to ensure access is available all the time. The Technical services manager spends a large amount of time on decisions regarding access and the licence agreements and ensuring that the access that should be available is available. She has to communicate on a regular basis with publishers and vendors.

5.5.5 Journal selection

Two questions were asked in this section to determine if the selection criteria were different from those used for print journals and what the Libraries reasons were for subscribing to a title.

Ms Buchanan responded that the same criteria are used for the selection of print and electronic journals regarding the content and subject. The library has a collection development policy that it uses for both formats of journals.

The selection, ordering and acquiring process is far more complex than the one in place for print journals. There are other considerations such as subscription costs, method of access, licensing restrictions, backfiles and archiving policies with electronic journals. The common considerations for journals were quality, faculty interest and subject content.

5.5.6 Journal acquisitions and management

This section included questions on the responsibility and procedures for licence agreements, maintenance of electronic journals and awareness of and access to electronic journals. The questions were asked to determine who had responsibility for these tasks and as the maintenance of electronic journals is a continuous process, is it the responsibility of a single person.

Ms Buchanan responded that the Technical Services manager and herself were responsible for the negotiating, signing and authorising of licence agreements to electronic journals. There is no standard procedure for licence agreements, each publisher is treated as a separate case, but there are many similarities in the agreements. The cataloguer sets up access and ensures that the access is maintained on the library catalogue.

The transient nature of the electronic journal means that more time is required to check the links, coverage and access than was spent on print journals. This is done by the Technical Services manager with the assistance of the subject librarians.

The library is made aware of journals by the subscription agents, subject librarians and academic staff and users. They inform the library of the availability of an electronic title. The library also receives publisher blurbs, newsletters and so on.

With regard to access to electronic journals, there are many difficulties needing addressing to ensure that access is smooth. When the library loses access to a title, the users, that is academic staff and students, inform the library that they cannot access it. They do this via electronic mail and the library Webpage has an e-mail address to send these difficulties to. The publisher and subscription agent very rarely alert the library to loss of access. The subject librarians have to keep in constant contact with the titles to determine if access is still available.

5.5.7 Cataloguing and classification

The questions in this section included what the procedures were for cataloguing and classifying journals and whether they were different for electronic and if so, why were they different.

Ms Buchanan responded that there are no separate cataloguing or classification procedures for electronic journals. The same record is created for both formats. The library does not follow the Online Computer Library Centre (OCLC) practice of cataloguing. UND Libraries uses complete original cataloguing for e-journals. The 856 field which is the uniform resource locator (URL) field is completed. With UND the pure e-journals are only catalogued on URICA. The library preferred this method because the OCLC practice would confuse users. About 60% of the titles of the electronic journals the library subscribes to are available on the library catalogue. All the Science electronic journals are listed on the library catalogue. Because of staff shortages the titles are not all catalogued.

5.5.8 Archiving practice

The section on archiving questioned whether the library archived its electronic journals, and who should be responsible for archiving electronic journals in the library. Ms Buchanan was asked the period print and electronic journals should be archived and how the library has dealt with old issues of journals.

Ms Buchanan responded that the library does not archive its electronic journals because this is a very costly process and the library does not have the necessary infrastructure to do this. The publisher or a certified digital archive like JSTOR should be responsible for archiving. It was more convenient to subscribe to archival databases rather than have the library archive journals.

With print journals, the library keeps all back or archival issues. These issues are stored in a stack area and on the shelves. The library does not have a space problem and can keep all issues. They are bound and kept on the shelves.

With electronic journals, the archive to back issues depends on the journal or subject. A field like Physics has publications that go back to the 1800s. The library subscribes to the database JSTOR to access archival issues of electronic journals and where possible it purchases the back issues of some electronic journal titles. (See also section 5.5.2.6) It has recently purchased the Institute of Physics archive.

5.5.9 Providing access to end-users

The questions in this section, included what the library access policy is for print and electronic journals and whether there are any charges to end-users for access.

5.5.9.1 Access policy

Ms Buchanan responded that it has an open access policy for its print journals. They are available to staff, students and library visitors. Patrons can use the print journals, photocopy articles or take them out on loan according to the borrowing privileges of users.

With electronic journals, the access policy is similar. They are available to all staff, students and on-site visitors. If a user has access to the Internet on campus, she/he can access the electronic journals. The licence agreements limit usage to on-campus only.

5.5.9.2 Charges for access

There are no charges for access to print or electronic journals. The only cost incurred with both formats are the photocopying and printing charge. Users pay for full-text printing on library printers and the university charges a fee to students for printing in the LANs.

5.5.10 Usage

Questions in this section were asked to determine what barriers there were to electronic journal usage and whether the library had evaluated user acceptance and usage of electronic journals. The final question in this section asked whether more use of electronic journals will cost the library more.

5.5.10.1 Barriers to usage

There were a number of barriers to electronic journal usage in the library. The first was the availability of sufficient computer workstations in the library. The library also has limited printing facilities.

The second barrier was the speed and reliability of these computers. Accessing the Internet during peak periods can be a time-consuming process due to network unavailability. The computers in the library have to be constantly cleared of viruses, and this affects their reliability.

The third barrier to usage was the unavailability of off-campus access. Users are unable to access electronic journals off campus because the access is set up by IP address and is limited by the licence agreements to on-campus use. Users have to authenticate themselves first before they are able to access the journals. They have to do this by logging into the university network and require a login and password to do so.

5.5.10.2 Evaluation of usage

Ms Buchanan responded that the library does evaluate its usage of electronic journals on an ad-hoc basis. Presently it uses the statistics provided by the publisher and subscription agents to evaluate usage.

5.5.10.3 The effect of higher usage on cost of access

The intention of this question was to find out if more usage will affect the cost of providing access. Ms Buchanan responded that the usage of the journals, print and electronic will not cost the library more. The subscription costs, processing and maintenance are where the costs lie.

5.5.11 The future

The final question was asked to determine what Ms Buchanan thought the future of electronic journals were in the library. She responded that at UND Libraries electronic journals would mostly replace print journals.

5.5.12 Summary of interview responses

The responses from Ms Buchanan indicate that subscriptions to journals come from a separate budget and do not affect the operating expenses of the library. These subscriptions are based on faculties and not collections or libraries. Electronic journals are bringing additional costs to the materials budget but this is outweighed by the benefits they provide to Library users. Ms Buchanan would prefer to subscribe to electronic journals and replace print journals with electronic journals in the future. The higher costs for electronic journals come from the level of staffing required to acquire, maintain and process electronic journals. In her experience, there has been no difference in staffing costs in the maintenance and procedures for print journals except for the high subscription costs for the print journal subscription. The library has done cost comparison at the time of need, that is at journal renewal periods and also does electronic journal evaluations on an ad-hoc basis and relies on publisher statistics for this. But a major contributor to the ease of access for electronic journals is the user. The library relies on the user to alert it if a title is inaccessible.

5.6 Summary of the chapter

It can be seen from the results chapter that the study was able to collect data to answer the research questions that were raised in chapter one. Results reported on the characteristics of the academic staff and postgraduate students, such as computer expertise, primary responsibility and online resource experience has impacted on their journal usage behaviour.

The results also identified the journal experience of the respondents. It identified the problems experienced with print and electronic journals, the frequency of use, reasons for their usage and what they liked and disliked about both formats of journals. The analysis of the journal data revealed that print and electronic journal prices increased substantially each year for various reasons. But the print journal prices have increased much more than the

electronic journals. The analysis further revealed that the average cost of an e-journal is lower than that of a print journal.

The responses from the interview with Ms Buchanan revealed that there are unique and additional costs to journals. Her responses indicated that electronic journals bring additional costs to the materials budget but these are outweighed by the benefits to the users. The interview responses also identified the problems of infrastructure, staffing, journal selection, acquisitions and management issues. They further revealed the problems of providing access to users with the barriers to usage and the effect of this usage on costs.

Chapter Six : Interpretation of the results

6.1 Introduction

In this chapter, the findings are considered in light of the research problem, research objectives and the themes and issues raised in the literature review. For purposes of accurately interpreting the survey results and analysis of the journal data, the problem statement, the purpose of carrying out the study and the research questions will be restated.

The purpose of the study was to do a comparative analysis of the Science print and electronic journal collection at the UND Libraries, in terms of costs and benefits. The study was conducted and as the interpretation of the results will show, it achieved the following objectives:

- The study established the costs of accessing and subscribing to print journals
- The study established the costs of gaining access to electronic journals
- It compared the cost of access to print journals with the cost of full-text access to electronic journals
- The study determined the benefits of print and electronic journals respectively.
- The study determined which of the two, journal ownership or full-text electronic access is most cost-beneficial in Science at UND Libraries.

The survey of the academic staff and postgraduate students addressed the following research questions:

- What are the benefits of print journals?
- What are the benefits of full-text electronic journals?
- What is the best way forward in Science for the UND Libraries?

It was the intention of the researcher to understand how the demographic data, library usage, computer expertise and usage and journal experience of the academic staff and postgraduate students influenced their journal seeking behaviour. It was in light of the foregoing research problem, objectives, research questions and the literature reviewed that the results were analysed and interpreted. The results are discussed here according to the research objectives. Very little is drawn from the literature review because the study differed substantially from the studies reported in the literature reviewed.

The study supported the hypothesis that :

- There are unique costs related to access to print and electronic journals respectively.
- There are unique benefits of print journals versus electronic journals.
- The costs are significantly higher in accessing electronic journals than print journals.
- The benefits are significantly higher in accessing electronic journals than print journals.
- The cost and benefit of accessing electronic journals are significantly higher than print journals.

The use of print journals has developed over several centuries and during that time these journals have evolved in specialised ways to fulfil their primary activity which are to disseminate research results. The electronic age, with the digitisation of data, has challenged the print journal. This is not the first time in the history of publishing that the print journal has been challenged. Going back to the 1940s and 1950s microfilm was used to create space by storing numerous large volumes on compact microfilm reels and fiche cards. This also continued in the 1970s when other media, such as CD-ROMs were used as an alternative to the printed copy. CD-ROMs offered retrievability initially starting as a substitute format for reference works. Today's challenge is the digitisation of the journals and ensuring sufficient mass storage capability.

It is evident that for e-journals to survive and thrive, they must retain the benefits of, but also be different from their print antecedents. There are many factors, such as cost, circulation of material, copyright and storage of journal collections that drive the demand for the print journal.

Ashcroft points out that e-journals allow timely and convenient content delivery to library users' desktops. Enhanced image quality and search interfaces have resulted in significantly increased demand for e-journals and reduced use of print volumes. This change in demand provides libraries with the option of canceling print journal subscriptions in order to realise savings. The ability to maintain titles in multiple formats may be fading. (Ashcroft 1999 : 107)

6.2 Benefits of print journals

One of the hypotheses of the study was that there are unique benefits to print journals. The results of the survey of academic staff and postgraduate students as well as the interview with Ms Nora Buchanan confirmed this, as opposed to Ashcroft's view that the demand for e-journals has significantly increased. The survey revealed that 94.7% of the academic staff and 95% of the postgraduate students used print journals. This indicates that a very high percentage of staff and student respondents used print journals. From the total of 38 academic staff, 100% used print journals for research followed by 63% who indicated they use print journals for teaching. Postgraduate students used print journals in essentially the same way as academic staff, with 100% using print journals for research followed by 38% who used print journals for current awareness.

6.2.1 Readability of the print journal

The survey revealed that the majority of the academic staff and postgraduate students found that the feature they most liked about print journals was the readability of the journal. Print journals are compact and portable. Of the 38 academic staff, 60% thought the print journal was easy to read and 68% of the postgraduate students concurred. A possible reason for this high percentage was that with print journals the difficulties of reading on the computer screen do not apply.

6.2.2 Browsability of the print journals

Journals are used for various purposes, research, to keep up to date with the field and for the preparation of lectures. They are also used for external communication such as preparing a presentation or paper. Browsing is therefore an important aspect of this use. The survey indicated that 55% of the academic staff and 60% of the postgraduate students liked the print journal because it is easy to browse. The print journal lends itself to this.

6.2.3 Portability of the print journals

Another benefit of print journals revealed by the survey was the portability of print journals. Of the total of 38 academics, 38% found the print journals portable while 30% of the postgraduate students found the print journals portable. A possible reason for this is that print journals can be removed from the shelves and taken out on loan. This enables users to

borrow the journal for a limited period of one week and avoid incurring the costs of photocopying. One of the major reasons that academic staff (68%) and postgraduate students (60%) disliked print journals was the need to photocopy articles. But the survey also revealed that respondents valued photocopies because they are theirs to own and annotate, store and refer back to and they are portable.

In the researcher's opinion another important consideration of the portability of print journals when compared to e-journals is the comfort factor. When reading a printed document, one can sit in a comfortable chair, shift around from time to time, and hold the paper at a convenient distance from one's eyes. The screen and desk chair, by contrast are in fairly fixed positions relative to each other.

It is common cause that reading requires uninterrupted periods of time. Journals are often read outside the library, for instance on aeroplanes, and allow a convenient form of background work that can be undertaken in those otherwise wasted periods of time. E-journals by comparison, require access to a computer with an Internet connection. The survey revealed that many academic staff and postgraduate students have personal computers at home, but e-journals are inaccessible outside the campus network. This disadvantage works in the favour of the portable print journal.

6.2.4 Quality of presentation

The quality of presentation is good with print journals, in terms of the graphics, images and text. Respondents of the survey liked this feature of the print journal. Of the 38 academic staff, 29% liked the quality of presentation and 35% of the postgraduate students liked this feature of the print journal.

6.2.5 Shelf arrangement of the print journals

In the interview with Ms Buchanan, she indicated that a benefit of print journals was their arrangement on the shelves when compared to e-journals. Users are usually interested in all journals in a subject field, not just the journals published by a particular publisher. Therefore, at present, for electronic journals users need access to the Websites of several publishers to obtain coverage in their field of interest. This is in contrast to the arrangement of the UND libraries, where all the journals on a particular subject are shelved together. Ms Buchanan thought that the above aspects of e-journal use did not suit the established information-

seeking patterns of the current population of users. This feature of the print journal arrangement suited the user.

6.3 Benefits of electronic journals

One of the hypotheses of the study was that there are unique benefits to electronic journals. The results of the survey of academic staff and postgraduate students as well as the interview with Ms Nora Buchanan confirmed this. The survey revealed that 76% of the academic staff used e-journals and 80% of the postgraduate students used e-journals. This finding indicates that a very high percentage of both groups used e-journals but they are lower than the percentage for print journals, see section 6.2. Furthermore as reported in 6.2, fewer respondents used e-journals than print. Ashcroft (1999 : 107) observes that the demand for e-journals has significantly increased, hence the high use of the print format is an interesting finding which is explored further in this chapter.

6.3.1 Searching facility

The survey revealed that the searching capability of e-journals was a commonly supported benefit of e-journals. The majority of the academic staff, 63% and 56% of the postgraduate students found that a feature they most liked about the e-journal was its searching facility. Finding specific information (for example, appropriate articles) is seen as being easier with e-journals than for print journals. As the Science subject librarian, the researcher has found that the e-journal has excellent searching capabilities which are helpful and saves time.

With the proliferation of material, it is difficult for users to learn of what is available, how to access this material and how to evaluate the usefulness of materials. With print journals, libraries have been able to provide an alerting service, usually from secondary, indexing and abstracting sources; together with the physical holding of the material in the library. For print journals, the user would have to use an index or online database to search for specific articles or browse. Most libraries use electronic indexes and abstracting services. With e-journals this system is fundamentally changed, the same search could be done online and relevant articles retrieved.

6.3.2 Browsability

This benefit of browsability relates to the searching facility of e-journals. Of the 38 academic staff, 60% liked the browsability of e-journals and 58% of the postgraduate students liked this feature.

6.3.3 Full-text searching

The third benefit that was favoured by respondents was the full-text capability of e-journals. The majority of the postgraduate students, 60% and 50% of the academic staff valued this benefit. Various levels of information are available for examination, including titles, abstracts, reviews of the article, accompanying data and appendices. The survey revealed that 76% of the academic staff accessed e-journals from their offices and 46% of the postgraduate students accessed them from their offices or the student LANs. This response is in keeping with the full-text benefit, because the journal would now be available on their desktop and the user would not have to come into the library to photocopy or borrow the journal. This response also supports the reason for usage of e-journals, with 71% of the academic staff and 76% of the postgraduate students indicating the predominant choice for e-journal usage was full-text. In the researcher's opinion the ability to access the full-text of an article without the inconvenience of foraging for a mis-shelved issue or waiting for its return from the bindery has certainly been a value-added service for users.

6.3.4 Availability – 24 hour access

The library has become a 24-hour a day access point to information services where users obtain services and resources on their terms and when they want the services, often not coming to the library physically nor interacting directly with the library staff. The survey revealed that 52% of the academic staff and 56% of the postgraduate students liked the availability of e-journals. One of the clear benefits of the library's electronic collection is that distance on-campus, for instance between an academic's office and the library, does not affect use of the collection.

6.3.5 Accessibility

Respondents were most interested in the potential for electronic journals to enhance access in all senses : access at any time, access from anywhere (on campus), convenient and quick

access; permanent (no missing issues) access and access to more e-journals. Of the 38 academic staff, 55% indicated that accessibility was a feature of e-journals that they liked and 50% of the postgraduate students also liked this feature. Access was a primary concern, including access to additional information (through links for instance) currency of contents, and searching and navigation features.

The survey revealed that respondents thought that the clear benefits of e-journals were that they could be accessed from their workstations, office, library, student LAN or even at a distance. In the researcher's experience one of the core advantages of using e-journals are accessibility – delivery to locations wherever users can obtain network connections.

6.3.6 Functionality

The functionality of the e-journal refers to the ability to download, its manipulability and interactivity features. The results of the survey revealed that the functionality of the electronic journals was of importance to respondents. Only 44% of the academic staff and 36% of the postgraduate students valued this benefit of the e-journal.

6.3.7 Other benefits of e-journals

The other benefits of e-journals as revealed in the survey were their currency, 42% of the academic staff and 38% of the postgraduate students liked this benefit. A feature of the print journal that the majority of the respondents disliked was the publication time lag and therefore the currency of the e-journal appealed to the respondents. The ability to print articles and so on from the e-journal was favoured by 52% of the academic staff and 45% of the postgraduate students.

Generally the presentation and organization aspects were of secondary importance. The multimedia features, interactivity, hyperlinks and alerting services were not seen as the main benefits of e-journals. Under 50% of the academic staff and postgraduate students surveyed valued these benefits. But surprisingly, in the researcher's experience these are the benefits that publishers and vendors market when they sell their e-journals.

Another significant benefits that Ms Buchanan highlighted in her interview was that the volume of printed material is continuously increasing and the library can only afford to acquire a diminishing part of it whereas with e-journals a perceived benefit includes the increased

number of titles available which extends the range of journals. The availability of user statistics for electronic access allows better analysis of titles taken and access to titles just in time rather than just in case. With print journals, the library has had to collect user statistics.

Thus, e-journals provide additional benefits that would be difficult to measure in terms of rands. The results of the user survey suggest that users do not necessarily want e-journals to do anything different from print journals. They are happy with print journals, but time and access limits affect their ability to use them effectively. These are the same factors that figure in their expectations of e-journals. Users did not perceive e-journals as a replacement for the library. On the one hand they value the library, the location of the journal archive as a place to visit and browse through journals. On the other hand they perceive e-journals as a means to obtain copies of journal articles quickly and easily without physically visiting the library.

One of the final questions in both the questionnaires asked respondents if given a choice between print and e-journals what they would prefer. The results indicated that 55% of the academic staff and 56% of the postgraduate students preferred the e-journal, while only 13% of the academic staff and 6% of the postgraduate students preferred print journals. This result is a major contradiction in terms of their usage of print and electronic journals. A major reason cited here was that e-journals were easier to access, retrieve and reference and can be accessed from workstation, office, student LAN or even a distance from the library.

But the survey also revealed that 31% of the academic staff and 36% of the postgraduate students were uncertain of what their preference would be, print or electronic journals. A possible reason for the uncertainty is that e-journals are in their infancy at the UND libraries. The results of the survey of the academic staff and postgraduate students as well as the interview with Ms Buchanan support the hypothesis that there are unique benefits of print and electronic journals respectively and that the benefits are significantly higher in accessing e-journals than print journals. The results of the survey indicated that over 95% of both groups showed a degree of expertise in using the information and communication technologies (ICT). Hence a lack of facility in using the technologies implicit in accessing e-journals can be ruled out as a factor for this uncertainty.

6.4 Costs of the print and electronic journals

This study confirmed the hypothesis that there are unique costs related to accessing print and electronic journals respectively. The analysis of the data on Science journal subscriptions and costs shows that the UND libraries are spending more, but continue to acquire fewer journal titles. There is always a cost to be incurred in the provision of any library material. Even if funding increases it will likely never match increases in costs because journal prices have risen so dramatically with both formats.

In spite of some favourable journal price decreases in 2004 and looking strictly at numbers, it appears that the library lost more (in terms of rands) than it gained over a period of five years. However, several other issues must be considered, like the subscription costs of the journals, the costs of the materials and services and the cost of providing the service. First the subscription costs of the journals needs to be looked at.

6.4.1 Subscription costs

The overall costs of e-journals are quite comparable to those of print journals. The subscription costs are the biggest threat to print journals and not the technology or production costs. The conventional pricing model which is used by the library for print journals has been the subscriptions to the individual title. This is inflexible. It relates to a physical product that can only have use at the printed issue level. The advent of electronic publishing has provided the opportunity to develop pricing models that fit more closely with the needs of the library and reflect functional value. (Keller 2001 : 284)

Subscription prices have caused and will continue to cause, most reductions in print holdings in the library. The drive for e-journals has a lot to do with the perceived deficiencies of the current system of print and with certain advantages of the new technology. (Rosenblum 2000 : 3)

On a per title basis, the e-journal cost has superior purchasing power. For example, in 2004 the Physics print journal subscriptions cost an average of R 13 155.80 per title, while e-journals were R 11 247.66 per title. The difference is more remarkable when one considers that nearly all the e-journals come, with several years of back files (but not enough) and additional multimedia features. The cost of obtaining these back volumes in print is

prohibitive. The problem is to provide the fifteen plus years of backfiles for e-journals. From the results of the survey, both groups of respondents used articles that were older than ten years and preferred a backfile of more than fifteen years.

In the case of Chemistry, the print journal subscriptions cost an average of R 10 972.79, and the e-journal subscriptions cost an average of R 13 166.47. The e-journal costs are about the same as the print, but the e-journals have many added features that justify their purchase, probably the most important is that they are accessible any time and anywhere a valid user has an Internet connection.

The library does not only subscribe to the journal offering the best value. There is a demand for a portfolio of titles where the cost per use criterion is applied broadly. Examples of these portfolios of titles are the Institute of Physics (IOP) titles and the Royal Society of Chemistry titles. The Institute of Physics online subscription is made up of thirteen titles. For example, in the IOP package, the library pays an average of 1 294 pounds per title, but if it were to subscribe to the *Journal of Physics : condensed matter* on an individual basis, it would pay 4 560 pounds for that title alone. If the library were to subscribe to individual titles, the cost would be more than subscribing to the electronic only package. With the package the library has purchased access to titles that it would not have normally subscribed to. Ms Buchanan in her interview stated that it made economic sense based on the cost per title for the library to subscribe to these packages. For the researcher the question needs to be asked whether the additional titles would be required by academic staff and postgraduate students.

In addition to electronic titles subscribed to, the library also subscribes to full-text databases. Access to these titles should be factored in. The cost of the journals in the full-text databases is not included in this study because these databases are not only used to find a known article or journal, but to perform general searches for information. These databases are also paid from a separate fund and cannot be factored into the subscription costs paid by the Faculty of Science. The journal costs that are included are those that are subscribed to individually or as publisher packages. Therefore full-text databases are not covered in the study because the coverage is selective and tend to offer full-text of more popular journals, general topic journals rather than scholarly titles.

A number of factors have contributed to the high subscription costs. The majority of the journals purchased have prices based in US dollars, pounds sterling and euros. Their cost to

the library is strongly dependent on the fluctuating value of the rand. The library pays for the journal subscriptions from October to November of each year. The timing when payment is made is very important because price is dictated by the current exchange rate. As illustrated by Figure 4 in section 5.4.4, the pound, euro and dollar were at their highest value in relation to the rand in October 2002 when journal payment was made.

There has been a real rise in the costs of journals all over the world. The Periodical Price survey done in 2003 by the Association of Research Libraries (ARL) in the US has shown that journal prices have risen by 12 – 15% in 2003. This was due to the mergers between major publishing houses like Elsevier and Academic Press. (Van Orsdel 2003 : 56) The increase in the cost of journals is a consequence of world wide increases but was exacerbated by the high exchange rates. On the basis of this data, it can be concluded that if the library wished to return to the standard of the journal subscriptions at the beginning of the nineteen nineties, it would need to spend roughly twice as much on journal subscriptions for Science.

Journal prices have increased by 7.7% in 2003. The rate has been very similar over the past two years with 8.3% and 7.9% posted in 2001 and 2002 respectively. (Dingley 2003 : 193) While the costs of the journals as cited in the *Library Journal Periodical Price Survey* of 2003 has increased by 7.7% library spending on journals has only increased by 3.4% in that same period. The average price of a Chemistry journal in 2003 was R 26 394.00. The variation according to subject can be dramatic. Physics and Chemistry were especially hard hit by the increase. By 2004, however, the average price of a Chemistry journal had dropped to R 10 972.00.

Other factors that contribute to the difference in the subscription costs are the type of packages purchased. The cost studies in the literature reviewed has shown that journals in subscription packages are more costly, for example, the Big Deal which is an online aggregation of journals that publishers offer as a one-price, one size fits all package. In the Big Deal, the library agrees to buy electronic access to all of a commercial publishers journals for a price based on current payments to that publisher. The content is bundled so that individual journals can not be cancelled. The ScienceDirect package offered by Elsevier is an example of such a licensing agreement. The library receives a discount if it purchases a multi-campus site subscription. (Van Orsdel 2003 : 56) Using aggregators for e-journals is a practical means for cost savings and efficiencies in the management of journals.

Ms Buchanan stated in her interview that the library purchasing methods are currently undergoing considerable changes with the growth of the library consortium, South African Site Licensing Initiative (SASLI). The consortia are increasingly negotiating with publishers for access by their members to e-journals and databases. The consortia have arranged a number of discounts for journal subscriptions with various publishers.

Another contributing factor to the subscription cost is the price charged by the subscription agents. These agents offer a wide range of services to the libraries, mainly related to print journals but increasingly to information-technology related services, such as automated serial management systems. Subscription agents survive because it is administratively inconvenient and therefore expensive for libraries to deal with every publisher separately. (Van Orsdel 2003 : 53) They are the wholesalers of the journals industry. According to Ms Buchanan UND Libraries pays Swets a thirteen percent administration and handling fee to provide this service. Therefore there seems to be no good reason to assume that it will be any more convenient for the library to have to deal with many publishers individually in the electronic era that it was in the era of print.

While package deals through an aggregator or the publisher offer access to wider arrays of journals, it is more difficult to cancel unwanted titles. The library is liable for the whole package. This may be the case even when the publisher drops certain journals or other publications which they were offering originally. The library also has access essentially to an electronic collection of articles, not a collection for print journal subscriptions.

Although the library did not save money by subscribing to e-journals, users have received many benefits. However, the introduction of e-journals may increase user expectations. In addition, e-journals increase the complexity of the library. Each new system seems to work differently from all the others in the library, leading to confusion for both library users and librarians who must cope with the myriad different search interfaces and indexing practices.

6.4.2 Funding formula

Professor David Walker, the Acting Director of Library Services, argues that the funding formula employed by the library to allocate funds to each Faculty is seriously flawed. The distribution of the Materials budget takes place in accordance with the Mulholland formula. As

stated in section 2.5.1.1 it is based upon the collation of a huge amount of statistical data and the identification of certain key parameters. It takes into consideration, the journal costs, research output, research staff numbers, academic staff numbers, average book price and average journal price. (Walker 2003 : 5)

According to the formula, the Faculty of Science is allocated 21.5% of the Materials budget at UND. Without discussing the merits of the formula in detail, the results indicate that the formula has produced effects that are seriously inhibiting research activity at the University.

The Faculty of Science in 2000 decided that it would be preferable to devise a new formula more suited to their purposes, which would be comparatively simple to apply and would be based upon simple but relevant criteria. It contained incentives which promoted higher productivity in both research and the training of post-graduate students.

The Faculty believed that the formula was numerically based and its approach to the assessment of 'research productivity': counting numbers of publications takes no account either of the significance of a particular piece of work, or of the intrinsic difficulty of research in a particular field. (Hey 2000 : 4)

As stated in section 2.5.1.1, the most frequently applied form of the Mulholland formula contains five parameters, namely academic staff, equivalent number of research publications, average book and journal price and number of books published. Three of these (academic staff, average book price and average journal price) are in fact compounds of weighted and unweighted data, while one parameter, the number of books published was regarded by the Faculty as irrelevant. (Hey 2000 : 3)

Only one of the parameters, equivalent number of research publications, survived roughly intact in the new Science proposed formula. The Faculty listed a set of seven desirable 'distribution criteria', with corresponding weighting factors. (Hey 2000 : 1-2)

6.5 Cost of materials and services

Journal subscriptions are only part of the scholarly information systems, internal operation costs are at least twice as high as the materials budget. Measuring the costs precisely and allocating the appropriate costs for content, staffing, facilities, hardware and overheads is

neither simple nor easy. The library spends a great deal on other costs like collection development, processing, ordering, cataloguing, shelving for print journals, issuing and servers and systems for e-journals; inventory control for both and subscription maintenance for both. There is a benefit of this service to the users with regard to e-journals, in that less time is spent finding and retrieving issues of journals. The library's non-subscription (that is, operational costs) are on average double the subscription costs.

6.5.1 Space utilisation

The chief impact of print journals on infrastructure is managing the physical space for growth of the collection over time. The transition to e-journals essentially eliminates shelving space concerns, no more weeding the collection, converting to microfilm or moving it to a remote location to make space for new volumes. Eventually, because of retrospective conversion efforts like JSTOR, the library will be able to reclaim journal storage space for other purposes. The cost savings, both on a capital and annual basis, are considerable.

But there are space concerns for e-journals as well. The first and probably most critical space consideration for e-journals, is electronic storage. Decisions must take into account a variety of different factors : the capacity of the system to store large files, familiarity of users with procedures for transferring, downloading and printing files; maintenance and data storage costs and the possibility of having to archive back issues.

Although disk storage cost is high, it must be remembered that simultaneous access by multiple users to all the journals at all times must be provided for, and the implications of this in hardware, network costs and software costs are significant. The addition of video clips and sound to journals would add to the network burden. Already the delivery of full-text and graphics over the Web can be very slow at peak times.

Ms Buchanan stated in her interview that presently the E G Malherbe Library does not have space concerns but with fewer items being added there is a saving for space utilisation because of the reduced space needs.

6.5.2 Infrastructure and digital technology

With regard to e-journals there are increased costs for the appropriate infrastructure in terms of equipment, hardware (servers and workstations), Internet bandwidth, increased costs for maintenance and increased costs for the staffing of new activities and maintenance like troubleshooting, software purchase and development. Research indicates that digital technology is not a cost saving revolution, but a value-adding one as stated by King at the PEAK 2000 conference. (Rosenblum 2000 : 2) The costs to libraries and content providers are significantly greater than expected, and greater than working in a traditional print environment.

While space is the most important requirement for the print format, networks, computer hardware and software and systems staff, are required to provide access to electronic resources. Fortunately for the library, these items are key components to a well functioning operation in all academic institutions, as they are essential for so many other reasons. None of the Library systems are used for e-journals exclusively since the Library provides access to the entire Web, databases, and the Web-based catalogue but the potential wear and tear on the hardware within the library as e-journal use increases, needs to be considered. Software requirements often change as providers make upgrades. The library has to commit to upgrading the hardware and software needed to access e-journals on a regular basis. If this is not done, then having access to e-journals maybe of little or no value, if users are unable to access them.

In a digital environment, sufficient computers are necessary for users to access information. The number and type of computers in libraries are important, if services provided allow not only access to indexes, but to full-text articles and other full-text resources displayed on the screen. The library does not have sufficient workstations to access e-journals and electronic resources presently, but plans are underway to install an Information Technology Division (ITD) managed computer LAN. Ms Buchanan in her interview stated that permission was given to ITD to install a computer LAN in the library to access library resources as well as function as a LAN for students.

Remote access must also be provided. Presently out-of-library access is limited to on-campus sites : offices, LANs and residences. The library has subscribed to e-journals with

user authentication and licensing restrictions and this severely limits the ability of libraries to offer remote access. Reading an article online takes more time than printing or noting citations to view later. If the computer serves the dual function of being a finding tool and an end source, then hardware for this increased use should be provided. The library has to provide the hardware required for the user to reproduce articles and other materials in a manner approximating the original when necessary. All the computers in the library have this necessary hardware loaded, but there are no printing facilities in the library. This will be a major problem for the library because the survey revealed that both academic staff and postgraduate students when given a choice would prefer to print from e-journals rather than only read them onscreen.

Factors that influence the use of electronic networks include the proximity to a computer, the computer experience of users, the network's ease of use and the number of Web access points provided by the Library. The survey revealed that the academic staff and postgraduate students have a fairly good command of the computer and its functions. The university computer infrastructure is not a deterrent to the use of electronic resources as measured by access to workstations and computer skills to use them. Older users and academic staff rated their computer skills as lower than did younger users and postgraduate students. Surprisingly, this factor did not appear to influence academic staff preference toward print publications rather than e-journals. The academic staff were undecided in that the stated preference for e-journals was in contrast to their use of print journals, see section 6.3.7.

Most publishers use Adobe Acrobat and its associated file format, pdf to display their journals on the Internet. This requires users to have an Acrobat viewer mounted on their machines (available free of charge on campus). The effect of using Acrobat or other such viewers, is that the appearance of the printed page is preserved even though the text is searchable. The document thus looks like the printed page and the pagination is maintained.

Paper and computer monitors work very differently. Information displayed on the monitor cannot substitute for paper, both in terms of utility and convenience. Computer screens are in landscape layout while pages are in portrait. Furthermore the screen holds far less information than a page and the resolution is inferior. The survey revealed that 38% of users print out articles indicating that although an electronic resource is being used, a printed document is the desired end-product. As noted above the survey revealed that users prefer to

print articles and read the article in hardcopy form rather than read on screen. Users are happy to use navigational pages such as table of contents, hypertext links on the screen. When the long full-text document is of interest, they print it out. There are several possible reasons for this. One is the computer screen can only hold a fairly small amount of information at a time, about a quarter of a typical printed page and users find it more useful to see a greater proportion of the document at a time. Second, reading from the screen can be difficult and consequently tiring on the eyes. Printouts are portable and can be read anywhere.

The journal serves unique functions for multiple audiences. While reading e-journals is not the same as reading print journals, many are beginning to acknowledge the possibility of these electronic documents offering users advanced features and novel forms of functionality beyond what is possible in print. The infrastructure is in place to offer this to the user. In the user survey only certain of these features were valued.

6.5.3. Licensing restrictions

Ideally, e-journals should be available to all valid users anywhere anytime. But with e-journals there are usually licence restrictions and limitations such as limiting access to certain geographic areas or preventing interlibrary loans from accessing e-journals or maintaining the print subscriptions. Many of the packages that the library has subscribed to have these licence restrictions. Ms Buchanan stated in her interview that many of the packages and individual subscriptions to e-journals cost less because of these restrictions. If the access was open-ended then the subscription costs would be more.

Other typical limitations include the number of simultaneous networks users licensed. Licences may also be multi-year commitments where the library may not be able to do anything until the licence is up for negotiation. This particular restriction affects the UND libraries at present where they have recently merged with the University of Durban-Westville libraries but access cannot be provided to Westville users until the licence is re-negotiated. Many of these licences run for a period of two years and are up for renewal in 2005. Ms Buchanan stated in her interview that the library is considering many new packages in light of the merger, such as the Elsevier ScienceDirect package of 1900 titles which will commence in 2005 and is available to all five campuses of the new University of KwaZulu-Natal. The

library was given a ten percent discount because of access to five campuses, but the access is limited by licence to on-campus access. Some licences have restrictions on interlibrary loans hence unheld titles will not be available through interlibrary loans. Such changes will most likely require a re-negotiation of the contract and will possibly increase the cost of the product.

6.5.4 Supplies and services

Other operational costs to maintain the journal subscriptions are the supplies and services. The cost of binding print journals, tattle-tapes for security measures, printing and photocopying costs do not have a major impact on the journal costs but are costs that should be added to the equation to fully understand the cost of maintaining the print journal collection. From the researcher's observations, print journals have the disadvantage of being out of circulation while the copies are being bound.

With photocopy expenses, the library employs a full-time staff to maintain the photocopy section. There are also the paper costs and the costs for the maintenance of the photocopying machines. But these profits or the proceeds from these go into a separate fund and do not have an impact on the materials budget. The materials budget is not credited with that amount and therefore they have no direct impact on the cost of the journal.

6.5.5 Archiving and perpetual access

One of the premise of scholarly communication is the permanent availability of published papers. However, the rapid obsolescence of both the file formats in which articles are stored and the hardware and software needed to access and interpret these files is a major concern for archiving. For e-journals, assuring access to and storage of files is a critical issue. The library must never assume that this responsibility is safe in the hands of the publishers. Publishers have not traditionally maintained paper stock. There are significant costs in storing large files and maintaining access to them. An important consideration in moving to electronic delivery is the ongoing access to data. Archiving and access to information in the future, when perhaps the library no longer subscribes to the title, are key concerns for the library.

The lack of a clear direction on archiving responsibility at UND libraries may result from the variety of preservation issues that still need to be addressed. Technical, social, legal and policy challenges are inherent in maintaining an archive of digital documents. Magnetic media are subject to deterioration and data loss and authentication issues require sophisticated technology. Words on a printed page can be viewed and comprehended without any special equipment but digital documents however, are dependent on hardware and software to access them. Hardware and software becomes obsolete. Copyright and licensing agreements must be written to permit libraries to archive.

The survey results for archiving show that (see section 5.3.5) both groups of respondents wanted a fifteen year backfile of print journals and e-journals. As important as having access to the back file, is the knowledge that the journal content (both current and back issues) will remain available in the future and will not disappear, for example when a subscription ceases.

The primary reasons for retaining paper copies will probably be: occasional access to older materials that have never been digitized; as paper back-up (safety copies) of items that have been digitized; for artifactual purposes and for the opportunity to re-digitise material, as needed from originals.

As the literature review found (section 3.4.1.3) for perpetual access to e-journals, the pricing model will be affected. Where the data resides is also an important issue. Ms Buchanan stated in her interview that most electronic information is leased and if users want perpetual access, then the library has to negotiate for this access at a premium price. The major disadvantage of e-journals was uncertainty about a permanent archive. Because most e-journal services only go back a few years, to possess the entire run of a journal, libraries must retain past volumes in print. Libraries access rather than own e-journals. The question of archiving is pertinent here - if a journal publication ceases, will the publisher guarantee access? Preservation involves migrating data from old technologies and software, a potentially costly proposition. Elsevier maintains a digital archive of its e-journals and has agreed to transfer them to a depository in the event that the company cannot maintain them.

Archiving is expensive. Traditionally the library served as depositories for print journals. But archiving is beyond the reach of a single library. Ms Buchanan thought that this responsibility should rest with a new sector of the information world, a service like JSTOR. As explained in

section 3.4.6 JSTOR is a digital archive collection of core scholarly journals made available through the WWW, intended to provide new research possibilities, and to help libraries with the long term costs associated with the storage of back issues. Serials librarians have no idea what publishers intend to do about archiving their titles. Publishers are unlikely to maintain long-term archives unless it is financially beneficial to them. As stated the current survey indicated that users would prefer a fifteen year print and electronic archive. Libraries are not sure who will be responsible for this vital activity. JSTOR and the IOP Archive are examples of how UND is also addressing this unsettled issue. Print, microform and audio-visual material can be adequately preserved. The archiving of electronic resources raises concerns about the security of the data files, search software and operating systems, the remote access links and storage costs.

Libraries have learned that storing large files of data and maintaining access to them means significant additional costs in terms of staff, time and resources. When migrating data to new media, cost issues need to be resolved and decisions need to be made about items that will be preserved.

6.6 Cost of providing the service and impact on staff time

Expenses are often not reduced when new services are offered which, on the surface, are thought to provide cost reductions. They are merely shifted to a different line of the budget. The costs of the journal subscriptions are covered by the Materials budget whereas the cost of providing the services are paid from the other budgets like the salaries and operating budgets.

The introduction of new electronic services has implications for virtually all library staff. Inevitable as electronic information systems expand, workloads will change and resources both human and financial, will need to be redirected. Successful implementation will only be achieved by a highly trained and skilled library workforce.

One of the trends in staffing as a result of the increased workload imposed by e-journals was to incorporate new responsibilities into existing library positions at UND libraries. Ms Buchanan stated in her interview that no new positions were created to handle the influx of e-journals. Staff members had taken on tasks in addition to their daily tasks. Had new posts

been created there would have been substantial costs for the increased staffing at professional levels. But in light of the merger and growing e-journal collection, this needs to be re-looked at. The discussion below will indicate the implications of not employing more staff. UND libraries chose to expand existing responsibilities rather than add new positions because of budgetary constraints and the merger. This section will discuss the cost of providing the journal service to users, in terms of staff.

The migration to an e-journal collection has affected staff and costs in every department in the library. The following discussion describes the major changes and impacts on the library along with related issues.

A substantial amount of staff time is required to manage the journal collection. Moreover the e-journal related activities require professional level skills, whereas many of the savings for print journals are in clerical activities such as checking-in and shelving. Electronic resources are more problematic, more time consuming and involve more paperwork than print subscriptions. E-journals involve more staff and increased staff time at both the acquisition and maintenance stages of the workflow than their print counterparts. This increase in staff time clearly affects staff workloads.

The workflow for print journals is a very linear process involving six simple steps, each performed by a different individual in the UND libraries, working independently. This involves ordering the journals, processing them by checking them in when they arrive, invoicing and arranging payment, shelving and binding them and the bibliographic instruction on their usage. On the other hand, the workflow for the acquisition of e-journals is non-linear and involves more people, often working in teams. The workflow is different for e-journals and print journals.

E-journals require higher-level library staff and increased communication and co-ordination. E-journals required more staff time, not only to select and acquire, but also to maintain, as well as to instruct users in their use. The departments required to handle journals remain the same regardless of format, but e-journals require involvement from the Information Technology Systems, Administration and Information Services Department.

The number of staff involved in handling e-journals as opposed to print journals has increased. The largest portion of staff time on e-journals has not been taken from the time spent on print journals, but from elsewhere. New tasks are required for e-journals – acquisition; creation of access rights, bibliographic instruction for use, negotiation and licensing. Libraries require new skills from library staff and these new skills often require more staffing at higher levels. There was an expectation of savings in staff time needed to manage the print collection but a substantial amount of staff time is required to manage the e-journal collection. Moreover e-journal related activities require professional level skills, whereas many of the savings are in clerical activities such as checking in.

Existing staff must also be trained to handle new tasks, which comes with cost implications. Staff members will benefit from relevant on-the-job training courses, workshops, seminars or conferences but the majority of staff at UND libraries have received no supplemental training at all, but had to learn on their own.

6.6.1 Purchasing and organizing the material

A number of departments in the library are involved in the purchasing or acquisition of journals and the organization of the journals in the library. The impact of e-journals on that process will be discussed below.

6.6.1.1 Administration and management

Journal collections represent a substantial cost and very sizeable fraction of the library budget. Journals have always required serious attention from the University Librarian. In Science, journal costs represent most of the materials budget. E-journals raise new issues which call for the involvement of the Technical Services manager and Acting University Librarian to an even greater extent.

Activities include:

- Communicating awareness of the e-journal collection to users
- Obtaining institutional funding and support
- Joining consortia
- Contract negotiation and review
- Setting and revising strategies for electronic resources acquisition

- Building a library staff with appropriate skills and managing change
- Restructuring workflow and re-organising staff changes.

The transition from print to e-journals will have a large impact on the workload and involvement of the Library's administration. It is always more difficult and time consuming to manage change than to maintain the status quo.

6.6.2.2 Systems staff

To develop and support the infrastructure needed for access to e-journals, the internal systems functions will have to be re-organised and centralised in a new library systems department . At present this is not so in the Library. Library computer support and staff development is provided by the IT assistant. The latter is responsible for the servers, software installation and upgrades. A percentage of her time is allocated to e-journals since the use of e-journals is growing and is a significant component of infrastructure use.

But this person also serves as the Webmaster, who spends about 25% of her time on e-journal access. She maintains the library Website with HTML pages listing e-journals by subject, titles and vendor. This is done with assistance from the subject librarians who have compiled and maintain the lists of e-journals on the library Home page.

6.6.2.3 Technical Services

Although there will be reduced staff time for the print journal processes (saving), there is a huge increase in professional level tasks. The costs for the staffing of the Technical Services balance out, but are more weighty on the professional side than the clerical side.

E-journals offer new challenges due to the number of e-journals now available and the complexity of management and access issues. The selection, ordering and cataloguing processes for e-journals are more complex than for print journals. There is also a sense of immediacy with e-journals that may not always be the case with print journals. Once e-journal titles have been set up, users have come to expect immediate uninterrupted access.

Technical Services operations have also been greatly challenged by the need to maintain dual formats. Since most e-journals are really traditional journals in electronic format,

acquisitions and processing procedures for managing e-journals will not differ significantly from those of print.

In the Technical Services department, the transition to an e-journal collection has had a direct impact on the day-to-day work of each staff member. Changes in workflow and procedures were dramatic, with very large shifts in costs. It is clear that with a decrease in print titles, there will be decreased workloads for tasks related to the print format but the role of the serials librarians has expanded with the influx of e-journals. Direct costs for cataloguing print titles and maintaining MARC should decrease. Binding fees should also be reduced.

6.6.2.4 The purchasing of the journals

The selection process of e-journals is more complicated than that of print journals. Academic staff, subject librarians, and the University Librarian choose print journals. However more departments are and will be involved in the selection of e-journals.

All the selection factors for print journals, such as content, cost, ISI impact factor, and importance to the collection, also apply to e-journals. Developing an e-journal collection is much more complex than developing a print collection. Common considerations in evaluating print are subject discipline, cost, quality, collection balance, faculty interest. In addition, new factors such as interface options, search features, display formats, access restrictions, linking capability and format must be contended with.

Ordering a journal no longer means that the library pays for physical issues or volumes. E-journals are different because the library will access them rather than own them. To guard against the abuse of intellectual property in the digital medium, publishers require libraries to sign licence agreements that delineate who comprises the user population, what constitutes 'authorised use' of the information and how long the access to the information will last. The library will have to develop a worksheet or checklist to apply to licence agreements. There are many aspects of licenses such as interlibrary loans, remote access, technical support, licence expiration and usage statistics to be dealt with. A single person may be required to handle this multifaceted task.

Print journals typically come in many separate issues annually, and when many print journals are taken by a library, the costs of recording the arrival or non-arrival of issues mounts greatly. Journal check-in includes a great deal of clerical-level work, yet opening the journal packages requires some sophistication in journal title selection or part discernment given the look-alike titles and title changes. The library also has to stamp dates of receipt, marks of ownership and attach tattle or anti-theft slips. Almost every change in a print journal, whether of its packaging, frequency of issue, title, organization of content, generates both increased direct costs in subscription fees and a good deal of hidden handling costs. With e-journals, savings accrue from the time required to check-in print issues, claim non-arrivals and replace missing pages. E-journals will eliminate a great deal of the clerical and semi-skilled work.

For e-journals, prices must be negotiated, trials arranged and competitive sources and package deals evaluated. Other additional factors are comparability with print content and visual quality, linking capabilities, interface design, archival policy, length of back files, availability of use statistics and access restrictions such as where (off-campus) and to whom (walk-in users).

6.6.2.5 Organising the journals

The amount of work required to organize and update the bibliographic record and holdings of e-journals is much greater than for print journals because of the inconstant nature of the e-journals. Cataloguing not only has to deal with a volatile collection but they will also have to maintain links from catalogue records to full-text. Libraries consider e-journals as part of their library resources and as such these journals should be reflected in the catalogue. UND Libraries uses complete original cataloguing for e-journals. The 856 field which is the uniform resource locator (URL) field is completed. With UND the pure e-journals are only catalogued on URICA and electronic equivalents of print titles. The library system, URICA, is a Web-enabled catalogue. The Web-based OPAC has a clickable link directly to the e-journal. The library also maintains a HTML list for the Web page.

But at UND libraries in addition to the URICA record, separate Web pages were created for e-journals. Cataloguers are required to add and delete titles on URICA and maintain the library Web page. Maintaining access points to e-journals both in the library catalogue and

Web page require a different set of skills from the activities associated with maintaining access points for a print collection.

The amount of work required to update bibliographic records and holdings of e-journals is much greater than for print journals because of their erratic nature. Journal holdings, access points and content are all subject to change at the whim of the publisher and/or the aggregator. Libraries rely on user feedback to determine whether there are problems accessing electronic resources. This method is thought to be faster, more efficient and more cost effective. For example, when an issue of print does not arrive, the library claims the missing issue from the vendor or publisher. When an issue of an e-journal fails to arrive, there is no vendor claim. As there is no check-in of the issue, the catalogue does not alert the library to the missing issue. Instead the library must rely on user feedback to find the problem.

Offsetting the decrease in activity levels and costs related to the print format is a very large increased workload for both acquisitions and cataloguing functions related to providing access to e-journals. The e-journal collection is also less constant than a print collection in that the electronic distribution is not tightly linked to calendar year only subscriptions, so journals are added continuously and sometimes cancelled during the year. This feature is an advantage but one that creates additional work.

With the circulation function providing access to the journals, there should be reduced staffing due to the fewer items to be shelved. Shelving activities will be affected with the onset of e-journals when journals are no longer physically stored in the library. But UND libraries are not at that stage as yet and there is still a strong user population for the print journals and monographs. But in the future there is likely to be a decrease in the need for shelf and stack maintenance and user photocopying.

6.6.3 Searching and training the users

The use of e-journals will require a considerable training exercise with the continuous change in hardware, software, systems and interfaces. Users will need to learn how to access the journals. This service is provided by the Information Services Department. The information services staff are responsible for providing an information service to all users, liaising with

academic staff, collection development in addition to the usual functions of answering questions, teaching classes and performing public relations such as promoting the availability of services. In practice, they are involved in a number of stages of the 'life cycle' of the e-journal. They share responsibility for identifying titles for purchase, evaluating potential purchases, helping academic staff and students use e-journals effectively, incorporating information about them in their user education classes and helping publicise them to their constituencies.

According to Ms Buchanan, more time will be spent on instruction and outreach activities required to make academic staff and students aware of the library's resources and services. E-mail notification, newsletter, library catalogue, and user education or instruction sessions are some of the methods to be employed. The subject librarians are responsible for the communication and public relation function.

They will provide a reference service by answering questions related to print and e-journals. Making discovery and access easier for users and promoting the e-journals through public relations. The library newsletter routinely features articles about specific electronic services. Another effort that has also expanded is the preparation of both online and printed documentation to help users understand how to use e-journals.

The Information Services Department is spending more time on instruction and outreach activities required to make academic staff and students more aware of the library's resources and services.

In the researcher's opinion the library will also provide a teaching service – instruction about e-journal integration into the libraries information literacy effort with instruction about databases and e-books. They will have to prepare tailor-made presentations for their audiences.

The format shift has also had an impact on how and what is taught in library instruction. With the print journal collection, users can access the collection by walking up to the shelf, pulling off the bound volume or the current issues, opening the pages to the article of interest, reading it, copying the information or taking the volume to a photocopy machine to read at a later point.

In spite of the growing number of users who were born into the computer age, there are still many users who need assistance with basic computer skills, however, those with the technological savvy need help as well. The library now aids users in getting connected to the electronic infrastructure and in learning the intricacies of the multitude of interfaces as well as helping them to actually find the information they need.

6.7 Cost of providing the alternative

A factor that has to be included when calculating the cost and benefit of the journal collection is the cost of providing the alternative. If a subscription is unavailable in the library and access cannot be gained then the library has to have an alternative for the user. This is in the form of the interlibrary loan service. The literature noted the potential of interlibrary loans saving in the Kingma study of 2000 (see section 3.4.5). But in light of the restrictions of e-journal use in this way, this issue needs further investigation.

Users have of necessity begun looking towards resource-sharing, interlibrary loan and document delivery to compensate for reduced subscriptions. Interlibrary loan and document delivery provide a way of accessing documents not available on site. Electronic access and electronic communication between libraries and between library and user have made interlibrary loan convenient and time saving. Users also do not have to pay for the article if obtained from another university library due to the South African co-operative interlending agreement between university libraries.

The studies reviewed in the literature by Kingma and Mouravieva (2000) and Halliday (2001) have found that it was more cost-effective to use document delivery for high cost low use journals than to maintain journal subscriptions. These studies have concluded that each library would have to carry out its own evaluation because what may be cost-effective in one library may not be cost-effective in another library.

The cost to the library is R 10.00 per request and the cost to the user is the amount of time spent waiting for the delivery of an article. The average response time is 72 hours. From the analysis it could be said that access via interlibrary loan will become a possible alternative for all those journals where the possibility of obtaining an article quickly costs less than the price of a subscription. But the library lacks in-depth circulation statistics in relation to its own

journal collection use and these are needed to provide a more detailed picture. Therefore it is not easy to assess cost-effectiveness of alternative approaches such as interlibrary loans. This is a subject for another study.

The interlibrary loan service, which obtains copies of articles from other libraries for academic staff and students, requested about 16176 articles in 2003. This figure has decreased from 18042 in 2002. A possible reason for this decrease is that users are aware of the accessibility of e-journals. But this high loan figure for 2003 indicates the state of the journal collection at UND Libraries. The survey indicated that both groups of respondents regarded the print journal collection as not comprehensive and used a high proportion of interlibrary loans. Research from the PEAK Project (see section 3.4.2.3) also concluded that library patrons used articles from non-subscribed journals to a higher degree than anticipated.

There should be a decrease in user requests for journal articles via interlibrary loan as e-journal access increases. This demand was not measured in the current study and there is no apparent evidence that there has been a decrease. Some changes in procedure will occur to alert users of the availability of items electronically. At the moment the net impact of e-journals on interlibrary loans seems to be negligible. A possible reason is that users are not checking if titles are available electronically and the interlibrary loan section also does not check the electronic availability of titles. But the prediction is that ultimately there will be a decrease in net requests for this service as users become increasingly self-sufficient and as the library's electronic content continues to expand.

6.8 Comparison of the costs of print journals and electronic journals

An hypothesis of the study is that the costs of accessing e-journals are significantly higher than those for accessing print journals. The results of the analysis of the journal data support this hypothesis. There are significantly increased costs in staffing and a shift in costs from print journals to electronic journals. With Technical Services there are large shift in costs because of the changes in the workflow and procedures. There are decreased direct costs for cataloguing of print titles and binding fees, but there is a large increased workload for both the acquisition and cataloguing functions related to providing access to e-journals. Costs for updating e-journal records on URICA, which is so volatile are greater. As noted an advantage of electronic distribution that, however, creates extra work is that e-journals are not

linked to a calendar year only, so journals are added continuously and sometimes cancelled during the year.

With the circulation and stack maintenance tasks, costs will be lowered or reduced as the e-journal collection grows. In theory it would be easier to collect use statistics for e-journals but the skills needed to perform this task would be a higher level as is the case in Technical Services to collect e-journal statistics.

Information Services is responsible for providing information and instructional services as well as collection development to support the academic programme of the University. Information Services will be affected by the significant change in content. The staff in this section are involved in several stages of the life-cycle of e-journals.

It is relatively straightforward to calculate and compare the total costs of the print journal subscriptions and e-journal subscriptions respectively. However, this simple calculation would ignore the complex set of factors that must be considered to make a comparison between print journal and e-journal subscription prices. A 'subscription' in the electronic world does not involve a simple payment for the annual content of journal titles as with the print journal. An annual subscription often brings with it several years of back file and the price models vary so radically.

Print journals are selected individually and reviewed annually. Print journal subscriptions are based on the cost of the print journal title. E-journals are based on the individual subscription cost or the total cost of the package. There are four types of e-journals.

Firstly the individual subscriptions, these are titles that are purchased from the publisher, such as the Royal Society of Chemistry titles. These individual subscriptions are the only type of e-journals that are paid from the Faculty of Science journal allocation, the other three types are paid from the Library budget. The second type are the publisher packages, such as the suite of 1900 ScienceDirect titles. The third type are the aggregators journals. These titles are purchased from vendors who provide access to different publishers journals like JSTOR. The final or fourth type is the full-text database where access to e-journals is provided by many different publishers, for example EbscoHost. The fourth type is not part of the study because these databases are bought for their searching capabilities and not for

their e-journal content. Full-text databases and e-journals are distinctly different sources, but both have sophisticated links to the e-journals that the library owns.

Price comparisons between print and e-journals will vary depending on the agreement with publishers, consortium agreements and the size of the library. Per title costs should be lower for e-journals. Even when e-journals are loaded with increased staff costs, the costs of these journals are much lower than print journal costs. When use is much higher for e-journals and print, the cost and benefit will be even greater. For example, for the journal title: *Annual reports on the progress of chemistry A*, the print title costs R 2220.00 while the electronic title costs R 1990.00. There is a difference of R 230.00 between the print and the electronic journal.

E-journals have many added value features that would justify their purchases even if they were about the same price as print. Probably the most important is that they are accessible any time and anywhere a valid user has an Internet connection. But they also have the potential for taking advantage of the linking capabilities of the Web and to link UND's subscriptions to the databases such as EbscoHost. E-journals can incorporate multimedia, link to background material and point to related information automatically.

The costs of the print journal collection include:

- allocation of fixed costs – subscription costs and processing
- costs associated with the service access to the collection – costs of shelves and back issues and current issues, stack shelves
- variable costs – directional reference to print journals (provided by subject librarians and other library staff), photocopying of print journals, shelving and re-shelving bound and unbound journals; binding of current issues

The costs of the e-journal collection include:

- collection related resources and allocation of computers, servers, systems, space
- resources used to train users and provide promotional and educational material for users
- variable costs – directional help, helping users and support provided to network users

As with the earlier example, the costs of some e-journals is lower than the print equivalent but the cost of an e-journal does not just relate to the price of the journal itself, but also to the supporting infrastructure. When the library acquires an e-journal, it purchases more than the content, it also purchases the search interface and the content links that enhance the electronic copy. The literature reviewed for the study (Halliday 2000; Kingma and Mouravieva 2000; Rosenblum 2000; Tenopir 2002; Varian 1996; Woodward 1994) as well as the journal data indicated that e-journals are not a cost-saving product but a value-adding one. The costs to the libraries are significantly greater than expected, and greater than working in a traditional print environment. But the high usage of such material suggests that while total costs remained high or even increased the cost per use are likely to have decreased.

Storage space for bound journals is a major expense. The e-journal results in increased costs of some activities, but the advantages and decreased costs in other areas outweigh the increases. The most significant benefits are to students and academic staff. The survey demonstrated broad user acceptance of journals, especially e-journals. An interesting finding in the survey, revealed that although academic and postgraduate students conduct research, they visit the library less often but are very dependent on the library. The assumption can be made that they are accessing the electronic resources from outside the library and rely on the journal subscriptions of the library to conduct their research.

Shared costs for single deals across the five campuses of UKZN should provide savings as in the example of ScienceDirect where the library gets a ten percent discount if it is multi-campus access and an electronic only subscription with no print journals.

Collection development costs are generally higher for e-journals because the cost of personnel needed for the time consuming process of negotiating licences, additional variables to be considered for example, interfaces, linking from databases and so on.

Subscription maintenance can be higher for e-journals due to the volatility of the collection. Since labour costs are higher during the transition, the benefit should increase over time unless subscription prices increase dramatically. The access to back files as part of current subscriptions, makes the economic picture for e-journals even better at the time of purchase.

The most significant benefits of a journal collection are to the students and academic staff. The survey of the user groups and Ms Buchanan demonstrate broad user acceptance. E-journals broaden the range of journals read, can be accessed from many locations and save time in searching. The added benefit of e-journals is that due to the number of distance education users, access is possible from remote locations such as the Geology and Geography students who do their fieldwork off-campus. Some technical problems, though, need to be addressed.

The e-journal is preferred in some respects over the print by the users. Overall the most obvious benefit for the libraries is the monetary savings associated with the subscriptions, (see section 5.4). In addition, associated costs of processing and storage are saved as well. The library no longer needs to spend money on security features, binding, circulation and the associated staff time. In addition to these direct and indirect costs, the libraries will see savings if it foregoes print issues entirely in the form of processing, invoicing, renewals, binding, circulation and re-shelving. Lastly, non-retention of print journals can save space.

UND libraries may have no choice, budget cuts and serials inflation may dictate that they forego print in order to shield the collection from further cancellations. The bottom line is of balancing declining budgets and providing continuous access to materials that increase in price by more than five times. But on a per title basis, the e-journals have superior purchasing power. Nearly all e-journals come with several years of back files. The average print journal subscriptions costs R 10 000 while e-journals average costs are R15 000.

In terms of the survey, a major requirement was a fifteen year backfile (an archive). That issue has not been resolved. If the library were to move rapidly to an e-collection, this will need to be accompanied by a considerable expansion of the workstations on campus. The problem of many simultaneous users will also need to be addressed.

A review of the costs of acquiring and circulating print journals indicate that a transition from print to electronic would eventually reduce annual library operation costs, but it is not clear how much of these savings might be offset by the costs of technology infrastructure and equipment replacement. Large recurring expenses in support of historical print collections would continue but gradually diminish over time as the aging of the collection reduced the rate of usage.

Some of the perceived disadvantages of e-journals are that they are not easily usable because there are no instructions or guidelines to help the user. Some operations take time, it is easier to turn a page in a print journal. Connection times are sometime slow and disconnection occurs easily.

6.9 Comparison of the costs and associated benefits

Two of the hypotheses of the study is that the benefits of accessing e-journals is significantly higher than that of print journals and the cost-benefit of accessing e-journals is significantly higher than print journals. E-journals have many value added features that justify their purchase even if they were about the same price as print. Probably the most important is that they are accessible any time and anywhere a valid user has an Internet connection. Moreover, they also have the potential to take advantage of the linking capabilities of the Web. Use of e-journals is much higher than use of the print journals according to the survey. Electronic resources are a real boon for distance education programmes.

There are three basic benefits of not retaining print journals:

- Money in the form of savings associated with subscriptions, processing and storage
- Time in the form of savings in processing, renewals, binding, check-in and associated serial tasks.
- Space in the form of savings on current shelves, bound volume shelves and storage areas. All libraries have space management problems due to expanding collections.
- Savings are also in the security features, circulations
- Associated savings on VAT, postage, shipping and handling charges.

6.10 Best way forward

The shift to electronic formats is a mixed blessing for academic institutions. The costs are great, subscriptions are often higher and the technology infrastructure needed to provide electronic access is complicated and expensive. At the same time, libraries must still maintain the infrastructure needed for print, in particular because of unresolved issues concerning archiving and preservation of journals. Libraries may also retain print

subscriptions due to the licensing agreements, which directly link online access to print subscriptions. The library will have to continue to support a print-based system while simultaneously merging in an electronic system.

While print will always have a place within the library's collection, there are a number of factors that are impacting directly on the ratio of print to electronic resources. With increases in electronic purchasing looking set to continue, and solutions to archiving and preservation under development, it is likely that the library will have to start cutting down on duplicate print and electronic collections, in favour of an online only collection. This will ensure access to holdings is maximised for an increasingly dispersed user base.

We have been in a period of transition from a print medium to an electronic environment for some time. Libraries have committed themselves to the new technology, taking on the expense necessary for infrastructure, hardware and software. Libraries cannot go back to a print-only environment, though spiralling costs make libraries wish they can. Clearly there are continuing challenges facing the Library's administration and staff as they proceed with the migration from a print to electronic journal collection.

Examined from the library perspective, it appears that the e-journal collection and services will yield benefits in requiring lower prices per title, less time of clerical staff, and potentially substantial savings in space. Thus, those resources can be reallocated into additional or better service to users.

Is it possible to replace print journals with full-text electronic access? The answer would be both 'yes' and 'no'. Yes in the sense that the libraries would cope with and benefit from the format, and no, that at the moment , the infrastructure and the staffing in the library is still not in place.

This reason for this answer to the original question is that the UND libraries are in the early stages of development and clearly there are a lot of outstanding issues to be addressed, many of which have been explored. A lot will change over the coming months, for example, the new LAN planned for the library, all of which will provide a challenge to the managers of the hybrid library.

In conclusion, while the cost of providing access to e-journals has increased expenditures overall, unit costs should decrease. The collection is more heavily used as compared with the print journals.

6.11 Summary of the chapter

It can be seen from the interpretation of the results that the study was able to accomplish the objectives that it set out to achieve and answered the research questions that were raised in the study. The study has managed to demonstrate that there are costs associated with accessing and subscribing to print journals. It further established that there are costs of gaining access to e-journals. E-journals have many advantages but these do not translate into cutting or saving costs. And e-journals provide additional benefits that are difficult to measure in Rands.

The survey of the academic staff and postgraduate students in the Faculty of Science resulted in several significant findings. It confirmed that the demographic data, library usage, computer expertise and usage and journal experience of both groups of respondents influenced their journal seeking behaviour.

The results of the survey confirmed the hypothesis that there are unique benefits to print journals and electronic journals. In many cases the reasons the respondents gave for preferring a format were the same. Although e-journals have many potential benefits over traditional print journals there are many practical problems that the library has to resolve The study provided preliminary information from which to continue discussions regarding the nature of the journal collection at UND Libraries.

The analysis of the journal data showed that UND libraries are spending more but acquiring less. The overall costs of e-journals are quite comparable to those of print journals. A number of factors were cited as the reason for the high subscription costs like the fluctuating exchange rate and publisher costs, but the subscription costs were only part of the systems, internal operation costs like staffing, infrastructure, hardware and so on were at least as twice as high as the subscription costs. Important issues that arose were that of interlibrary loans, archiving, remote access and simultaneous access.

On the whole the study was therefore able to answer its research question and accomplished the objectives it set out to achieve.

Chapter Seven : Conclusions and Recommendations

7.1 Introduction

This chapter provides the concluding remarks of the study and various recommendations are made in response to the analysis of data and interpretation of the results performed in the previous sections.

7.2 Revisiting the purpose and objectives of the study

The purpose of the study was to do a comparative analysis of the Science print and electronic journal collection at the UND Libraries, in terms of costs and benefits. The study achieved the following objectives:

- The study established the costs of accessing and subscribing to print journals
- The study established the costs of gaining access to electronic journals
- It compared the cost of access to print journals with the cost of full-text access to electronic journals
- The study determined the benefits of print and electronic journals.
- The study determined which of the two, print journal ownership or full-text electronic access, is most cost-beneficial in Science at UND Libraries.

The anticipated outcome of the study was to inform UND libraries' decision-making, chiefly regarding the Science journal cancellation decisions and to make possible choices between print and electronic full-text journals. Information and answers to these will help the Library anticipate trends in journal collection and subscriptions and help in financial planning and budgeting.

7.3 The hypotheses for the study

- There are unique costs related to access of print and electronic journals
- There are unique benefits of print versus electronic journals
- Costs are significantly higher in accessing electronic journals than print journals
- Benefits are significantly higher in accessing electronic journals than print journals
- The cost and benefit of accessing electronic journals is significantly higher than that of print journals.

7.4 Conclusions

The UND libraries have found themselves faced with the difficult decision of whether or not to cancel print journal subscriptions in favour of electronic journals. The cost of acquiring both formats of the same title is often the driving factor behind this decision though there are other concerns such as storage, archiving, user expectations and demands on library personnel.

The library has made tremendous investments in the products and services they offer, especially in the journal collection. Often the decision to acquire these services is made without completely understanding the actual costs involved and without knowing whether the new resources are economically better choices than more traditional resources like print. Furthermore, the library budget is shrinking in real terms and the library has to justify its acquisitions and prove their value.

Analysing the costs and benefits, as has been shown through the study, can support the contention that the choice to offer access to e-journals is economically sound. The library hoped to make savings in subscriptions to e-journals or even not spend additional money in providing access. Sometimes the cost of a new service may not outweigh its direct benefits. In such a case as this the library must decide whether the non-tangible benefits of offering access to e-journals are worth the potential added costs. But this is subject to guaranteed perpetual access.

Library decisions are determined by the needs of its users, namely the Faculty and students. These users require access to e-journals as seen from the survey. The addition of e-journals involves a significant investment of money and time. The comparison is useful in proving to the library that even though the e-journals may cost more, the returns and or cost savings in other areas can easily outweigh the initial expense. The advantages of e-journals do not translate into cutting costs.

The survey of the academic staff and postgraduate students in the Faculty of Science resulted in several significant findings. Analysis of the results indicated that respondents used print journals for ease of use and e-journals for full-text searching. Users considered

e-journals easier to access and search than print journals, however they reported that print journals had a higher quality of text and figures. It can be concluded that print journals are still necessary and it is premature to abandon print at this stage. Respondents also answered an open-ended question about reasons why they preferred a particular format. In many cases, the reasons that the respondents gave for preferring a format were the same. The most cited reason for e-journals was searching and full-text and ease of access. The most cited reason for print journals was that the format was easier to read. Although the support on campus was stronger for providing both electronic and print versions of the journals, many favoured canceling print duplicated by e-journals, if there was guaranteed perpetual access to the content, hence the request for a fifteen year back-file. But Ms Buchanan stated in her interview that if users want perpetual access, then the library has to negotiate this access at a premium price. So this perpetual access comes at a cost. This issue is dealt with in the recommendations.

It is clear that e-journals have potential benefits over traditional print journals. However, the results of this study illustrate that there are still many practical problems that the library should consider when allowing users to attempt to access journal articles published in electronic format. Some of these problems were: insufficient computer workstations, lack of printing facilities, increased professional workloads imposed by e-journals and lack of common procedures between the different library sections. Each section in the library has its own procedures and deadlines which are governed by the number of staff, reporting structure and task loads. As a result of this there is a lack of a single common procedure.

The study has revealed that there are many issues related to e-journals which have to be resolved in order for the best continuation and development of the role of such journals in scholarly communication. One of these issues is that the library does not have the infrastructure or capacity at present to handle a totally e-journal collection. In spite of the number of respondents using e-journals and the advantages of e-journals – a substantial proportion of both groups are using the print journals. The reasons for this usage need to be investigated. It could be that the necessary infrastructure is not in place or even the portability of the print journal is too attractive. The results of the survey might have been different if it were carried out on the Pietermaritzburg campus where journals are only loaned overnight.

This study was conducted from 2002 to mid 2004. Since the inception of the study e-journals have grown substantially and user interfaces have improved. There have also been major developments in the library with regard to the journal subscriptions. The University Librarian and the Library reports to the Deputy Vice-Chancellor for Research, and this Office has covered the shortfall for the journal expenditure and has sought additional funding for journals. The Research Office, under Professor David Walker has also successfully motivated for the Libraries to receive adequate funding for books and journals.

This study provides the library with preliminary information from which to continue discussions regarding the nature of the journal collection at UND Libraries and makes the following recommendations.

7.5 Recommendations

An important result of most research projects is the identification of promising directions for additional research. This thesis produced such recommendations.

7.5.1 Background to the recommendations

A brief review of important points relating to the study is necessary as an introduction to the recommendations to be made.

The increased foreign exchange rate compounded by the frequent increase in the price of journal subscriptions has led to journal cancellations. To cope with this situation, libraries are coming to measure their collections and looking at alternative ways to overcome this journal crisis. For most libraries and the faculties they serve, meeting this objective means making choices; namely canceling journal subscriptions, choosing new subscriptions with caution, and seeking alternative cost-effective means of providing users with information. Broadly speaking, libraries spend their financial resources on materials, staff and operating expenses and these are the only areas in which major economies can be made. (Bot 1998 : 1)

Traditionally, the library has borne costs as a result of providing access to scholarly information: the book or journal has to be ordered, catalogued, sometimes bound, shelved and re-shelved, circulated and so on. The largest component in the cost of operating of a

library is likely to be the cost of the staff. Other costs to be considered are equipment, use, space occupied, copyright clearance, cost of online access, purchase and maintenance of the collection.

Libraries can assess the benefits of access to and use of information and journals provided by the library. Archiving and access to information in the future, when perhaps the library no longer subscribes to the title, are key concerns for librarians.

7.5.2 Directions and practical steps to be taken

In the light of the above, the following recommendations are made with regard to the future of electronic journals. The increasing proportion of the total University budget allocated to the Library budget will hopefully continue as a trend to the optimum six to seven percent of the total budget. The University should spend at least six percent, if excellent service is required and five percent if normal generally acceptable levels are required. (Willemse 2002 : 35) Other recommendations for further action include the revising of the funding formula and the ratio for journals to books and the appointment of an Electronic Resource Librarian.

7.5.2.1 The funding formula

The funding formula is used for the distribution of the Library Materials budget. The Mulholland formula that is used by the Library to allocate funds for books and journals is seriously flawed because the Faculty of Science is one of the three leading faculties in terms of research output at the University, has an allocation insufficient to cover the costs of their journal subscriptions.

The Mulholland formula needs to be re-examined. The formula takes into consideration the journal costs, research output, research staff numbers, average book price and average journal price. It is clear that the formula does not give adequate weighting to the differing costs of journals in the various fields, or to the research outputs of the faculties. The Faculty of Science (Hey 2000 : 3) also believed that the formula was numerically based and did not take into account the significance of a particular work, or of the intrinsic difficulty of research in a particular field. Within the Faculty of Science, the Science formula is used and this formula is more nuanced.

It is therefore recommended in this study that the Library Advisory Committee and other relevant committees in the Library need to re-assess the University funding formula to the library or devise a formula that would take all of the above factors into consideration. Furthermore the Mulholland formula that is used to allocate funds for books and journals needs to be re-examined.

7.5.2.2 Ratio of journals to books

Due to the journal prices spiraling out of control, larger portions of the library budget have been spent on journal subscriptions. The focus of budget cuts has shifted to journal subscriptions with massive journal cancellations and a steady erosion of new book purchasing. Because expenditures on serials are annually recurring costs and because journal prices increase at twice the rate of book prices, it can readily be seen that a shift of resources from books to journals carries a financial poison.

Furthermore the library does not purchase access to electronic resources from the Materials budget but from the General fund. In practical terms, this sequestration of funds for electronic resources has, in many instances, left them virtually immune from cuts and, thus, placed a disproportionate burden on other library materials in times of crisis. The other danger is that the book budget is top-sliced in the materials budget cutting exercise. Professor Salim Karim, the Deputy Vice-Chancellor for Research recommended that there should be a two to one ratio for journals to books. In other words, there should be one third of the budget dedicated to book purchases and two thirds to journal subscriptions. In this way the integrity of the book collection is not undermined. Undergraduates use books heavily in the first few years of study.

If the ratio is to be adopted, then the journal budget will not overwhelm the book budget. In the absence of such a measure the Faculty of Science, recognizing the need to ring fence a proportion of the budget for books, recommended that 10% of their budget allocation should be kept aside for book purchases. This journals crisis is impacting directly on the ability of the library to build a comprehensive core collection for current users and long term archives. (Hey 2000 : 2)

7.5.2.3 Set of core journals

The Library is subscribing to fewer journals but is paying more each year. On the basis of the journal data, it can be concluded that if the library wished to return to the standards at the beginning of 1990s it would have to spend roughly twice as much on journal subscriptions for Science.

Therefore, as a recommendation for this study, each discipline should maintain a set of core journals, a number of which should remain so permanently. They should also be immune from the journal cancellation process. In this way the integrity of the journal collection is not challenged. For example, the Institute of Physics (IOP) Package A consists of thirteen physics title that the library subscribes to which was negotiated at a premium price with the Institute. But not all thirteen titles are major titles in Physics. If the Institute were to offer the Library another package at a reasonable price, the Library would accept that offer. Therefore if there were core titles in Physics that had to be maintained, no offer would entice the Library to cancel them.

These core titles in a subject area must be considered essential to justify their being maintained in multiple formats. But the respondents in the survey were not decided on the format, print or electronic. The majority of the academic staff and postgraduate students felt that an archive should be maintained for journals older than fifteen years. This has cost implications for archiving. But at present print journals are the best format for archiving.

7.5.2.4 Electronic Resources Librarian

The growth of the print and electronic journal collection is overwhelming. In the past five years the electronic collection has grown considerably and in 2005 with access to the ScienceDirect package, a suite of 1900 titles, managing and co-ordinating the journal collection will be a mammoth task. This task has to be centrally coordinated and re-organised because there are so many sections / departments that are involved in the process. Presently this tasked is shared among professional staff members who are doing it as the need dictates (reactive) but a more proactive and coordinated approach is required. Many of the procedures were developed within a print environment and are not sufficiently flexible in the electronic environment. The amount of work required for the maintenance of an e-journal

collection is much greater because of its volatile nature. The complexity of negotiating prices and contracts requires a specialist to cope with the legalese and purchasing variables.

The library therefore needs to employ a full-time Electronic Resources Librarian with an assistant to provide a focal point for integrated development of all electronic resources. This position will cross traditional departmental functions including systems, technical services and information service. There is also a need to create a separate IT section where all responsible departments will co-ordinate their efforts or liaise with this section. Almost all departments are involved in the journal process, that is, Circulation, Acquisitions, Cataloguing, Information Service and Administration. The merger also presents Library Management with the opportunity to restructure the journal processes.

7.5.2.5 Computer workstations in the library

To access e-journals there have to be sufficient workstations in the library for its users. There are only four workstations on the ground floor of the EGM Library and four workstations in the Audio-visual room in the library which are insufficient. As a solution a LAN should be installed in the library. Ms Buchanan stated in her interview, permission had been granted to ITD to install a LAN in the library. The proposal for the new LAN would be twenty computer workstations with the necessary hardware and software. This LAN will be managed by ITD and will allow access to all resources, not necessarily library resources. In addition to this the library needs to look at ways to increase the number of computer workstations on the library floors. Library management needs to investigate methods of increasing the number of computers in the library, by way of sponsorships, corporate funding and so on.

7.5.2.6 Measuring usage of journals

Any form of benefit analysis requires input from users on the nature of their use of particular library and information service (LIS) products, in this case the journals, and their assessment of the impact of providing or not providing them. In this study, the researcher did an analysis of usage through the surveys but not an in-house analysis of use. Monitoring print journal usage in the library has always been a difficult task. Loan statistics tend not to be a very reliable indicator of use. Measuring the use of print journals is so staff intensive as to be impractical and can also be a time-consuming process. Appropriate data enables the library

to better understand how users use journal collections and it is important that library management have the best information available to inform their decisions. Providing e-journals offers the opportunity to study usage in a more systematic way. The library should collect and tabulate data on every measurable library service especially journal use. Correlations can then be drawn between interconnecting services like photocopies and journal use, budget cuts and interlibrary loan borrowing.

7.5.2.7 Provision of remote and perpetual access

The Library's strategic plan indicates that the library must provide access to its resources. The survey revealed that distance does not affect the use of the collection (see section 6.3.4). Therefore the library must also make provisions to provide remote access to e-journals and ensure continued access to its archival issues. At present, it lacks the equipment and infrastructure to do this. So much is not in place for a total shift from a print to an electronic journal collection. Presently, access to the journals are set up by the University's IP address which means that these journals are only available on campus. It is recommended that Library management actively monitor future opportunities for enhanced access to e-journals, for example access via a LAN server with passwords.

7.5.2.8 Awareness amongst academic staff

Faculty staff members have been well insulated from the problems of e-journal access, largely through the efforts of the library. The library sets up access to the journals, maintains the licence agreements and produces brochures with instructions on accessing e-journals. The library also maintains a Webpage with lists of titles available arranged by subject and publisher. The academic staff and users are also informed when there are changes and when new electronic journal packages have been purchased. The Faculty then only becomes aware of the issues and problems of access and so on when their favourite journal is cancelled or electronic access is lost. The library must raise awareness among academic staff about scholarly communication issues and promote a willingness to explore new avenues of publications.

7.5.2.9 Staff training and support

With the advent of e-journals, the role of the librarian and library staff is changing in order to incorporate the new medium. Staff at UND Libraries share the responsibility for identifying journals for purchase, evaluating potential purchases, helping students and faculty use e-journals effectively, incorporating information about journals in their library education sessions and helping publicise them to their users. With the onset of these tasks, there will be a period of change and logic therefore dictates that library staff should be trained. Librarians are increasingly needing technical competence, at least at the level of being able to refer problems to network supervisors, for example to advise users on browser configurations to enable e-journal access and on the use of library software.

There is therefore, a greater need for effective training of library staff to cope with the rapidly changing situation. The complexity of the electronic environment makes end-user searching more difficult and the need for user education therefore becomes necessary.

It is recommended that the library provide staff training and support as appropriate. This training should be area-specific with support as necessary.

Both past and new research (Argille 1999; Ashcroft 1999; Connolly and Reidy 1999; Gyeszly 2001; Jaeger 2003; Montgomery 2000; Tenopir and King 2002a) have indicated that e-journals require more promotion and evaluation than is currently taking place. This is due to lack of resources in terms of staff time and available budgets. The librarians therefore need a working knowledge of market research techniques and also need the communication skills necessary to promote the e-journals using both traditional means and through the utilization of new skills such as Web design and other online promotional techniques.

7.5.2.10. Archiving

The archiving of online content remains a concern and the print journals is regarded as a short term solution. The survey revealed that respondents wanted a backfile of fifteen years for print and e-journals. There is also the problem of migrating the data. As a recommendation of this study, an archiving policy needs to be written to guide the UND Libraries. Dr Dale Peters of the Killie Campbell Africana Library is involved in many projects

with archiving and preserving digital documents. Dr Peters should be consulted with regard to this policy.

7.5.2.11 Future research

There are still many unresolved problems concerning e-journals requiring the further investigation of this study. Solutions to these could be used to assist the Library in planning or improving services. Data collection capabilities from digital collections are far more sophisticated, reliable and precise than print collections. This provides opportunities for research on usage and user behaviour.

Finally, to conclude the library is likely to play an even more important role than it has in the past as the journal collections, print and electronic are highly beneficial to students and staff. The challenges will be great and the library should prepare itself to develop innovative programmes that will supply suitable services to all students and staff. Despite some turmoil, the scholarly journal system seems likely to continue its important role in research, teaching and lifelong learning. E-journals will continue to grow in acceptance and strength, although the library will continue to purchase both electronic and print journals at additional cost in order to provide an effective service.

7.6 Summary of the chapter

The library should not think in either / or terms when it comes to choosing between electronic and print formats, but should look at models that incorporate both. There are certain advantages to both formats and it is important to take advantage of both. In any event there will be a diverse market of print, microform and electronic journals for at least several more years.

The research indicates that digital technology is not a cost saving revolution but a value-adding one. The costs to the libraries are significantly greater than expected and greater than working in a traditional print environment.

List of works cited

Abel, R.E. and Newlin L.W. (eds.) 2002. *Scholarly publishing : books, journals, publishers and libraries in the twentieth century*. New York : Wiley.

Aitchison, J.M.H. 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. Master of Information Studies Thesis. Pietermaritzburg : University of Natal, Department of Information Studies.

Anderson, K. et al. 2002. Publishing online-only peer-reviewed biomedical literature : three years of citation, author perception, and usage experience. *JEP/Journal of Electronic Publishing*. Available: http://www.press.umich.edu/jep/06-03/anderson.html. Viewed 14 October 2003.

Argille, C. et al. 1999. Electronic journals and users – three perspectives. *Serials Review*, vol. 25 (3) : 47-59.

Ashcroft, L. and McIvor, S. 2001. Electronic journals : managing and educating for a changing culture in academic libraries. *Online Information Review*, vol. 25 (6) : 378-387.

Ashcroft, L. and Langdon, C. 1999. Electronic journals and university library collections. *Collection Building*, vol. 18 (3) : 105 –113.

Association of Research Libraries. 2005. Framing the issue open access. http://www.arl.org/scomm/open_access/framing.html#openaccess Viewed 28 February 2005.

Bailey, K. D. 1987. *Methods of social research*. London : Collier Macmillan.

Bevan, S. 2001. Replacing print with e-journals : can it be done? – a case study. *Serials*, vol. 14 (1) : 17-24.

Bittel, L.R. (ed.) 1993. *Mc-Graw Hill encyclopedia of professional management.* New York : McGraw-Hill.

Black, T. R. 1999. *Doing qualitative research in the social sciences*. London : Sage.

Blagden, J. 1998. Opinion paper : access versus holdings. *Interlending & Document Supply*, vol. 26 (3) : 140-143.

Bot, M., Burgemeester, J and Roes, H. 1998. The cost of publishing an electronic journal. Available: http://www.dlib.org/dlib/november98/11roes.html Viewed 13 February 2001.

Brin, B. and Cochran, E. 1994. Access and ownership in the academic environment : one library's progress report. *Journal of Academic Librarianship*, vol. 24(4): 207-212.

Broadbent, M. and Lofgren, H. 1991. *Priorities, performance and benefits : an exploratory study of Library and information units.* Melbourne : Australian Council of Libraries and Information Services.

Brooks, S. 2003. Academic journal embargoes and full text databases. *Library Quarterly*, vol. 73(3) : 243-260.

Busha, C. H. and Harter, S. P. 1980. *Research methods in Librarianship : techniques and interpretation.* New York : Academic Press.

Cain, M. 1995. Periodical access in an era of change : characteristics and a model. *Journal of Academic Librarianship*, vol. 21(5): 365-370.

Case, M. M. 1998. Measuring the cost effectiveness of journals: the Wisconsin experience. Available: http://www.library.wisc.edu/libraries/News/ULC/reports/98.99.pdf. Viewed 13 February 2001.

Chan, L. 1999. Electronic journals and academic libraries. *Library Hi-tech*, vol. 17 (1): 10-16.

Chrzastowski, T.E. and Olesko, B.M. 1997. Chemistry journal use and cost : results of a longitudinal study. *Library Resources and Technical Services*, vol. 41 (2) : 101-111.

Clarke, A. 2003. *Evaluation research : an introduction to principles, methods and practice*. London : Sage.

Cochenour, D. 2003. E-journal acceptance at Colorado State University : a case study. *Serial Review*, vol. 29 (1) : 16-25.

Collier, M. Ramsden, A. and Zhao, D. 1995. Networking and licensing texts for electronic libraries : De Montfort University's experience. *Interlending & Document Supply*, vol. 23(4): 3-13.

Coombes, H. 2001. *Researching using IT*. New York : Palgrave.

Connolly, P. and Reidy, D. (eds.) 1999. *The digital library : challenges and solutions for the new millennium*. Proceedings of an international conference held in Bologna, Italy, June 1999.

Cook, B. (ed.) 1993. *The electronic journal : the future of serials-based information*. New York : Haworth.

Cornish, G. P. 1999. *Looking both ways : the challenge to the intermediary in an electronic age.* Paper presented at the Digital Library : challenges and solutions for the new millennium : proceedings of an international conference held in Bologna, Italy, June 1999.

Corrall, S. 2000. *Strategic management of information services : a planning handbook*. London : Aslib.

Davis, P. 2002. Patterns in electronic journal usage : challenging the composition of geographic consortia. *College and Research Libraries*, vol. 63 (6) : 484-497.

Davis, S.1995. Surviving the serial crisis : are e-journals an answer? *Serials Review*, vol. 25(4): 95.

Degener, C.T. and Waite, M.A. 2000. Fools rush in … thoughts about electronic journal collections. *Serials Review*, vol. 26 (4) : 3-11.

De Vos, A.S. et al. 2002. *Research at grass roots : for the social sciences and human service professions*. Pretoria : Van Schaik.

Dorn, K. 2001. Aggregation vs facilitation : an agency response to ejournal aggregation. Available : http:// www.harrasowitz.de/present/ifla01.html. Viewed 11 April 2003.

Diedrich, C-P. 2001. E-journals : the OhioLink experience. *Library Collections, Acquisitions & Technical Services*, vol. 25 : 191-210.

Duranceau, E. 1997. Beyond Print : serials acquisitions for the digital age. Available: http://web.mit.edu/waynej/www/durnaceau.htm Viewed 15 April 2003.

Duranceau, E and Lippert, M. 1996. Electronic journals in the MIT Libraries : Report of the 1995 e-journal subgroup. *Serials Review,* vol. 22(1): 47-62.

Ekman, R. and Quandt, R. (eds.) 1999. *Technology and scholarly communication*. Berkeley : University of California Press.

Evans, J., Bevan, S. J. and Harrington, J. 1996. BIODOC : access versus holdings in a university library. *Interlending & Document Supply*, vol. 24 (4) : 5-11.

Flaxbart, D. 1998. A response to Albert Henderson. *Issues in Science and Technology Librarianship.* Available : http://www.istl.org/98-fall/article3.html. Viewed 9 April 2003.

Frazer, S.L. and Morgan, P.D. 1999. Electronic-for-print substitutions : a case study. *Serials Review*, vol. 25 (2) : 1-7.

Gardner, S. 2001. The impact of electronic journals on library staff at ARL member institutions : a survey and a critique of the survey methodology. *Serials Review*, vol. 27 (3/4) : 17-32.

Geslin, N. 2002. Investigation into the acquisition of scholarly resources at University of Natal Libraries. Unpublished report. Pietermaritzburg : University of Natal, Libraries.

Goodman, D. 2000. Should scientific journals be printed? A personal view. *Online Information Review*, vol. 24 (5) : 357 – 363.

Gorman, M. 2002. The economic crisis in libraries : causes and effects. In : *Scholarly publishing : books, journals, publishers, and libraries in the twentieth century*, edited by R.E Abel and L.W. Newlin. New York : Wiley.

Gossen, E. A. and Irving, S. 1995. Ownership versus access and low-use periodical titles. *Library Resources & Technical Services*, vol. 39(1):43-52.

Guedon, J-C. 2002. In Oldenburg's long shadow : librarians, research scientists, publishers, and the control of scientific publishing. *ARL proceedings* 138. Available : http://www.arl.org/arl/proceedings/138/guedon.html Viewed 7 March 2003.

Gyeszly, S. D. 2001. Electronic or paper journals. *Collection Building*, vol. 20 (1) : 4-11.

Hahn, K. and Faulkner, L. A. 2002. Evaluative usage-baded metrics for the selection of e-journals. *College and Research Libraries*, vol. 63 (3) : 215-227.

Hal, V. 1996. Pricing electronic journals. *D-Lib Magazine*, June. Available: http://www.dlib.org/dlib/june96/06varian.html Viewed 13 February 2001.

Halliday, L. and Oppenheim, C. 2000. Comparison and evaluation of some economic models of digital-only journals. *Journal of Documentation*, vol. 56 (6) : 660-673.

Halliday, L. and Oppenheim, C. 2001. Progress in documentation development in digital journals. *Journal of Documentation*, vol. 57 (2) : 260-283.

Harnard, S. 1997. The paper house of cards. *Ariadne*. Available : http://www.ariadne.ac.uk/issue8/harnard. Viewed 7 March 2003.

Hawbaker, C. A. and Wagner, C. K. 1996. Periodical ownership versus full-text online access : a cost-benefit analysis. *Journal of Academic Librarianship*, vol. 22(2): 105-109.

Henderson, A. 1995. Research journals : a question of economic value. *Logos*, vol. 6 (1) : 43-46.

Herring, S. D. 2002. Use of electronic resources in scholarly electronic journals : a citation analysis. *College and Research Libraries*, vol. 63 (4) : 334-340.

Hey, J. 2000. A proposed formula for the distribution of Library funds within the Faculty of Science. Report presented to the Faculty of Science Board meeting in May 2000. Unpublished document. Durban : University of Natal.

Hitchcock, S., Carr, L. and Hall, W. 1998. Survey of STM online journals 1990-95 : the calm before the storm. Available: http://journals.ecs.soton.ac.uk/survey/survey.html. Viewed 6 March 2001.

Houle, J. 2000. Owneship versus access : the CISTI source / SUMO experience at McGill University. *Interlending & Document Supply*, vol. 28 (3) : 116-122.

Hunter, K. 1998. Electronic journal publishing ; observations from inside. *DLib Magazine,* July/August, Available : http://www.dlib.org/dlib/july98/07hunter.html. Viewed 9 May 2002.

Jaeger, D. 2003. The future of the hardcopy journal. *Against the Grain*, vol. 15 (2) : 30.

Jenkins, C. 1997. User studies : electronic journals and user response to new modes of information delivery. *Library Acquisitions : Practice & Theory*, vol. 21 (3) : 355-363.

JSTOR : the need. 1998. Available: http://www.jstor.org/about/need.html. Viewed 13 February 2001.

Kane, L. T. 1997. Access vs. ownership : do we have to make a choice? *College & Research Libraries*, vol. 58 : 59-67.

Karim, S A. 2003. Notice placed on the University LAN for all campuses at the University of KwaZulu-Natal, Durban. 4 September 2003.

Keller, A. 2001. Future developments of electronic journals : a Delphi survey. *The Electronic Library,* vol. 19 (6) : 383-396.

Ketcham-Van Orsdel, L. and Born, K. 2000. Pushing toward more affordable access. *Library Journal,* vol. 125(7): 47.

Kidd, T. 1997. Are print journals dinosaurs? *Ariadne*. November 1997. Available : http://www.ariadne.ac.uk/issue12/main Viewed 7 March 2002.

Kidd, T. 1998. Electronic journals : their introduction and exploitation in academic libraries in the United Kingdom. *Serials Review*, vol. 24 (1) : 7-14.

Kidder, L. H. and Judd, C. 1986. *Research methods in social relations.* New York : Holt, Rinehart and Winston.

King, D. W. and Montgomery, C. H. 2002. After migration to an electronic journal collection. *DLib Magazine*, vol. 8(12) Available : http://www.dlib.org/dlib/ Viewed 15 April 2003.

King, D. W. et al. 2003. Library economic metrics : examples of the comparison of electronic and print journal collections and collection services. *Library trends*, vol. 51 (3) : 376-400.

Kingma. B. R. 1996. *The economics of information : a guide to economic and cost-benefit analysis for information professionals*. Englewood, Colorado : Libraries Unlimited, Inc.

Kingma, B. R. 1998. The economics of access versus ownership : the costs and benefits of access to scholarly articles via interlibrary loan and journal subscriptions. *Journal of Library Administration,* vol. 26 (1-2): 145-157.

Kingma. B. R. and Mouravieva, N. 2000. The economic of access versus ownership : the Library for Natural Sciences, Russian Academy of Sciences. *Interlending & Document Supply,* vol. 28 (1) : 20-26.

Kraft, D. H. and Polacsek, R. A. 1978. A journal-worth measure for a journal-selection decision model. *Collection Management*, vol 2(2) : 129-139.

Lancaster, F.W. 1977. *The measurement and evaluation of library services.* Washington, D.C. : Information Resources Press.

Lancaster, F.W. 1988. *If you want to evaluate your library.* Champaign, Illinois: University of Illinois, Graduate School of Library and Information Science.

Lee, S. H. 1987. *Pricing and costs of monographs and serials : national and international issues*. New York : Haworth Press.

Liew, C.l.L. and Foo, S. 2000. Study of graduate student end-users and perceptions of electronic journals. *Online Information Review*, vol. 24(4) : 302-315.

Lo, Szu-chia. 2001. The development of electronic journals in Taiwan : status report on a continuous study of access issues. *The Electronic Library*, vol. 19 (3) : 134-143.

Long, M. 1999. The impact of new technology on journal publishing and document delivery : a publisher's perspective. *Interlending and Document Supply*, vol. 27 (3) : 104-107.

Lynden, F. C. 1994. Remote access issues : pros and cons. *Journal of Library Administration*, vol. 20 (1) : 19-36.

Maenzanise, J. L. 2002. Information seeking patterns of distance learners registered with the Zimbabwe Open University. Master of Information Studies Thesis. University of Natal : Pietermaritzburg.

Mark, N. 2000. Opinion paper : Interlending in the hybrid library – how long will we provide the service? *Interlending & Document Supply*, vol. 28 (3) : 132-136.

Mason, J. 2002. *Qualitative researching*. London : Sage.

McCabe, M. 1999. The impact of publisher mergers on journal prices : an update. Issue 207. Available : http://www.arl.org/newsltr/200/mccabe.html. Viewed 13 February 2001.

McClure, C.R. 1999. Developing statistics and performance measures to describe networked information services. ARL Workshop Discussion Prospectus. Available : http://www.arl.org/stats/program/mcclure.html Viewed 3 August 2001.

McGuire, M. et al. 2000. *The Internet handbook for writers, researchers and journalists*. New York : Guildford Press.

McEldowney, P. 1995. Scholarly electronic journals – trends and academic attitudes. Available : http://www.people.virginia.edu~pm9k/libsci/ejs.html Viewed 3 June 2001.

Mercer, L. S. 2000. Measuring the use and value of electronic journals and books. *Issues in Science and Technology Librarianship*. Available: http://www.library.ucsb.edu/ist1/00-winter/article1.html. Viewed 14 March 2002.

Miller, R.L. (ed.) 2003. *The A – Z of social research.* London : Sage.

Milne, P. 1999. Electronic access to information and its impact on scholarly communication. Available : http://www.csu.edu.au/special/online99/proceedings99/3056.htm Viewed 11 April 2002.

Mobley, E. R. 1998. Ruminations on the Sci-Tech serials crisis. *Issues in Science and Technology Librarianship*, Fall. Available:http://www.library.ucsb.edu/istl/98-fall/article4.html. Viewed 3 November 1999.

Montgomery, C. H. 2000. Measuring the impact of an electronic journal collection on library costs. *D-Lib Magazine*, vol. 6(10) Available: http://www.dlib.org/dlib/october00/montgomery/10montgomery.html. Viewed 14 March 2001.

Morse, D.H. and Clintworth, W.A. 2000. Comparing patterns of print and electronic journal use in an academic health science library. *Issues in Science and Technology Librarianship*,

Fall. Available : http:// www.library.ucsb.edu/istl/00-fall/refereed.html. Viewed 8 August 2002.

Newell, A. 1992. Access to journal information and the impact of new technologies. In : Cook, B. (ed.) *The electronic journal : the future of serials-based information*. New York : Haworth. pp. 45-67.

Nisonger, T. E. 1997. Electronic journal collection management issues. *Collection Building*, vol. 16 (2) : 58-65.

Oppenheim, C., Greenhalgh, C. and Rowland, F. 2001. Future of scholarly journal publishing. *Journal of Documentation*, vol. 56 (4) : 361 – 398.

Peek, R. P. (ed.) 1996. *Scholarly publishing : the electronic frontier*. Cambridge : MIT Press.

Peters, A. 1982. Evaluating periodicals. *College & Research Libraries*, vol. 43 (2) : 149-151.

Pikowsky, R. A. 1997. Electronic journals as a potential solution to escalating serials costs. *Serials Librarian*, vol. 32 (3/4) : 31-56.

Powell, R. R. 1997. *Basic research methods for librarians*. London : Ablex Publishing Corporation.

Prior, A. 2001. Acquiring and accessing serials information : the electronic intermediary. *Interlending & Document Supply*, vol. 29 (2) : 62-68.

Raju, R. 1995. A case of the application of Peromnes method of job evaluation in the University of Natal, Durban Libraries. Master of Information Thesis. Pietermaritzburg : University of Natal.

Rambler, M. 1999. A new solution to the journals crisis. *The Journal of Electronic Publishing*, vol. 4(3) Available: http://www.press.umich.edu/jep/04-03/rambler.html. Viewed 3 June 2001.

Robnett, B. 1998. Online journal pricing. *Serials Librarian*, vol. 33 (1-2) : 55 – 58.

Rooks, D. C. 1993. Electronic serials : administrative angst or answer. *Library Acquisitions: Practice & Theory*, vol. 17 : 449-454.

Rosenblum, B. 2000. PEAK 2000 Conference reveals e-publishing's "War for the Eyeballs". *Library Hi-tech News*, vol 17 (9) : 2.

Rowland, F. 1997. Print journals : fit for the future? *Ariadne*. Available : http://www.ariadne.ac.uk/issue7/fytton. Viewed 7 March 2003.

Rupp-Serrano, K. et. al. 2002. Canceling print serials in favour of electronic : criteria for decision making. *Library Collections, Acquisitions & Technical Services*, vol. 26 : 369-378.

Sathe, N. A. 2002. Print versus electronic journals : a preliminary investigation into the effect of journal format on research processes. *Journal of the Medical Library Association*, vol. 90(2) : 235-243.

Scigliano, M. 2000. Serial use in a small academic library : determining cost-effectiveness. *Serials Review*, 26(1): 43-52.

Shaughnessy, T. W. 1991. From ownership to access : a dilemma for managers. *Journal of Library Administration*, vol. 14 (1) : 1-7.

Shemberg, M. and Grossman, C. 1999. Electronic journals in academic libraries : a comparison of ARL and non-ARL libraries. *Library Hi-tech*, vol. 17 (1) : 26-45.

Sherman, J. 2003. *The History of the Internet*. New York : Franklin Watts.

Soete, G. and Salaba, A. 1998. The Barschall Legacy. Available: http://www.library.wisc.edu/projects/glsdo/cost.html. Viewed 3 June 2001.

Sosteric, M. 2002. Electronic journals ; the grand information future? *Electronic Journal of Sociology*. Available : http://www.sociolog.org/content/vol002.002/sosteric.html. Viewed 3 August 2002.

Sridhar, M.S. 1988. Is cost benefit analysis applicable to journal use in special libraries. *Serials Librarian*, vol. 15(1-2):137-153.

Stankus, T. 1999. *Electronic expectations : Science journals on the web*. New York : Haworth Press.

Sweeney, L. 1997. The future of academic journals : considering the current situation in academic libraries. *New Library World*, vol. 98 (1132) : 4-15.

Tammaro, A. M. 1999. Document delivery as an alternative to subscription. Paper presented at the Digital Library : challenges and solutions for the new millennium : proceedings of an international conference held in Bologna, Italy, June 1999.

Tenopir, C. and King, D. W. 2002a. Designing electronic journals with 30 years of lessons from print. *Journal of electronic publishing*. Available : http://www.press.umich.edu/jep/04-02/king.html. Viewed 7 March 2003.

Tenopir, C and King, D. W. 2002b. Reading behaviour and electronic journals. *Learned publishing,* vol. 15 (4) : 259-265.

Thomes, K. 2001. The economics and usage of digital library collections. Available: http://www.arl.org/newsltr/210/econ.html. Viewed 14 February 2001.

Ulrichs International Periodicals directory. 1997. New York : Bowker.

University of Kwa-Zulu Natal. 2004a. History of the University of Kwa-Zulu Natal. Available : http://www.ukzn.ac.za/aboutus/history.asp. Viewed 10 March 2004.

University of Kwa-Zulu Natal. 2004b. Minutes of the Durban Library Advisory Committee, 19 April 2004. University of Kwazulu-Natal Library Materials Budget 2003 Update. Durban : University of Kwa-Zulu Natal, Libraries.

University of Natal. 2003a. World class institute opens. *Nuinfo*, vol. 13 (9) : 1.

University of Natal. 2003b. University of Natal Annual Report 2003. Durban : University of Natal. Available : http://www.library.und.ac.za/Annual%20report%202003.pdf Viewed 3 December 2003.

University of Natal. 2003c. Library Visitor's brochure. Durban : University of Natal Libraries.

University of Natal. 2003d. Research outputs for 2002. Unpublished document. Durban : University of Natal, Research Office.

University of Natal. 2003e. 2003 registration statistics. Durban : University of Natal, Division of Management Information. Available: http://innerweb.und.ac.za/depts/dmi Viewed 15 September 2003.

University of Natal. 2003f. Minutes of the Durban Library Advisory Committee, 14 April 2003. Durban : University of Natal, Libraries.

University of Natal. 2002a. Minutes of the Durban Library Advisory Committee, 2 September 2002. Durban : University of Natal.

University of Natal. 2002b. Minutes of the Durban Library Advisory Committee, 15 May 2002. Durban : University of Natal.

University of Natal. 2002b. University of Natal Annual Report 1997 – 2001. Durban : University of Natal.

University of Natal. 2002c. University of Natal Annual Report, 2002. Durban : University of Natal. Available : http://www.library.und.ac.za/Annual%20report.pdf Viewed 15 September 2003.

Van Orsdel, L. and Born, K. 2003. Big chill on the Big Deal : Periodical Price Survey 2003. *Library Journal,* April 15 : 51-56.

Varian, H. 1996. Pricing electronic journals. *D-Lib Magazine*, June 1996. Available : http://www.dli.org/dlib/june96/06varian.html. Viewed 13 February 2001.

Veldsman, S. 2004. Licensing digital resources : implications for access, use and delivery of full-text articles. 7th Annual LIASA Conference, Polokwane, Limpopo Province. Available : http://www.liasa.org.za/conferences/conference2004/papers/1 Viewed 2 November 2004.

Walker, A.D.M. 2003. Funding policies in the University Libraries. Unpublished report. Durban : University of Natal, Research Office.

Weiser, A. 1998. University libraries testing model for e-journal prices. *Library Journal*, vol. 123(15): 14.

Wening, J. A. 1996. Procuring an online, full-text journal resource. *Against the Grain*, vol. 8 : 28-30.

Whalley, B. 1997. Electronic journals, evolutionary niches. *Ariadne*. Available : http://www.ariadne.ac.uk/issue3/ggg/intro.html. Viewed 15 September 2004.

White, G. W. and Crawford, G. A. 1998. Cost-benefit analysis of electronic information : a case study. *College & Research Libraries*, vol. 59(6):503-510.

White, M. 2001. Electronic access to scientific journals : problems, problems … and so the electronic journals would cost more than the print versions. Available: http://www.findarticles.com/cf_0/mOBLB/10_24/80316447/print.html . Viewed 24 May 2002.

Willemse, J. 2002. *Library funding : adequate financial support for African University libraries*. Oxford : International Network for the Availability of Scientific Publications.

Woodward, H., et al. 1997. Electronic journals : myths and realities. *OCLC Systems & Services,* vol. 13 (4) : 144-151.

Woodward, H. 1994. The impact of electronic information on serials collection and management. *OCLC Systems & Services*, vol. 20 (1) : 35-45.

Wooliscroft, M. 199. Access and ownership : academic libraries' collecting and service responsibilities and the emerging benefits of electronic publishing and document supply. *New Zealand Libraries*, vol. 47 (9) : 170-180.

Zahray, W. P. 1990. *Electronic dissemination of scholarly journals : an economic and technical analysis*. (D.Phil – Engineering and Public Policy). Pittsburgh : Carnegie Mellon University.

Appendix A : Pilot study introduction letter

22 October 2003

Dear Colleague

The purpose of the study is to do a comparative study of print and electronic journals at University of Natal, Durban Libraries (UND). The journal is a major vehicle for scholarly communication and research, by serving as the primary means of establishing priority and authority in a field, and providing an archival record. Print journals that serve this function have been stable in form and content for a long period of time. Electronic journals, developed as an alternative, supplements or replicas of print journals have the potential to fundamentally change scholarly communication by offering an interactive environment, rapid dissemination as well as other features.

The Faculty of Science has undergone a number of journal cancellation exercises in the last few years. This study will help the Library make informed decisions about journal cancellations.

The pilot questionnaire has been sent to a sample of postgraduate students and academic staff in the Faculty of Medicine, Durban. The purpose of the questionnaire is to test the hypothesis, point out problems and/or difficulties experienced when answering the questions. I would appreciate it if you would provide feedback on the visual layout and whether the questions are effectively ordered.

The attached questionnaire is designed to elicit your views on the benefits of journals in the UND Libraries. Therefore I would be grateful if you would complete the attached questionnaire. Please hand the completed questionnaire to Ms Rani Moodley – Medical Subject Librarian.

Yours sincerely

Roshini Pather
Science Subject Librarian
E G Malherbe Library

University of Natal, Durban
patherr@nu.ac.za / Tel. : (031) 2603025 / Fax (031) 2602051

Appendix B : Questionnaire introduction letter

18 December 2003

Dear Colleague

The purpose of the study is to do a comparative study of print and electronic journals at University of Natal, Durban Libraries (UND). The journal is a major vehicle for scholarly communication and research, by serving as the primary means of establishing priority and authority in a field, and providing an archival record. Print journals that serve this function have been stable in form and content for a long period of time. Electronic journals, developed as an alternative, supplements or replicas of print journals have the potential to fundamentally change scholarly communication by offering an interactive environment, rapid dissemination as well as other features.

The Faculty of Science has undergone a number of journal cancellation exercises in the last few years. This study will help the Library make informed decisions about journal cancellations.

The population for this study is the academic staff and postgraduate students in the Faculty of Science, Durban. I hope that this research will not simply be an academic exercise, but will help the Library anticipate trends in journal collection and subscriptions and help in financial planning and budgeting.

The attached questionnaire is designed to elicit your views on the benefits of journals in the UND Libraries. Therefore I would be grateful if you would complete the attached questionnaire.

Yours sincerely

Roshini Pather
Science Subject Librarian
E G Malherbe Library

University of Natal, Durban
patherr@nu.ac.za / Tel. : (031) 2603025 / Fax (031) 2602051

Appendix C : Questionnaire for postgraduate students

Please place a tick in the appropriate box, filling in the blank if 'other' is selected, in the space provided

Section A : Demographics

1. Participant name: (optional) _____

2. Gender :
   - ❑ Male
   - ❑ Female

3. Age:
   - ❑ 18 – 23
   - ❑ 24 - 29
   - ❑ 30 – 39
   - ❑ 40 – 49
   - ❑ 50 and over

4. What degree/diploma are you currently enrolled for? _____

5. What is your primary research field?

   - ❑ Biological Sciences
   - ❑ Bio-medical Sciences
   - ❑ Chemistry and Applied Chemistry
   - ❑ Computer Science
   - ❑ Environmental Sciences
   - ❑ Geology and Earth Sciences
   - ❑ Mathematics and Applied Mathematics
   - ❑ Physics and Applied Physics
   - ❑ Statistics
   - ❑ Other, please specify

Section B: Library Usage

6. On average how often do you visit the University Library (E G Malherbe Library)?
   - ❑ Daily
   - ❑ Weekly
   - ❑ Fortnightly
   - ❑ Monthly
   - ❑ Rarely or Never

7. What are your main reasons for using the Library? If more than two or three, please give the order of importance with 1 being the most important.

_____

_____

8. How dependent are you on the University Library for the research you conduct?
   - ❑ Very dependent
   - ❑ Somewhat dependent
   - ❑ Not dependent

Section C : Computer expertise and usage

9. Do you use the computer in the course of your studies, duties or tasks?
   - ❑ No
   - ❑ Yes

10. If No, please move to Section D : Journal experience.

11. For how long have you been using computers? _____ years

12. How often do you use the computers?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Once a fortnight
    - ❑ Once a month
    - ❑ Rarely or never

13. Can you do the following on the computer – (Please tick all that are applicable)
    - ❑ Management of Files and Folders
    - ❑ Use Windows software
    - ❑ Use DOS software
    - ❑ Word processing
    - ❑ Spreadsheets
    - ❑ Electronic / Online Database searching
    - ❑ E-mail
    - ❑ Internet / World Wide Web (WWW)
    - ❑ Setup, maintenance and troubleshooting

14. How often do you use the following resources? (Please tick the relevant box)

Resource	Daily	Weekly	Fortnightly	Once a month	Rarely or never
Windows based software					
DOS based software					
Word processing					
Spreadsheet/Accounting					
Databases					
Internet / WWW					
E-mail					
Others: please list					

15. Do you use the Internet for: (Please tick all that are applicable)
    - ❑ E-mail
    - ❑ Databases
    - ❑ World Wide Web
    - ❑ FTP
    - ❑ Other, please specify _____

16. Online resource experience. How often do you use the following? (Please tick the relevant box)

Resource	Daily	Weekly	Fortnightly	Once a month	Rarely or never
Internet/WWW					
CD-ROM databases, for example Citation indexes					
Indexes, for example Agricola					
WebCT					
Library catalogue/OPAC					
Electronic journals					
Others : please list					

17. How many hours a week do you spend actively using the Internet / World Wide Web excluding time spent using email. Approximate number of hours _____

Section D: Journal experience

18. Do you use journals in the course of your studies?
    - ❑ Yes
    - ❑ No

19. If NO, please go to Question 69.

20. Are you satisfied with the present Library service regarding journals?
    - ❑ Yes
    - ❑ No

21. Please state why? _____

22. What percentage of your usage is journal or non-journal material?

	% = 100
❑ Journal	_____
❑ Non-journal	_____

23. What do you use journals for? (Please tick all that are applicable)
    - ❑ Research
    - ❑ External communication (that is, formal publication, formal presentations)
    - ❑ Teaching
    - ❑ Current awareness
    - ❑ Other, please specify _____

24. What is the percentage success rate you have in locating a journal article? _____

PART 1 : Print journals:

25. Do you use print journals?
    - ❑ Yes
    - ❑ No

26. If NO, please go to Question 68.

27. If YES, on average how often do you use print journals?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Fortnightly
    - ❑ Monthly
    - ❑ Rarely

28. For how long have you been using print journals?
    - ❑ Less than 1 year
    - ❑ 1-2 years
    - ❑ 3-4 years
    - ❑ 5 years and more

29. What method do you use for locating print journal articles? (Please tick all that are applicable)
    - ❑ Electronic indexes / abstracts
    - ❑ Print indexes / abstracts
    - ❑ Recommendation from colleagues
    - ❑ Citation from other articles
    - ❑ Other, please specify _____

30. Where do you mostly read print journals?
    - ❑ Library
    - ❑ Office
    - ❑ Home
    - ❑ Other , please specify _____

31. Is there a particular time of day when you tend to read print journals?
- ❑ Yes
- ❑ No

32. Approximately how many articles from print journals have you read in the past month? ____

33. What is the source/s of the print journal/s you use? (Please tick all that are applicable and estimate a percentage for each source)

	% = 100
❑ Personal subscription	_____
❑ Library subscription	_____
❑ Interlibrary loans	_____
❑ Other sources, please specify	_____

34. What is the age of the articles you read? (Please tick all that are applicable)
- ❑ Less than a year
- ❑ 1 – 2 years
- ❑ 3 - 5 years
- ❑ 6 - 10 years
- ❑ Over 10 years

35. Once you have located a relevant article, what do you typically do with it? You may choose to have more than one category.
- ❑ Read
- ❑ Photocopy
- ❑ Take notes
- ❑ Other , please specify _____

36. What features of the printed journal do you like? (Please tick all that are applicable)
- ❑ Easy to read
- ❑ Easy to browse
- ❑ Quality of presentation
- ❑ Portability
- ❑ Other, please specify _____

37. What features of the printed journal do you dislike? (Please tick all that are applicable)
- ❑ Publication lag time
- ❑ Limited by library hours
- ❑ Loan period of only one week
- ❑ Need to photocopying articles or and/or take notes
- ❑ Other, please specify _____

38. Are you satisfied with access to print journals?
- ❑ Yes
- ❑ No

39. Please state why? _____

40. What do you believe is the future of print journals?
- ❑ Mostly replacing electronic journals
- ❑ Co-existing with electronic journals
- ❑ Supplementing electronic journals
- ❑ Other, please specify _____
- ❑ No opinion

PART 2 : Electronic journals

41. Do you use full-text journals available in electronic (digital) format?
- ❑ Yes
- ❑ No

42. If NO, please go to Question 68.

43. If YES, on average how often do you use electronic journals?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Fortnightly
    - ❑ Monthly
    - ❑ Rarely

44. How long have you been using electronic journals?
    - ❑ Less than 1 year
    - ❑ 1-2 years
    - ❑ 3-4 years
    - ❑ 5 years or more

45. How did you find out about the existence of electronic journals? (Please tick all that are applicable)
    - ❑ Library catalogue
    - ❑ Library staff
    - ❑ Library Homepage
    - ❑ Search engine, for example Yahoo
    - ❑ Print journal
    - ❑ Specific journal's Website
    - ❑ A multi-journal Website
    - ❑ Online citation index
    - ❑ Other, please specify _____

46. From where do you mostly access electronic journals? (Please tick all that are applicable)
    - ❑ Library
    - ❑ Office
    - ❑ Home
    - ❑ Student LAN
    - ❑ Other, please specify _____

47. How do you gain access to electronic journals? Please tick all that are applicable)
    - ❑ Electronic Database, for example EbscoHost
    - ❑ Library Homepage
    - ❑ Publishers site
    - ❑ Specific journal's Website
    - ❑ Multi-journal Website, for example ScienceDirect
    - ❑ Other, please specify _____

48. What is the source of the electronic journal you use?
    - ❑ Personal subscription
    - ❑ Library subscription
    - ❑ Freely available title
    - ❑ Other, please specify _____

49. Which of the following statements most accurately describes your use of electronic journals:
    - ❑ I use e-journals primarily to retrieve full-text articles online
    - ❑ I use e-journals primarily to access special online features, for example hyperlinks to cited articles)
    - ❑ I use e-journals primarily for ease of searching and/or browsing
    - ❑ I do not use e-journals at all
    - ❑ None of the above

50. What is your most preferred format for reading full-text e-journal articles ON THE SCREEN :
    - ❑ HTML
    - ❑ PDF
    - ❑ Rather than reading from the screen, I prefer to print and read the printed copy
    - ❑ Other, please specify _____

51. Once you have located a full-text article do you usually:

- ❑ save it to a file on your computer
- ❑ print it out
- ❑ do both
- ❑ Other, please specify _____

52. What features of the electronic journal medium do you like? (Please tick all that are applicable)
    - ❑ Browsability
    - ❑ Interactivity / Hyperlinks/ Linkability
    - ❑ Searching facility
    - ❑ Currency of document / Timeliness
    - ❑ Multimedia features
    - ❑ Accessibility
    - ❑ Ability to print
    - ❑ Availability, i.e 24 hour access
    - ❑ Functionality, i.e downloading
    - ❑ Full-text searching
    - ❑ Alerting services
    - ❑ Convenience
    - ❑ Other, please specify _____

53. What features of the electronic journal medium do you dislike? (Please tick all that are applicable)
    - ❑ User authentication / Password/usernames
    - ❑ IP access
    - ❑ Dependence on computer hardware and software
    - ❑ Viewing software , i.e Adobe Acrobat
    - ❑ Coping with individual journal interfaces
    - ❑ Difficulty in reading on-screen
    - ❑ Need for scrolling
    - ❑ Downloading time
    - ❑ Speed of retrieval
    - ❑ Difficulty with printing
    - ❑ Lack of browseability
    - ❑ Copyright restrictions
    - ❑ Other, please specify _____

54. Do you actively try to keep abreast of new online features?
    - ❑ Yes
    - ❑ No

55. Are you satisfied with access to electronic journals?
    - ❑ Yes
    - ❑ No

56. Please state why? _____

57. What do you believe is the future for electronic journals?
    - ❑ Mostly replacing print journals
    - ❑ Co-existing with print journals
    - ❑ Supplementing print journals
    - ❑ Other, please specify _____
    - ❑ No opinion

58. Should libraries maintain electronic archives or hard-copy archives?
    - ❑ Electronic
    - ❑ Hardcopy
    - ❑ Both

59. Assuming that electronic archives of journals are proven to work well and are readily accessible. Would you be happy to see hard-copy archives discarded and replaced entirely by electronic archives?
    - ❑ Yes
    - ❑ No

- ❑ Uncertain

60. For how long should journals in print be archived?
    - ❑ 1 - 5 years
    - ❑ 6 - 10 years
    - ❑ 11 - 15 years
    - ❑ More than 15 years

61. For how long should electronic journals be archived?
    - ❑ 1 - 5 years
    - ❑ 6 - 10 years
    - ❑ 11 - 15 years
    - ❑ More than 15 years

62. On average what percentage of your journal use is print ___ and/or electronic ____ = 100%

63. Given a choice between print and electronic journals, which would you choose?
    - ❑ Print journals
    - ❑ Electronic journals
    - ❑ Uncertain

64. Please state why ? _____
_____

65. Which would you consider easier to access?
    - ❑ Print journals
    - ❑ Electronic journals

66. Please state why? _____
_____

67. What percentage of the journals (print and electronic) you would like to access, does the library have = 100%? _____

68. How often do you find you have to use interlibrary loans for obtaining journal articles?
    - ❑ Never use interlibrary loans
    - ❑ Less than 5 times per month
    - ❑ 6 - 10 times per month
    - ❑ 11 - 15 times per month
    - ❑ 16 - 20 times per month
    - ❑ More than 20 times per month

69. Would you publish in an online journal?
    - ❑ Yes
    - ❑ No
    - ❑ Uncertain

70. Why? _____

71. Please feel free to make additional remarks about your journal usage, or comments on the questionnaire.
_____
E-mail : _____

Thank you for taking time to complete the questionnaire.

Appendix D : Questionnaire for academic staff

Please place a tick in the appropriate box, filling in the blank if "other" is selected, in the space provided.

Section A : Demographics

1. Participant name: (optional) _____

2. Gender :
   - ❑ Male
   - ❑ Female

3. Age:
   - ❑ 18 – 23
   - ❑ 24 – 29
   - ❑ 30 – 39
   - ❑ 40 – 49
   - ❑ 50 and over

4. What is your position (or equivalent status) at the University?
   - ❑ Junior Lecturer
   - ❑ Senior Lecturer
   - ❑ Assistant Professor
   - ❑ Associate Professor
   - ❑ Professor
   - ❑ Other, please specify

5. What is your primary research field?

   - ❑ Biological Sciences
   - ❑ Bio-medical Sciences
   - ❑ Chemistry and Applied Chemistry
   - ❑ Computer Science
   - ❑ Environmental Sciences
   - ❑ Geology and Earth Sciences
   - ❑ Mathematics and Applied Mathematics
   - ❑ Physics and Applied Physics
   - ❑ Statistics
   - ❑ Other, please specify

6. In your current position, your primary responsibility is to:

   - ❑ conduct research
   - ❑ conduct research with some teaching
   - ❑ both conduct research and teaching
   - ❑ mostly teach, but with some research
   - ❑ other, please specify

Section B : Library Usage:

7. On average how often do you visit the University Library (E G Malherbe Library)?
   - ❑ Daily
   - ❑ Weekly
   - ❑ Fortnightly
   - ❑ Monthly
   - ❑ Rarely or Never

8. What are your main reasons for using the Library? If more than two or three, please give the order of importance with 1 being the most important.

_____

9. How dependent are you on the University Library for the research you conduct?
   - ❑ Very dependent
   - ❑ Somewhat dependent
   - ❑ Not dependent

Section C : Computer expertise and usage

10. Do you use the computer in the course of your studies, duties or tasks?
    - ❑ No
    - ❑ Yes

11. If No, please move to Section D : Journal experience.

12. For how long have you been using computers? _____ years

13. How often do you use the computers?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Once a fortnight
    - ❑ Once a month
    - ❑ Rarely or never

14. Can you do the following on the computer – Please tick all that are applicable
    - ❑ Management of Files and Folders
    - ❑ Use Windows software
    - ❑ Use DOS software
    - ❑ Word processing
    - ❑ Spreadsheets
    - ❑ Electronic / Online Database searching
    - ❑ E-mail
    - ❑ Internet / World Wide Web (WWW)
    - ❑ Networking
    - ❑ Setup, maintenance and troubleshooting

15. How often do you use the following resources? (Please tick the relevant box)

Resource	Daily	Weekly	Fortnightly	Once a month	Rarely or never
Windows based software					
DOS based software					
Word processing					
Spreadsheet/Accounting					
Databases					
Internet / WWW					
E-mail					
Others: please list					

16. Do you use the Internet for: (Please tick all that are applicable)
    - ❑ E-mail
    - ❑ Databases
    - ❑ World Wide Web
    - ❑ FTP
    - ❑ Other, please specify _____

17. Online resource experience. How often do you use the following? (Please tick the relevant box)

Resource	Daily	Weekly	Fortnightly	Once a month	Rarely or never
Surfing the Internet/WWW					
CD-ROM databases, for example Citation indexes					
Information retrieval using indexes, for example Agricola					
WebCT					
Library catalogue/OPAC					
Electronic journals					
Others : please list					

18. How many hours a week do you spend actively using the Internet / World Wide Web excluding time spent using email. Approximate number of hours _____

Section D: Journal experience

19. Do you use journals in the course of your studies?
    - ❑ Yes
    - ❑ No

20. If NO, please go to Question 69.

21. Are you satisfied with the present Library service regarding journals?
    - ❑ Yes
    - ❑ No

22. Please state why? _____

23. What percentage of your usage is journal or non-journal material?

	% = 100
❑ Journal	_____
❑ Non-journal	_____

24. What do you use journals for? (Please tick all that are applicable)
    - ❑ Research
    - ❑ External communication (that is, formal publication, formal presentations)
    - ❑ Teaching
    - ❑ Current awareness
    - ❑ Other, please specify _____

25. What is the percentage success rate you have in locating a journal article? ___

PART 1 : Print journals:

26. Do you use print journals?
    - ❑ Yes
    - ❑ No

27. If NO, please go to Question 69.

28. If YES, on average how often do you use print journals?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Fortnightly
    - ❑ Monthly
    - ❑ Rarely

29. For how long have you been using print journals?
    - ❑ Less than 1 year
    - ❑ 1-2 years
    - ❑ 3-4 years
    - ❑ 5 years and more

30. What method do you use for locating print journal articles? (Please tick all that are applicable)
    - ❑ Electronic indexes / abstracts
    - ❑ Print indexes / abstracts
    - ❑ Recommendation from colleagues
    - ❑ Citation from other articles
    - ❑ Other, please specify _____

31. Where do you mostly read print journals?
    - ❑ Library
    - ❑ Office
    - ❑ Home
    - ❑ Other , please specify _____

32. Is there a particular time of day when you tend to read print journals?
    - ❑ Yes
    - ❑ No

33. Approximately how many articles from print journals have you read in the past month? ____

34. What is the source/s of the print journal/s you use? (Please tick all that are applicable and estimate a percentage for each source)

	% = 100
❑ Personal subscription	_____
❑ Library subscription	_____
❑ Interlibrary loans	_____
❑ Other sources, please specify	_____

35. What is the age of the articles you read? (Please tick all that are applicable)
    - ❑ Less than a year
    - ❑ 1 – 2 years
    - ❑ 3 - 5 years
    - ❑ 6 - 10 years
    - ❑ Over 10 years

36. Once you have located a relevant article, what do you typically do with it? You may choose to have more than one category.
    - ❑ Read
    - ❑ Photocopy
    - ❑ Take notes
    - ❑ Other , please specify _____

37. What features of the printed journal do you like? (Please tick all that are applicable)
    - ❑ Easy to read
    - ❑ Easy to browse
    - ❑ Quality of presentation
    - ❑ Portability
    - ❑ Other, please specify _____

38. What features of the printed journal do you dislike? (Please tick all that are applicable)
    - ❑ Publication lag time
    - ❑ Limited by library hours
    - ❑ Loan period of only one week
    - ❑ Need to photocopying articles or and/or take notes
    - ❑ Other, please specify _____

39. Are you satisfied with access to print journals?

- ❑ Yes
- ❑ No

40. Please state why? _____

41. What do you believe is the future of print journals?
    - ❑ Mostly replacing electronic journals
    - ❑ Co-existing with electronic journals
    - ❑ Supplementing electronic journals
    - ❑ Other, please specify _____
    - ❑ No opinion

PART 2 : Electronic journals

42. Do you use full-text journals available in electronic (digital) format?
    - ❑ Yes
    - ❑ No

43. If NO, please go to Question 69.

44. If YES, on average how often do you use electronic journals?
    - ❑ Daily
    - ❑ Weekly
    - ❑ Fortnightly
    - ❑ Monthly
    - ❑ Rarely

45. How long have you been using electronic journals?
    - ❑ Less than 1 year
    - ❑ 1-2 years
    - ❑ 3-4 years
    - ❑ 5 years or more

46. How did you find out about the existence of electronic journals? (Please tick all that are applicable)
    - ❑ Library catalogue
    - ❑ Library staff
    - ❑ Library Homepage
    - ❑ Search engine, for example Yahoo
    - ❑ Print journal
    - ❑ Specific journal's Website
    - ❑ A multi-journal Website
    - ❑ Online citation index
    - ❑ Other, please specify _____

47. From where do you mostly access electronic journals? (Please tick all that are applicable)
    - ❑ Library
    - ❑ Office
    - ❑ Home
    - ❑ LAN
    - ❑ Other, please specify _____

48. How do you gain access to electronic journals? Please tick all that are applicable)
    - ❑ Electronic Database, for example EbscoHost
    - ❑ Library Homepage
    - ❑ Publishers site
    - ❑ Specific journal's Website
    - ❑ Multi-journal Website, for example ScienceDirect
    - ❑ Other, please specify _____

49. What is the source of the electronic journal you use?
    - ❑ Personal subscription

- ❑ Library subscription
- ❑ Freely available title
- ❑ Other, please specify _____

50. Which of the following statements most accurately describes your use of electronic journals:
    - ❑ I use e-journals primarily to retrieve full-text articles online
    - ❑ I use e-journals primarily to access special online features, for example hyperlinks to cited articles)
    - ❑ I use e-journals primarily for ease of searching and/or browsing
    - ❑ I do not use e-journals at all
    - ❑ None of the above

51. What is your most preferred format for reading full-text e-journal articles ON THE SCREEN :
    - ❑ HTML
    - ❑ PDF
    - ❑ Rather than reading from the screen, I prefer to print and read the printed copy
    - ❑ Other, please specify _____

52. Once you have located a full-text article do you usually:
    - ❑ save it to a file on your computer
    - ❑ print it out
    - ❑ do both
    - ❑ Other, please specify _____

53. What features of the electronic journal medium do you like? (Please tick all that are applicable)
    - ❑ Browsability
    - ❑ Interactivity / Hyperlinks/ Linkability
    - ❑ Searching facility
    - ❑ Currency of document / Timeliness
    - ❑ Multimedia features
    - ❑ Accessibility
    - ❑ Ability to print
    - ❑ Availability, i.e 24 hours access
    - ❑ Functionality, i.e downloading
    - ❑ Full-text searching
    - ❑ Alerting services
    - ❑ Convenience
    - ❑ Other, please specify _____

54. What features of the electronic journal medium do you dislike? (Please tick all that are applicable)
    - ❑ User authentication / Password / Usernames
    - ❑ IP access
    - ❑ Dependence on computer hardware and software
    - ❑ Viewing software, i.e. Adobe Acrobat
    - ❑ Coping with individual journal interfaces
    - ❑ Difficulty in reading on-screen
    - ❑ Need for scrolling
    - ❑ Downloading time
    - ❑ Speed of retrieval
    - ❑ Difficulty with printing
    - ❑ Lack of browseability
    - ❑ Copyright restrictions
    - ❑ Other, please specify _____

55. Do you actively try to keep abreast of new online features?
    - ❑ Yes
    - ❑ No

56. Are you satisfied with access to electronic journals?
    - ❑ Yes
    - ❑ No

57. Please state why? _____

58. What do you believe is the future for electronic journals?
- ❑ Mostly replacing print journals
- ❑ Co-existing with print journals
- ❑ Supplementing print journals
- ❑ Other, please specify _____
- ❑ No opinion

59. Should libraries maintain electronic archives or hard-copy archives?
- ❑ Electronic
- ❑ Hardcopy
- ❑ Both

60. Assuming that electronic archives of journals are proven to work well and are readily accessible. Would you be happy to see hard-copy archives discarded and replaced entirely by electronic archives?
- ❑ Yes
- ❑ No
- ❑ Uncertain

61. For how long should journals in print be archived?
- ❑ 1 - 5 years
- ❑ 6 - 10 years
- ❑ 11 - 15 years
- ❑ More than 15 years

62. For how long should electronic journals be archived?
- ❑ 1 - 5 years
- ❑ 6 - 10 years
- ❑ 11 - 15 years
- ❑ More than 15 years

63. On average what percentage of your journal use is print ___ and/or electronic ____ = 100%

64. Given a choice between print and electronic journals, which would you choose?
- ❑ Print journals
- ❑ Electronic journals
- ❑ Uncertain

65. Please state why ? _____

66. Which would you consider easier to access?
- ❑ Print journals
- ❑ Electronic journals

67. Please state why? _____

68. What percentage of the journals (print and electronic) you would like to access, does the library have = 100%? _____

69. How often do you find you have to use interlibrary loans for obtaining journal articles?
- ❑ Never use interlibrary loans
- ❑ Less than 5 times per month
- ❑ 6 - 10 times per month
- ❑ 11 - 15 times per month
- ❑ 16 - 20 times per month
- ❑ More than 20 times per month

70. Would you publish in an online journal?
- ❑ Yes
- ❑ No

- ❑ Uncertain

71. Why? _____

72. Please feel free to make additional remarks about your journal usage, or comments on the questionnaire.
_____

E-mail address: _____

Thank you for taking time to complete the questionnaire

Appendix E : Questionnaire introduction letter to Ms Nora Buchanan

5 March 2004

Dear Nora

I would like to conduct an interview with you regarding the journal subscriptions at ex-UND Libraries. The attached questionnaire is designed to elicit your views on journal subscriptions, the costs and benefits of journals and various issues relating to journals at the UND Libraries.

The purpose of my study is to do a comparative study of Science print and electronic journals at UND Libraries. I hope that this research will not simply be an academic exercise, but will help the Library anticipate trends in journal collections and subscriptions and help in financial planning and budgeting.

Therefore I would be grateful if you take some time to look at the interview schedule and gather the information and let me know when it will be convenient for me to conduct the interview in person.

Yours sincerely

Roshini Pather
Science Subject Librarian
E G Malherbe Library

University of Natal, Durban
patherr@nu.ac.za / Tel. : (031) 2603025 / Fax (031) 2602051

Appendix F : Interview schedule for Acting University Librarian - Ms Nora Buchanan of the E G Malherbe Library

A : Budget

1. What do you think of the proportion of the library budget allocated to the Main Library?

2. What proportion of the library budget is spent on serials, both print and full-text electronic?

3. What proportion of the library budget is spent on science journals?

4. What proportion of the library budget is spent on books?

5. What proportion of that is spent on Science books?

6. Do you have separate budgets for print and full-text electronic journals?

7. If yes, what are they.
   - Print journals
   - Full-text electronic journals

8. How does your library pay for journals by:
   - ❑ subject discipline funds
   - ❑ general resources funds
   - ❑ other funds, please specify

9. Which payment option or cost model do you use for print and electronic full-text journal subscriptions?

10. What would be the library's preferred method of paying for print journals?

11. What would be the library's preferred method of paying for full-text electronic journals

12. Has the library reduced expenditures in order to provide journals?

13. If yes, in which of the following areas?
   - ❑ capital expenditures
   - ❑ supplies and services
   - ❑ monographs
   - ❑ staff
   - ❑ other, please describe

B : Print journals versus full-text electronic journals:

14. In the last 12 months, have you cancelled any print journal subscriptions in Science in favour of full-text electronic journal access?

15. If yes, how many titles have you cancelled?

16. Why have you cancelled print journals in favour of full-text electronic journals?

17. Do you plan to cancel any print journal subscriptions in the next 12 months in favour of full-text electronic access?

18. If yes, how many?

19. What are the unique costs of print journals, i.e shelving, binding and space

20. What are the unique costs of full-text electronic journals, i.e archiving

21. Are there increased costs for journals when they have an electronic option?

22. If yes, what are they?

23. What, if any, effect does electronic access, have on the print subscription assuming both are subscribed to?

24. From a cost perspective what would you cut to receive for the same subscription?
    - ❑ Print journals
    - ❑ Electronic journals

25. What do you think, users would prefer to receive for the same subscription
    - ❑ Print journals
    - ❑ Electronic journals

26. Please give reasons for your answer?

27. What are the current costs of receiving and processing print and full-text electronic journals?

28. What are the binding, replacement of lost issues and missing pages costs of print journals?

29. What, if any, do you consider to be the advantages and disadvantages of the electronic version compared with the print version and vice versa?

30. Is there a cost distinction between providing access to current issues versus archival issues electronically?

31. Has the library done any cost comparisons between print and full-text electronic journals?

32. If yes, what do they reveal?

33. If no, does the library intend doing any cost comparisons and if so how?

C : Infrastructure:

34. What resource demands does the full-text electronic journals involve?

35. The print journals are available to anyone to use in the Library. Does the library provide sufficient equipment in the library for in-house use of full-text electronic journals?

36. If no, what is required?

D : Staffing issues

37. What new positions, if any, has the library created in the past five years to help with the acquisition or maintenance of journals, especially electronic journals?

38. Compared to the number of staff who worked with print journals before the library started receiving electronic journals, have the number of staff who work with electronic journals increased or decreased.

39. If yes, by how many?

40. Compared to the amount of staff time previously spent on print journals, has the amount of staff time spent on electronic journals increased or decreased?

41. What do you consider to be more complex and time consuming to order, print journals or electronic journals?

42. Why?

D : Journal selection

43. Are the selection criteria used in choosing electronic journals different from those used for print journals?

44. What are your reasons for subscribing to a title:
- ❑ Price
- ❑ Content
- ❑ Faculty demand
- ❑ Friendly licence agreement
- ❑ Archiving issues
- ❑ Platform or format
- ❑ Print cancellation policy
- ❑ Speed of publication
- ❑ Other, please specify _____

E: Journal acquisition and management:

45. Who in the Library is responsible for negotiating/signing/authorising licences to electronic journals?

46. Do you have standardised procedures for negotiating licence agreements of electronic journals, or is each journal treated as a separate case?

47. Maintenance of electronic journals is a continuous process due to the constant flux in journal holdings, frequency, access points, links and content. Who, if anyone, at your library updates these details once the electronic journals have arrived?

48. How does your Library become aware of e-journals?

49. How does your library find out if it has lost access to specific electronic journals
- ❑ serials vendor
- ❑ journal publisher
- ❑ academic staff
- ❑ postgraduate students
- ❑ undergraduate students
- ❑ other, please specify _____

F: Cataloguing and classification

50. Do you have separate cataloguing and classification procedures for print and electronic journals?

51. If yes, why?

52. Does the level of cataloguing for print journals differ from electronic journals?

53. Approximately what percentage of the full-text e-journals the library subscribes to, are accessible through the standard library catalogue
_____% (Enter integer between 0 – 100)

G : Archiving

54. Is your library responsible for archiving any of the electronic journals that you subscribe to?

55. Who do you think should be responsible for archiving electronic journals?
- ❑ vendor/provider
- ❑ publisher
- ❑ consortium
- ❑ certified digital archives like JSTOR
- ❑ library
- ❑ Other, please specify _____

56. For how long should journals in print be archived?
    - ❑ 1 - 5 years
    - ❑ 6 - 10 years
    - ❑ 11 - 15 years
    - ❑ More than 15 years

57. How have you dealt with old issues of print journals?

58. For how long should electronic journals be archived?
    - ❑ 1 - 5 years
    - ❑ 6 - 10 years
    - ❑ 11 - 15 years
    - ❑ More than 15 years

59. How have you dealt with old issues of electronic journals?

60. Can you comment on general challenges of archiving electronic journals as compared to print journals?

H : Providing access to end-users:

61. What is your access policy for print journals?
    - Staff
    - Students
        - Postgraduate
        - Undergraduate
    - Visitors

62. What is your access policy for electronic journals?
    - ❑ Staff
    - ❑ Students
        - Postgraduate
        - Undergraduate
    - ❑ Visitors

63. How are users made aware of full-text journal articles / e-journals?

64. Are there any charges to users relating to accessing either print or electronic journals?

65. If yes, what form do they take:
    - ❑ Flat university computing fee
    - ❑ General university tuition
    - ❑ Budget earmarked for computer/library service
    - ❑ Users pay for printing full-text on library computers
    - ❑ Users paying for printing citations on library computer
    - ❑ Users pay for delivery options – e-mail, fax, downloading
    - ❑ No charges assessed for individual services
    - ❑ Other, please specify _____

I : Usage:

66. What do you think are the barriers to electronic journal usage in the library?
    - ❑ Quality, performance and availability of library computer equipment
    - ❑ Getting access to the library's electronic journals from off-campus locations (Proxy Server / Authentication problems
    - ❑ Speed and reliability of office equipment
    - ❑ Quality of computer support and training available to users
    - ❑ Computer skills of users

67. Do you plan on evaluating patron acceptance and usage of electronic journals?
    - ❑ No
    - ❑ Yes

68. If yes, how do you plan to evaluate patron acceptance and usage of electronic journals?
    - ❑ Usage statistics provided by publisher or vendor
    - ❑ Usage statistics compiled in-house
    - ❑ Patron survey (random sample)
    - ❑ Patron survey (non-random sample)
    - ❑ Electronic questionnaire or suggestion form
    - ❑ Other , please describe

69. Will more use cost more?

70. If yes, how will this be calculated?

J : The future:

71. What do you believe is the future for electronic journals?
    - ❑ Mostly replacing print journals
    - ❑ Co-existing with print journals
    - ❑ Supplementing print journals
    - ❑ Other, please specify _____
    - ❑ No opinion

Please feel free to give any other comments on any aspect of the electronic journal and its use.