INVESTIGATING THE CIRCULATION PATTERNS OF BOOKS ON THE OPEN SHELVES AT AN ACADEMIC INSTITUTION'S LIBRARY IN ORDER TO EVALUATE THEIR CIRCULATION INTENSITY AND PERFORMANCE

by

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ABSTRACT

In response to the decreasing budget of the University of Cape Town (UCT) libraries, the fundamental objective of this study was to suggest methods for streamlining and managing its largest tangible asset, the book collection, to determine whether library resources are being utilised in an effective and cost-effective manner. The study followed up an investigation conducted in 1992, which found that heavy pressure existed for a limited number of items in high demand, and recommended the implementation of a weeding policy, as a large proportion of books was no longer in active use.

The use-centred approach to collection management was adopted as the method of conducting the empirical investigation. Using the university library's BOOK/PLUS computer system, annual "snapshots" of books that were circulating during specific periods in 1996, 1997 and 1998 were taken and randomly sampled. To determine the level of demand for books circulating in the collection, and to what extent these demands were being met, the proportions of both old and new books circulating in the collection were measured. This was done by plotting the age (determined from the accession date) of every sampled book against its frequency of circulation. The proportion of circulating books was also compared with the total proportion of books available for circulation. The costs of meeting these demands were investigated, and suggestions for improving the performance of the collection were made. A benchmark of current circulation frequency of books was created, and recommendations for weeding portions of the collection that were underused were made.

The investigation revealed that users borrowed a low percentage of new books. It was also demonstrated that circulation varies from subject to subject, and because it could be shown that books are either overused or underused, the effectiveness levels or return on the investment of resources could be regarded as correspondingly either high or low.

This could have various implications, including poor collection performance due to ineffective book selection criteria. At the time of the investigation, there were no collection development policies at the UCT libraries. The findings from this study emphasise that a policy is required to streamline collection development, especially in the context of accountability for decision-making and selection of material. "Dead" or underused items still occupying shelf space and incurring maintenance costs could be removed to improve the assessment of the library and its resources, and show the actual value users derive from the book collection. Improved selection policies and a review of the departmental fund allocations are recommended to increase cost-effectiveness.

The amalgamation of the library holdings of the five tertiary institutions in the Western Cape in the Cape Library Co-operative (CALICO) will have an extensive impact on the circulation activity of books in the library. It is therefore recommended that this study be repeated once these systems have been implemented, since it can create pathways for improving co-operative collection development in a cost-effective manner. This would be consistent with the drive for economy of service provision which is being displayed in Higher Education in South Africa, and indeed globally.

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LIST OF ACRONYMS AND ABBREVIATIONS

ARL	Association of Research Libraries
ACRL	Association of College and Research Libraries, which is a division of the American Library Association (ALA)
BORIS	Borrowers' Information Service
CALICO	CApe LIbrary CO-operative
CESM	Classification of Educational Subject Matter
DDC	Dewey Decimal Classification
FLC	Faculty Library Committee
FTE	Full Time Equivalent (student)
HBUs	Historically Black Universities
HWUs	Historically White Universities
IFLA	International Federation of Library Associations and Institutions
ILL	Interlibrary Loans
ISO	International Standards Organisation
LIS	Library and Information Science
LISU	Library and Information Statistics Unit (Loughborough University, UK)
NACUBO	National Association of College and University Business Officers
NCHE	National Commission on Higher Education
SA	South Africa
SAPSE	South African Post-Secondary Education
SCONUL	Standing Conference on University and National Libraries
SLIS	Shared Library and Information System
TQM	Total Quality Management
UCT	University of Cape Town
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNISA	University of South Africa
US	United States
WGLIT	Working group on Libraries and Information Technology

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CHAPTER 1

INTRODUCTION TO THE STUDY

1.1. BACKGROUND AND SCOPE OF THE INVESTIGATION

Although libraries operate as non-profit service providers, funders are often hesitant to spend money on purchasing additions to the collection without an indication of the usefulness or value of the purchased information to its users. Large sums of money are spent on purchasing information which is housed in the library, but who uses the information, and what is its value to the user population? How well does the library's principal asset, its collection, serve the needs of users?

Increasingly, librarians and library managers have to justify not only the means of deciding which resources to purchase, but indeed making the purchase itself. Budget allocations are steadily decreasing, and accountability for expenditure and its perceived rewards have become an important phenomenon in libraries. The transformation process that the University of Cape Town (UCT) is currently undergoing has affected all departments and faculties in this institution, including the university library. Within an environment of limited resources and funding in Higher Education, it is important for academic libraries to evaluate and measure the performance of their largest tangible asset, the collection, by reviewing present operative policies or procedures to determine whether library resources are being utilised in a cost-effective, efficient manner. Within the context of expanding publications and the growth information and information technologies, evaluating the performance of the collection can identify the growing and changing needs of its users. Constant performance evaluation and re-evaluation of services and resources can assist libraries to evaluate successes or failures, and is vital for informing and the determination of policies, goals and objectives, in order to examine the present, and plan for the future.

What follows is a response to the decreasing budget of the UCT libraries, and a proposal for streamlining the book collection, in terms of collection development and removal of "dead" items, so that its users can derive the most benefit, and the library can operate in a cost-effective manner.

1.2. **PROBLEM STATEMENT**

The investigation aimed to find methods for quantitatively measuring the performance of the open shelf book collection of the Main library at the University of Cape Town. A follow-up of a study conducted in 1992 was performed, which investigated the circulation intensity and age-related movement of the open-shelf book collection at the University of Cape Town Main library, in relation to:

(a) The circulation and rate of usage of new materials in the collection, to determine whether they were circulating effectively and cost-effectively. Circulation patterns of new acquisitions in specific subject collections will also be investigated. This will provide an image of the books that are in high demand. Demand will be compared to the books available for borrowing, in order to ascertain the *effectiveness* of the book collection. Levels of cost-effectiveness will also be investigated.

(b) A model or guideline, against which future circulation performance of the collection will be measurable, will be implemented. This involves the development of a "benchmark" against which to evaluate the circulation intensity of books on the open shelves of the Main library, in relation to their age, in order to predict expected use. Development of the benchmark will be based on averaging, over a three-year period, "snapshots" of circulation activity in the Main library, in order to arrive at a circulation mean. The mean distribution as well as each separate snapshot will be compared to the circulation patterns evident in the original study, in order to establish whether any patterns of circulation movement in the second study could have been predicted by the first.

(c) The extent to which age is a factor affecting book use and thus the circulation intensity of books: investigating the library's weeding policy, and the viability of retaining unused or little-used books on the open shelves. Would it be more cost-effective to move the book into storage, where it could nevertheless be retrieved and access would still be available through the catalogue?

1.3. JUSTIFICATION FOR THE STUDY

1.3.1. The University of Cape Town Libraries

At the time of the study the UCT libraries consisted of the Main library (also called the J.W. Jagger Library, or the Linear Library because of its linear physical structure), together with 10 branch libraries, which are situated on various sites throughout the university campus. This configuration is, however, in the process of change as a result of faculty restructuring at the UCT. Currently, the greater part of the library's stock is housed in the Main library, and its book collection will form the focal point of this investigation. The Main library comprises materials for the Social Sciences, Humanities, Languages and literature, Science and Engineering. The Short Loan Centre, which contains materials in high demand, is also housed in the Main library and will not form part of this study, as an investigation into accessibility and availability of its materials was conducted in 1996 (Leibbrandt, 1996).

The library's principal asset is its collection. In 1997, 17 404 new items[1] were purchased at a cost of R10 233 577, increasing the total stock of UCT libraries (excluding manuscripts) to 11 060 680 items (University of Cape Town Libraries, 1998: 5-6). By the end of 1998 the total inventory value of the library's collection had increased from R99 422 560 in 1997 to R109 606 979 in 1998. The total library collection was composed of 1 171 233 volumes and items, of which books constituted 59.3% or 694 927 volumes (University of Cape Town Libraries, 1999).

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[1] Includes total purchases and expenditure for books and periodicals, excluding motion pictures, audio records, maps and charts, slides and other units

When such large sums of money are at stake, it is imperative that analysis and measurement of its use is implemented, especially in the face of the low exchange rates, dwindling resources and pressure for curtailment of costs incurred by UCT libraries. A frequent analysis of collection use is therefore required, in order to justify present expenditures and requests for future funding. This will determine whether the funding of information growth is proportionate to its use (which is derived from current use of materials) and enable one to predict probable or future use.

"The ultimate test of the quality of a library collection ... is the extent and mode of its use. (S)tatistical analysis of book use ... is concerned with who uses the collection, for what purpose, and how much, and with which portions of the collection are most used" (Lancaster, 1977: 178). This investigation proposes to focus on the circulation activity levels of books in the collection as a manifestation of collection use. It will enquire into the decline of use of library materials with age. It will look at how effective and cost-effective materials circulation is, and at the difference between its perceived and actual values.

1.3.2. **Previous studies into circulation evaluation and obsolescence at UCT libraries**

In 1992 a study of circulation patterns of books available for borrowing from the open shelves of the Main library at the UCT was conducted, in response to complaints about ageing book stock. It investigated the proportion of books in the library that were actively circulating, and whether the accepted phenomenon of decline in use with age, or obsolescence, would be supported in an environment where a reduction in the purchase of new books was evident.

> "Discussions with members of staff in the library services at UCT, responses from students during a user survey and observation, seemed to indicate that a considerable proportion of books on the open shelves in the Main Library were fairly old (dating from the 1960's and before) and might no longer be desirable. Complaints had been made by both staff and students that the library no longer seemed to be getting as many new books as in the past and that more new books were needed."
>
> (de Jager, 1994: 72)

The basic findings of this study were that there was heavy demand for that proportion of books in the library that were circulating during the previous six years (1987 to 1992). Heavy pressure existed for a limited number of items in high demand. The study also found that new books entering the system are not immediately in demand, but that demand gradually builds up. An informed weeding policy was recommended, as it was found that a large proportion of books in the library was no longer in active use.

1.3.3. Rationale for a second study

Faculty restructuring at the UCT, reducing the 1998 number of faculties from ten to six, and inter-faculty co-operation and teaching, as well as the construction of a new Central Library, have raised important issues for collection management and storage. In 1998 there were no formally adopted collection management policies in the library to administer, control and regulate materials acquisition and weeding, which require close collaboration between library and academic staff.

The initial study in 1992 aimed to establish which proportion of books in the library were actively circulating, and whether the use of books was declining, as they grew older. It was found that the majority of the books in demand were accessioned during the previous six years, and that demand gradually decreased, as books grew older. New books added to the collection did not immediately circulate rapidly, but their use gradually increased, and then continued for many years (de Jager, 1995: 207). The observed pattern of low use of new books was disturbing, and warranted further investigation, especially in the context of decreasing expenditure on library materials, which, as the first investigation concluded, will affect the use of older material as the user population grows (de Jager, 1994: 78).

In essence, the changing student profile, the increased interfaculty teaching occurring with the new faculty structure, decreased funding, spiralling costs and the reduced purchasing power of the Rand have implications for the development, management and use of the UCT's library collection. The present study intended to develop collection performance measures to enable the library to measure, compare, plan and improve its collection, and set goals for the future.

1.4. DELIMITATIONS OF THE STUDY

This study will concentrate solely on the book collection at the University of Cape Town's Main library. In addition, the library administers small collections of subjects that are found in dedicated branch libraries, including Law and Education. Subjects that formed part of a branch library's collection, but were present in small portions in the Main library were omitted from calculations. It was recognised that the recorded circulations of such small subject areas would not be a true reflection of their actual circulation, as the circulation figures for the dedicated branch libraries were not included with that of the Main library.

At the UCT, the restructuring of faculties will inevitably lead to increased inter-faculty teaching, which will result in an increasingly inter-disciplinary library collection. This will impact on the use of the collection, and could therefore affect the performance measurement indicators in the future, so that future studies should take branch circulation into consideration as well.

This study will not address the determination of absolute collection size or growth rate. Factors such as decreased funding, different rates of obsolescence and growth for different disciplines and levels of services desired by the user community are all factors which impact on collection development, but they are beyond the scope of this study.

It must be noted that there will be no attempt to measure the *cost-benefit* of materials, in terms of acquisition costs in relation to how useful or beneficial users find the book collection – such qualitative analyses of value are difficult to measure and are beyond the scope of this study. The study will focus on circulation patterns as an indication of user need.

The study will aim to determine the level of demand for books circulating in the collection, and to what extent the book collection meets the demands placed upon it. In order to do this, the use-centred approach to collection management will be adopted as the main method of conducting the empirical study. The proportions of both old and new books circulating in the collection will be measured, to determine levels of effectiveness in relation to their use. The effectiveness of the book collection in meeting user demands will be measured by investigating the proportion of books circulating in the collection in comparison to the total number of books available for borrowing. The cost of meeting these demands will be investigated. The proportion of older material circulating will also be investigated, and it will be determined whether their circulation frequency justifies the cost of maintaining them on the open shelves.

1.5. POTENTIAL VALUE OF RESEARCH

Any investigations into performance measurement in libraries should benefit the host institution that is the primary funding body. This study could thus assist in streamlining the book collection of the Main UCT library by identifying obsolete materials from the materials available for borrowing from the browsing collection. Circulation statistics will be used to examine what users are actually doing, and to determine levels of effectiveness and cost-effectiveness of the various subjects under investigation. A benchmark against which to measure variations in collection use over time will be created.

1.5.1. **Collection use and Benchmarking**

The information on circulation intensity could be used to supplement decisions about acquisition of material and therefore the development of the collection. Unnecessary expenditure on materials that do not circulate can be avoided in this way. An example would be not to purchase the next edition of a book when the previous edition has had a very low or non-existent circulation intensity level. This can assist in the development of an effective collection management and development policy.

A snapshot of collection activity at a given time is useful for the analysis of current needs and demands. However, collection circulation data accumulated over a period of time can be used to pinpoint variations in collection use. The comparison and averaging of data accumulated over a period of three years, from 1996 to 1998, will provide a standard mean against which future variations in collection use can be measured and compared over time.

1.5.2. **Effectiveness and cost-effectiveness studies**

Levels of effectiveness for both the collection as a whole and for specific subjects will be determined by comparing the circulation frequency of books circulating to the total books available for borrowing. Expenditure on acquisitions will be compared to circulation statistics, in order to ascertain whether cost-effectiveness of new materials in the collection has improved or decreased at the end of the period 1996-1998. The circulation information will also be used for analysis of the relative use of subjects in the collection, compared to total collection size, to the size of the subject collection, and proportional expenditure on specific subjects in relation to circulation. Indicators of cost-effectiveness will be procured in this manner. This data will provide germane information whereby the library can measure, compare, plan budgets and improvements, and set objectives for the future.

1.5.3. **Weeding**

It will be determined whether the age of a book has an effect on the frequency of its circulation. Where books are underused or little used, weeding them from the collection will create shelf space and make newer materials more visible to users. "The history of the monograph collection growth of the Main library for the past 10 years is one of a fairly consistent accession rate of about 8700 volumes per year and an average "deletion" rate of about 900 volumes or 10%" (University of Cape Town Principal's Circular, 1998 (c): 26). However, a weeding backlog of 50 000 volumes and the lack of a collection management policy has made the problem of materials management and storage a growing one. Therefore, in 1998, the UCT Library Planning Group "agreed that substantial weeding of the browsing material presently on the shelves – 20%, is necessary and overdue and that the materials should be kept highly relevant and of high quality by rigorous selection criteria" (University of Cape Town Principal's Circular, 1998 (c): 26). Although weeding by careful analysis of criteria such as circulation statistics or accession date *alone* may be shown to be inadequate, the provision of an estimated use period whereafter obsolete materials can be removed from the open browsing collection, can provide valuable information for decision-making. In conjunction with close co-operation between subject librarians and faculty representatives of the academic community, it is proposed that the results of the study will provide an effective means of collection control, growth and management.

To summarise, the study of circulation data will assist in planning for future collection decisions, such as selection of materials and budget allocation to the various services. Responses to economic constrictions and resource cutbacks may then be based on both professional judgement and specific data which has been collected from the system, and can be referred to for corroborative ~~and proactive~~ decision-making.

1.6. CLARIFICATION OF CONCEPTS AND TERMS

Collection development

Collection development is based on two facets: funding and allocation of funding to the various academic departments, and the selection of material. Both distribution of funding and selection procedures can affect the use of new materials, particularly when the average price of books is increasing, (especially in the fields of science and technology, where books are most expensive), and erroneous selection policies and procedures could affect the use of new materials. Currently, while faculty librarians provide current awareness services to the UCT academic community, book selection is an academic responsibility. Although departments develop collection development profiles, the 1992 study by de Jager indicated that "there are no formal book selection policies to ensure accountability" (1994: 81). The library uses the average price of materials to allocate its library materials budget, which is based on a formula of "equitability by virtue of enabling each department to acquire the same percentage of the literature published in its field, in accordance with the principles set out by the Association of Research Libraries" (Eave, 1989: 130).

Obsolescence

The older a book becomes, or the longer a title is kept and maintained in the library, the more expensive the investment in its storage, upkeep and preservation becomes. Where financial resources are limited, and the real purchasing power of the budget is decreasing, it makes more sense to invest in the storage of useful books than in the storage of less useful books. "If there is a tendency for books to be used less and less, then the returns on the investment in continued storage (and maintenance) must diminish" (Buckland, 1975: 39).

Obsolescence has also been defined as entailing a "decline over time in validity or utility of information" (Line and Sandison, 1974: 283). Line notes that obsolescence is "not an objective thing independent of circumstances". He further states that when considering consequences of detecting obsolescence, such as removal of books into storage, the subjective value of the book to the user should be taken into consideration, and removal of books approached with caution, as it is a very contentious issue (1993: 673).

Performance measures or output measures

"[T]hey are counts and combinations of counts which enable a library to assess the degree to which a program meets its objectives. They objectively describe how quickly, how accurately, and under what conditions specific activities are accomplished or certain effects are achieved. ... They typically focus on efficiency of activities when our chief concern is productivity and on effectiveness when our concern is users' needs" (Kelley, 1991: 23).

Benchmark

Benchmarks show at what level of performance the service is operating *now*. If changes are subsequently made to the service, the effects can be measured against the benchmark previously established. (Lancaster, 1993:6-7)

Circulation

"The annual total number of items charged out for use, usually ... outside the library, includes initial charges, renewals, and general collection and reserves" (Van House et al., 1994: 54). It does *not* include in-house use.

Effectiveness

Effectiveness must be measured in terms of how well a service satisfies the demands and needs of its users. Effectiveness or quality of service or product is measured by output measures that are user-based. Measuring effectiveness usually involves qualitative techniques such as interviews or questionnaires; however, it can be measured by looking at what users actually do as opposed to what they say they do, i.e. using their actual use of the collection rather than their opinions as measures of effectiveness. In the context of quantitative analysis of effectiveness, indications of overuse or underuse of certain areas of the collection can provide valuable information about where librarians are failing in their collection development, and where they are failing to meet user needs adequately. "In determining effectiveness, librarians need to compare indicators of current performance to library objectives or previous performance. Only with extreme caution can the library make comparisons system-wide, to other libraries, or to pre-determined standards" (Hernon and McClure, 1990: 144).

Cost-effectiveness

"Cost-effectiveness is concerned with the relationship between levels of effectiveness and cost" (Lancaster and McCutcheon, 1978: 12). It is the "accomplishment of objectives expressed in terms of cost" (Hernon and McClure, 1990: 5).

Cost-benefit evaluation

Cost-benefit evaluation is concerned with determining whether and to what extent the cost of providing a service is more or less than the value of the service (Baker and Lancaster, 1991: 8). It is the "justification for the expense of providing a service or program in terms of the benefits derived from it" (Hernon and McClure, 1990: 5). It usually involves user opinions about how good a service is, and can be quite subjective in nature.

Measures and standards

"Measures are not standards. They provide objective descriptive data while a standard defines a desired level of performance. Using data collected, library performance is often compared to standards we have established... by the repetition of data collection at intervals. It would also be useful if the study could be repeated in the aftermath of significant changes in procedures and policies which are likely to alter the ability of the collection to adequately serve the users' needs" (Kelley, 1991: 24-26).

Accession date

The accession date refers to the date on which library materials were added to the library system.

Publication date

This date is different from the accession date. It refers to the year in which the material was published. There is usually a time lag between the time when an item is published and when the library purchases, catalogues and adds it to the library collection.

Synchronous and diachronous studies of circulation

Synchronous studies use data on current circulation of library materials and plots, backward in time, the publication or accession date of materials borrowed. It looks at current use taking place during a specified period of time. In this thesis, current use during a specified time is referred to as a "snapshot". In comparison to this, diachronous studies examine usage over time. In the context of collection usage, a diachronous study would draw collection samples, record the evidence of past use from data tables and plot the use of these items over time, in order to establish a history for each item under investigation. These are laboriously time-consuming, while computers have made synchronous studies much easier to produce.

Weeding

Weeding refers to the removal of books or monographs, either permanently, or to low-cost storage facilities. The need for weeding has become increasingly apparent in the face of "rapidly growing collections, shortage of space, and the high cost of storing books on open stacks" (Slote, 1989: 3). Authors of library standards have for many years advised libraries to weed their collections regularly. In comparison to this, the archival view of the library emphasises collection size as an indicator of quality. Traditionally, library size has been viewed as an indicator of value: the bigger a library's collection, the more valuable it was perceived to be to users. Figures regarding collection size were often reported in the libraries' official statistics. In libraries where size is perceived to be important, the removal of books from the collection would signify a reduction in the value of the library and its collection. There may also be "emotional and intellectual blocks against removing books from a collection. Many people consider books to be valuable records of human heritage and therefore almost sacred. The removal of books becomes painful (Slote, 1989: 5). Subjective views regarding weeding often influence whether it is performed in libraries or not.

1.7. **APPROACHES TO THE STUDY OF COLLECTION EVALUATION**

Early literature on performance measurement in the Library and Information Science (LIS) environment have focused on the highly theoretical or conceptual aspects or have been noted for their complex statistical nature. Studies have focused on both quantitative and qualitative approaches to the study of performance measurement in the LIS environment. Orr, for example, in his work titled Measuring the goodness of library services: a general framework for considering quantitative measures deliberated on the differences between quality and value of a library service, or how good a service is and how much good it does. In describing their interconnection, he expressed the commonly-held view that the size of a library is directly related to its worth: that as inputs such as money and the collection increase, outputs and outcomes will increase as well (1973: 315-332). However, most importantly, he did realise that outputs and outcomes will not increase in direct proportion to what is put in.

Hirsch (1959: 7-20) identified two qualitative means of evaluating collections:

1) *Impressionistic evaluation studies*, which involve collection evaluation by one or more individuals, such as librarians, subject specialist, students or faculty members. While the particularly useful expertise of the latter group is recognised in the evaluation of academic libraries, Williams, in his work titled Surveying library collections, affirmed the subjectivity of this approach (1967: 23-45).

2) *List-checking*, or checking against an external authority such as a standard list containing the most frequent citations in a particular subject field. This is a

fairly labour-intensive and costly task for large academic libraries with many subject collections. In addition, lists can become outdated very quickly. Lancaster cautioned that "standard lists used to check adequacy of collections may be the very ones that were used earlier to build these collections [and] that their use as evaluative tools is, therefore, essentially zero" (1977: 177).

On the other hand, Scientific Management approaches have focused on the quantitative approach to determining the benefit of a library service; using quantitative analysis of data, usually derived from the library system itself (such as circulation data), to provide statistics about the collection and its services. The Scientific Management school includes Morse, who, in his pioneering work titled Library effectiveness, attempted in a highly mathematical manner to describe how probabilistic modelling could be used to assist librarians in decision and policy-making. Much of his work is based on circulation data, which he used to calculate factors such as optimal loan periods, and predict future use of the collection (Lancaster, 1977: 189). Fairthorne pioneered the science of bibliometrics (Wills and Oldman, 1977: 178). Although statistics in themselves provide no qualitative information about, for example, why a certain service is failing or unsuccessful, they can show, by manipulation of data, that it *is* failing, or not performing optimally.

Chen has expressed the view that using highly mathematical models as a means of performance evaluation can lead to much manipulation of statistical data, which is often descriptive in nature, but does very little to assist the librarian with diagnosing or prediction of performance. This is particularly true in today's computerised environment, where statistical packages can manipulate data in many ways, and provide a myriad of statistics - which are often quantitative descriptions, but do not provide any information as to why certain aspects occur. Therefore statistics in themselves provide no qualitative information about, for example, why a certain service is failing or unsuccessful - they merely show, by using manipulation of circulation data, that it is failing, or not performing at its optimum.

1.7.1. The 1990's: the search for practical measures

Until the 1990's, very little practical information as to how to implement an evaluation of library services or resources had been published. Nancy Van House, Christine Abbott, Ian Winkworth and organisations such as the Standing Conference on University and National Libraries (SCONUL) in the United Kingdom (UK), and seminars and conferences such as the Northumbria Conferences on Performance Evaluation, attempted to address this problem by developing performance indicators which could be adapted for use in particular libraries and in particular contexts. "The performance indicators which were first developed were chiefly for use in the single library" (Poll, 1998).

There has thus been a move away from mere discussions about performance measurement and what it can do for the library, towards demonstrating the value and benefit that can be derived from using performance indicators. They can be used to show that the library is a necessary component of an institution, and can perform its operations in a cost-effective, efficient and effective way. It is however becoming increasingly apparent in the literature that escalating competition for resources and budget cutbacks mean that more evaluative and richer measures which use both quantitative and qualitative means to supplement each other have to be sought. This thesis will not seek to investigate qualitative measures, but will concentrate on quantitative evaluation of the library collection.

A number of important publications on indicators for measuring academic library performance have emerged recently. These include proposals for actual measures and indicators, which have culminated in publications such as Association of Research Libraries (ARL) publication ARL Statistics, which provides information on using performance measures. The SCONUL produced practical guides to performance indicators for libraries. At the international level, the ISO 11620 International standards on library performance indicators has been approved, and the International Federation of Library Associations and Institutions (IFLA) has developed International guidelines for performance measurement in academic libraries, which aims to "offer tools for the evaluation process that, by using them in an identical way, allow historical comparisons within the library and even comparisons between libraries" (Poll and te Boekhorst, 1996: 10).

1.7.2. **The international impetus**

The contribution libraries make to a country's development may not always be tangible, and could therefore be difficult to measure. For this reason, the late 1990's have brought a drive towards creating performance indicators that can measure the economic value and contribution of libraries at a national as well as international level. With the globalisation of information and increasing collaboration between libraries, it has been recognised that performance indicators are suited for use on a national and international scale, and can inform national information frameworks and policies in the current context of globalised information. This would allow for comparisons across borders, and the areas of comparison targeted by the *Workshop on the collection, analysis and use of library statistics*, hosted by the European Commission in Luxembourg on 9th and 10th December 1997, include:

- Market penetration
- Collection use
- Availability of information
- Speed of services
- User satisfaction
- Cost-effectiveness

(Poll, 1998)

International organisations such as IFLA, the ISO and the United Nations Educational, Scientific and Cultural Organization (UNESCO) are endeavouring to investigate a "core" group of performance indicators that are internationally comparable. They have endorsed projects such as LIBECON 2000, which aims to "improve consistency, quality and comprehensiveness of statistical data for libraries in Central and Eastern Europe, to further co-operation in developing standards for services in the electronic environment, and to seek agreement on internationally acceptable management ratios for library services" (Segbert, 1998). It is however recognised that the organisation of libraries and their activities differ in each country, and it is therefore difficult to develop standards or benchmarks for comparative purposes at an international level.

1.7.3. **Quantitative analysis**

During the 1970's and 80's practical work was carried out at libraries which sought to evaluate collections through analysis of actual use of its materials. Availability studies, particularly by Kantor (1976) investigated whether or not an item may be found in the library when needed. Collection usage studies, notably by Trueswell (1965, 1969) described procedures for determining what proportion of the collection accounts for what proportion of its use. Slote (1989) tried to determine what length of time a book sat on the shelf between circulations, and Lancaster (1977) used circulation statistics to determine the relative use of collections.

Traditional collection studies sought to measure the value of the collection against an external standard such as a bibliography or book list rather than by analysing the use of the collection itself.

> "Whereas the idea of the external standard for collection evaluation was universally accepted for many years, we are now beginning to get much more emphasis on evaluation of the collection in terms of the amount and type of use it receives, either by drawing a sample of the materials from the collection itself... and examining the data labels to find out which categories of materials are most used, or by taking a sampling in a particular time period and observing what kinds of materials are being borrowed over a particular period of time."

(Lancaster and McCutcheon, 1978: 22).

Classic and well-cited examples of studies of the collection sample are the Fussler and Simon study at the University of Chicago (1969), and studies at the Hillman Library of the University of Pittsburgh (Kent et al., 1979). While these studies provide much of the theoretical and practical background for evaluative studies, advancing technologies and pressure for library managers to show how money is being spent, have resulted in the drive to find measures of cost-effectiveness of library services and resources.

1.7.4. **Effectiveness and cost-effectiveness evaluation of the collection**

Effectiveness must be measured in terms of how well a service satisfies the demands and needs of its users. Effectiveness or quality of service or product is measured by output measures that are user-based. Measuring effectiveness usually involves qualitative techniques such as interviews or questionnaires, although it can be measured by looking at what users actually do as opposed to what they say they do, i.e. studying their actual use of the collection rather than their opinions, in order to obtain measures of effectiveness. In the context of quantitative analysis of effectiveness, indications of overuse or underuse of certain areas of the collection can provide valuable information about where librarians are failing in their collection development strategies, and where they are failing to meet user needs adequately. "In determining effectiveness, librarians need to compare indicators of current performance to library objectives or previous performance. Only with extreme caution can the library make comparisons system-wide, to other libraries, or to pre-determined standards" (Hernon and McClure, 1990: 144).

An evaluation of effectiveness of services measures the extent to which user demands and needs are satisfied by a particular service or resource, and can be expressed quantitatively. Cost-effectiveness is therefore concerned with the relationship between levels of effectiveness and the costs incurred in achieving these performance levels. Levels of achievement all have costs associated with them, and thus cost-effectiveness assesses whether the cost of service or resource provision justifies the demand for it (Lancaster and McCutcheon, 1978: 13). As evaluation should only be carried out with specific questions and goals in mind, cost-effectiveness studies such as those by Cronin (1985) have focussed on specific aspects of services in libraries, such as cost-effectiveness of resource sharing activities, especially interlibrary lending. Rosenberg (1985) and Kantor (1989) have provided detailed discussions of cost analysis.

"Cost-effectiveness ... relates to optimi[s]ation in the allocation of resources – the better the allocation of resources, the better the quality of service (i.e. effectiveness) that is achieved for a particular level of expenditure" (Lancaster: 1993: 6). The optimal allocation of resources (input) results in a cost-effective service or resource (output). The benefits (outcomes) of this in relation to costs are difficult to gauge, require qualitative analysis and will therefore not be considered in this thesis. It is however noted that this type of investigation could provide important indicators as to why certain services or resources are effective, and indications of how others can be improved. Many factors impact on the cost of a service or resource provision, including personnel costs (the largest part of a library's operating costs), use of equipment such as computers, the amount of space occupied by buildings, desks and shelves, mailing and other delivery costs, telephone, electronic mail and facsimile costs, printing costs, cost of online access, leasing or purchasing of CD-ROM databases, and purchases of materials such as books and periodicals. The cost per use of monographs and other resources is therefore not straightforward, since it includes many of the above costs. It costs money and labour to keep material on the shelves, where they are accessible to users. There are also significant costs involved in moving materials into storage, or areas where less space is required, such as compact storage units.

1.7.4.1. Limitations of quantitative analysis approach

No library operates in a vacuum, unaffected by social, economic and political occurrences and constraints. Therefore, while quantitative analysis which rely on extraction of automated statistics can provide hard, concrete facts about collection use, which can be statistically proven, it does not give an indication as to the subjective environment in which users make decisions about the way in which they use the library collection. Quantitative analyses rely on the actions of library users, which may be a direct result of library policies and procedures, such as incorrect selection polices, and not on user opinions or needs, which an interview or survey may have ascertained.

While quantitative analyses allow information to be obtained relatively quickly, in comparison to interview techniques or sending out questionnaires and waiting for their return, snapshots of circulation activity are indications of the present situation, the here and now. If the objective is to arrive at guidelines which can be applied to overall performance and used to guide future decision-making, activities have to be analysed over a period of time, which is just as time-consuming, if not more so, as other techniques.

1.7.5. **Summary:**

The approaches outlined have encompassed performance measurement as an assessment of value and benefit, may be used to determine how well a library collection is used. Quantitative analysis of statistical data, usually derived from circulation data, may be used to determine which strategies will produce the desired result. The role of evaluation in decision and policy-making, and as an essential aspect of management, particularly in the effective allocation of resources, was considered. These approaches emphasise that evaluation is a practical exercise, in order to gather hard data useful in problem-solving, planning and decision-making activities.

To this end, performance indicators that are quantitative expressions of the value and use of particular aspects of a library's services or resources have been developed. They are derived from a need to measure the performance of a specific activity or service: how well a service is performing, the degree to which it meets the needs and demands of users, and whether it meets its objectives in a cost-effective, efficient and effective manner. Practical performance indicators that inform national policy decision-making, and allow for comparisons with other countries have been recommended by the major organisations in the libraries' performance measurement and standards field.

National political imperatives to encourage greater accountability and efficiency in public services are a key factor in South Africa. Traditionally, libraries have not had to prove measures of productivity or value. However, during economic constraints and budget cutbacks, and fierce competition for resources, librarians are increasingly being held accountable for what they spend, and how resources are allocated, and what benefits are derived from their services. Libraries therefore have to justify their very existence.

1.8. RESEARCH METHODOLOGY

1.8.1. Research design

This investigation will quantitatively analyse the *books* circulating in the Main UCT library's open shelves. The use-centred approach to collection management will be adopted as the main method of conducting the empirical investigation. Annual "snapshots" of books circulating during 1996, 1997 and 1998 are taken, using the University library's BOOK/PLUS computer programme, and randomly sampled. Intrinsic to this inquiry is the study of the library's book collection and its use. Use and demand manifest themselves as circulation figures. Therefore the circulation intensity of books relative to their age and subject will be analysed. To determine the level of demand for books circulating in the collection, and to measure the extent to which these demands are being met, the proportions of both old and new books circulating in the collection will be measured. It is also important to know whom the users of the books circulating are, in order to attempt to provide explanations for the demand and circulation levels of books in the Main library. User categories (e.g. undergraduate students, postgraduate students and academic staff) therefore had to be taken into consideration. The cost of meeting the demands for the use of both new and old books will also be investigated. Any changes made to collection policies or procedures would be reflected in the circulation figures, and for this reason a benchmark of current circulation frequency will be created so that future circulation can be measured against it.

1.8.2. <u>The empirical investigation and its study samples</u>

This study aims to test and build on the following suggestions made during the initial investigation in 1992:

(a) The purpose of the 1992 study was to provide a snapshot of collection use during a particular period of time. This study will use the information provided from the 1992 study to determine whether the circulation patterns in 1996-1998 could have been predicted by the initial study. In order to measure future frequency of use of books in the collection, a "benchmark" of circulation frequency in relation to age, will be produced.

(b) Obsolescence was noted during the previous study, and it was suggested that books with an accession date of 25 years and older should be removed from the shelves via an informed weeding policy. The investigation will re-examine this section of the analysis data, using different instruments (computer-manipulated reports). It will provide guidelines for the removal of books that are little used or underused in the book collection.

(c) Circulation intensity of new materials will be investigated as an indication of the period of time it takes for new materials to circulate. By observing past trends denoting the period of time that it takes for a new book to begin circulating, it will be determined whether a standard pattern can be observed. Use of new materials can also be used as an indication of whether the library is used mainly for study or research. A library used mainly for research should have circulation patterns that reflect far greater movement of its new books than older material.

d) In addition to the above, a cost-effectiveness study will assess the costs involved and assist in the determination of cost-effectiveness of the book collection, where effectiveness is expressed quantitatively as the cost of materials in relation to the circulation intensity of materials in the book collection. Both old and new books will be assessed for their cost-effectiveness, which will be measured in terms of demand (expressed as circulation) in relation to cost.

As postulated by Lancaster, the circulation intensity of specific subjects in the collection, relative to expenditure per subject will be investigated (1993: 19). For example, the extent of actual use of a subject collection in comparison to the amount of use expected, is usually relevant to the size of the subject collection. This is a particularly useful ratio, which can be used as an indicator of whether the system of departmental collection development profiles is serving its purpose of selecting materials relevant to current research and academic programmes and courses.

1.8.3. **Data collection procedures**

Due to the fact that the UCT libraries are in a process of undergoing managerial and structural changes, which also involve collection management changes and modifications, the library could be seen to be in a state of flux. Interviews with library staff were carried out to determine whether and in what capacity collection management policies had been adopted, and to assess the extent to which they would affect the investigation.

The investigation into collection usage used the synchronous study approach. This takes current circulation and plots, backwards in time, the publication or accession date of materials borrowed. It looks at current use taking place during a specified period of time. In this thesis, this current use during a specified time is referred to as a "snapshot".

A synchronous study was carried out on an annual basis, during each September UCT vacation period, from 1996-1998. All samples were derived from the main population group (the book collection) by using computerised means, the BOOK/PLUS library software programme, also called BORIS, short for **BOR**rowers' **I**nformation **S**ervices. A pilot study was conducted on 4 September 1996 to determine how many days would be required for a sufficiently large circulation sample to be produced for comparison to the 1992 investigation. Consequently, the UCT library's statistical manager was requested to provide a printout of all the books due back into the library over three to four days during the vacation period.

The present circulation study produced the following sample sizes: In 1996, 1788 books were due back during 23-25 September, and during 30 September to 3 October 1997 and 1998, 1821 and 2474 books respectively were due back into the library. This time period was chosen as most of the students would be on vacation and the sample would be small enough to be manually handled via printouts, which could then be input into a computer database. One problem encountered was that during 1998 the person responsible for running the BOOK/PLUS request forgot to do so, and therefore the 1998 circulation sample was produced during the week following the September vacation, the first week of the fourth term. Students had returned from vacation at this stage, but this did not appear to affect the sample retrieved.

1.8.3.1. Sampling and reducing bias

The sample in the 1992 synchronous study of all books due back into the library at a given time had yielded 1023 records, and a comparable sample was used for the follow-up investigation. The 1996-1998 investigations yielded results from which the following samples were derived: 1024 (1996), 1034 (1997), and 1034 (1998) books. The sample was systematically selected by alternately recording the data on each page from the front, then the back of the printout. The printout received from the library had recorded books due back into the library on the specified dates in the order in which they were borrowed by users. Since most users in academic libraries concentrate on specific subjects, the printouts revealed clusters of subjects as users came into the library to borrow material during the day.

The fact that different types of users doing different subjects borrow materials at different times was also considered. For example, first year students have classes mainly during the first five periods, and may visit the library after their lectures, while postgraduates may be working and only able to visit the library at night, or staff may be able to borrow material at any time of the day. To reduce bias as much as possible, and due to the fact that the printouts consisted of over 7000 records in total and was too large to input into a database and sample randomly, systematic sampling was used as described above. Hernon and McClure advocate that this method is used where "the sampling units are long lists or pages of lists" (1990: 112).

Circulation statistics recorded in the databases included the accession, author, title, DDC number and the category of user (only available during 1997 and 1998, due to reconfiguration of BOOK/PLUS) input into a separate database. This enabled manipulation of the data for the desired statistical reports including the establishment of a benchmark against which future circulation of the book collection could be estimated.

1.8.4. Considerations of reliability and validity of information

Circulation data of book transactions, especially vast analytical reports, can easily be manipulated with computer programmes. Circulation data can provide valuable information about the collection and its use, which might otherwise not be obtainable through the use of questionnaires and interviews or observation of use. At times, what a user *actually* does can directly oppose what is *said* to be done. The advantage of quantitative analysis is that the entire book collection does not have to be examined. If a representative and random sample is drawn from the population sample, it can be used to make inferences about the entire collection of the particular library under scrutiny. In addition, the information obtained will remain objective if the analyst does not project subjective views while data is being analysed and reasons for behaviour of samples is provided.

While Kyrillidou has warned that methods of data collection over time within the same institution can "create problems in cross-sectional comparisons and time-series trends" (1995: 3), the consistency of the collected data has been verified using the analytical component of the Microsoft Excel computer package. The analysis of the samples revealed very little variations and a consistent mean.

Circulation statistics do not reflect the true use of materials, as in-house use of library materials is inevitable and not recorded. The samples were derived from recorded circulation statistics, which could have distorted their results. However, Lancaster points out that "the ratio of in-library use to at-home use tends to remain relatively constant in a particular library unless the characteristics of the library itself, or the community is serves, changes rather drastically" (1982: 24). Faculty restructuring and co-operative teaching programmes are to be phased in, and were initiated in 1998. It was therefore expected that the characteristics of the library and the UCT community would remain fairly constant for the period under consideration, and would not affect the circulation sample.

Difficulties with determining true accession dates of items using the automated library system, due to the changeover to BOOK/PLUS in 1990 were expected and found. The transfer to computerised catalogues and technical services resulted in all books accessioned before 1990 being entered onto the computerised system with an accession date of 1990. Since the accession date was used to determine the age of the book, true accession dates had to be determined. This was achieved by accessing each book that reflected an accession date of 1990, via the on-line catalogue, BORIS. The title of each book was used to access the bibliographic details and the real accession date was verified in this way.

Indicators of cost were especially difficult to determine. Different methods of material classification are used when purchasing items for the library, and when classifying for organisation of the collection. Monograph purchases are subdivided into subject by CESM (Classification of Educational Subject Matter), as prescribed by SAPSE (South African Post-Secondary Education) Information Systems categories, and not by Dewey Decimal Classification (DDC), the shelf organisation scheme used by UCT libraries. The cost-effectiveness analyses had to take this into consideration, and the differences between categories reconciled where possible. It must be noted that this could not be accomplished for all categories, and those affected in this way were omitted from the relevant studies.

The argument could be presented that circulation patterns could be inappropriate for the evaluation of obsolescence patterns, especially when considered over a period of years, since it may very well be many of the same books which are borrowed year after year. However, Lancaster has advocated that circulation patterns can provide valuable *estimates* of obsolete materials, which can facilitate and inform weeding policies.

1.8.5. **Representativeness**

While the samples can be said to be representative of the internal population (the University of Cape Town), it would be wrong to utilise the measures developed for a specific academic setting to other university libraries. Universities concentrate on different subjects, have different foci, and operate in different economic, social and political settings, which all impact on their libraries' collection, its purposes and management. While certain generic performance indicators may be used for general comparative purposes, such as collection size and turnover for collaborative efforts, many performance measures should be performed for internal purposes. Since performance measures are usually performed for specific purposes, such as to measure at what level a service is performing, it is usually not suited to external comparisons. This is especially not advised in the South African situation, where Historically Black Universities (HBUs) and Historically White Universities (HWUs) have a history of disparities.

1.9. EXPOSITION OF CHAPTERS

The following chapter provides an introduction to Higher Education and refers to the South African context. Several committees have been commissioned by the Department of Education in South Africa to investigate the crisis in Higher Education, and cognisance is taken of their work. Chapter three investigates the conceptual framework relating to collection management and performance measures, and sets the background for chapter four, which deals with the issue of analysis of the use, effectiveness and cost-effectiveness of the book collection. Specific performance indicators will also be discussed. Chapter five deals with standards and the creation of a benchmark for circulation activity at the UCT libraries. Chapter six will deal with obsolescence and weeding, and is followed by conclusions and recommendations.

CHAPTER 2

ACADEMIC LIBRARIES AND HIGHER EDUCATION IN CONTEXT

2.1. THE INTERNATIONAL CONTEXT

As part of the larger organisation of tertiary institutions academic libraries focus their services and collections on the programmes and courses offered by their universities, as well as on the needs of the faculties and their student bodies. Tertiary institutions are both producers and consumers of information, which is "created as a part of the research and scholarship of faculty (and others) and is purchased and preserved in libraries to assist with further research and scholarship and, ostensibly, to facilitate teaching" (Budd, 1998: 10). The library's mission should be the provision of support for teaching, research, publication and training foci within the institution. These foci are, however, not static, and are constantly influenced by the broader, national and international external and internal environments. As a component of the larger academic establishments, libraries therefore have to respond to changes that will impact on the library resources and collections, space allocation, provision of and access to the collection, the format and medium of information provision and mechanisms of delivery, and the use of the information.

Rapid global economic, scientific, social and political changes and the challenge to keep up with technological advances and innovation have had an international impact on the ways in which businesses are managed. Companies are restructuring and downsizing their operations and human resources, and implementing performance measures for increased productivity, effectiveness, cost-effectiveness and efficiency.

Higher Education institutions have not been immune to this drive. Higher Education institutions in North America, Australia and the UK are being pressurised by National Education systems to establish performance indicators "for greater accountability and improved attention to quality. ... Academic research libraries also feel the pressures of a shifting from a management system accustomed to increased revenue and growth to systems that demand more evidence of efficiency and effectiveness" (Kyrillidou, 1995: 1-2). For example, the ARL annually publishes *ARL Statistics* data on using performance measures, and also advised the National Association of College and University Business Officers (NACUBO) which developed benchmarks for university domains, including the library (Kyrillidou, 1995: 2). "The NACUBO project collects, synthesizes, and reports hundreds of data elements and computed benchmark ratios covering 40 critical areas of institutional management" (NACUBO, 1998). In 1997 the South Carolina General Assembly approved a law instituting a system in which state contributions to a public college would be based on how well the institution performs, as well as progress towards stated goals (Kyrillidou, 1998).

In the UK the SCONUL produces practical guides to performance indicators for libraries, which are also used to compare performances across institutions. Standards are set against which libraries can measure their performance. At the international level, the International Standard Organisation's ISO 11 620 *International standards on Library performance indicators* has been approved, while the IFLA's development of international guidelines for performance measurement in academic libraries identified seventeen select indicators with an emphasis on international applicability to all types of academic libraries (Kyrillidou, 1998).

2.2. THE SOUTH AFRICAN CONTEXT

2.2.1. Libraries in South Africa

Traditionally, libraries have not had to 'prove their worth' except in the sense of showing a growth in collection size by acquisition, which indicated that their main asset, the collection, was increasing in provision capacity and therefore, ostensibly, in value. Higher Education institutions in South Africa are marked by the prevalent differences between HBUs and HWUs, including in the area of library collections. Uneven resource allocations and development has seriously affected the ability of HBU libraries to fulfil their functions as essential hubs of information access and provision. Traditionally there have been differences in resource allocation between HBUs and HWUs, resulting in uneven collection development, where HBUs have suffered the most. In an environment of decreased funding, and where libraries are being called on to make do or do less with more, it is extremely difficult for HBUs to "catch up" to the status of HWUs, while at the same time purchasing collection materials in order to maintain growth of new literature. Regional co-operation, whereby access to information sources and resources is provided for all students of participating higher education institutions, has become imperative in order to redress historical disparities. Consequently, the *National Commission on Higher Education (NCHE) Working group on Libraries and Information Technology (WGLIT)* has advocated that "national strategic objectives be defined for collection development at least at macro level, if South Africa's academic bookstock is not to remain inequitably distributed between institutions and unevenly balanced between subject areas" (NCHE, 1996: ch.8). They recommend that "collection evaluation indicators must be developed at national level [national information and performance indicator system] to permit the comparative measurement of strengths and weaknesses in collections across institutions, and to encourage co-operation" (NCHE, 1996: ch.8). In a collaborative environment, and especially for HBUs, this will eliminate the need for libraries to attempt to develop 'total' collections that support all users by purchasing and owning the information.

2.2.2. **The university community**

Research and teaching are central to every university's mission. The formal statement of goals and objectives of the UCT library states that its basic goal is "the effective development of library and information services to all sections of the university community to promote the educational, research and service programmes of the University" (University of Cape Town Libraries. Goals and objectives, 1998 (a): 1). Therefore, the university library exists to support and serve the needs of teachers, undergraduate and postgraduate students, subscribers to the library and other affiliated researchers. Three distinct groups of users can be identified: undergraduates, postgraduates, and researchers and teachers, who all have diverse needs which have to be fulfilled. "Postgraduate study with its generally high research component and emphasis on self-study rather than on lecturing and group teaching, may be regarded as qualitatively different from undergraduate study" (de Jager, 1995:34). The latter focuses on learning, and consequently the library's role would be to provide access to materials. The library lends research support to researchers and teaching staff. "Library support for teaching would be manifested in supplying staff members with materials relating to the courses that they have to teach. Support for learning will consist of making such materials more accessible to students, for example in duplicated form in the reserve study collection for shorter loan periods" (de Jager, 1995: 38). The users of the library and the proportion of the library's community that they constitute become significant when one considers collection use, and will be further discussed in chapter 4, in relation to the users of new materials circulating in the collection.

2.2.3. Academic libraries and funding

Higher Education institutions are provided with finance by the South African State. Funding is determined according to specific subsidy formulae, which take amongst other issues, the following into account:

> a. The contribution ratio in respect of each program activity of the institutions to be financed by the State;
> b. The size as well as the increase in size of the institution as reflected in various input parameters (for instance student numbers);
> c. The various expenditure categories (for instance personnel expenditure, supplies and services, etc.) peculiar to the relevant institution's activities, and the annual increases in the costs associated with these expenditures; and
> d. Outputs of institutions that can be associated with the effectiveness with which programmes/activities have been carried out (for instance the pass rates of students or the research outputs of the staff of a university).
>
> (National Commission of Higher Education, 1996)

Academic libraries are generally not required to generate substantial income for themselves. As institutions which support the teaching and research functions of the broad university community, libraries are resource-intensive organisations which generate a small amount of income from charges for some services (such as library fines and interlibrary lending), but receive the bulk of their funding from the university. Once the university has allocated money to the library, the bulk of the budget is allocated to personnel and materials resources. However, rising administration costs (such as salaries, utilities' costs), along with the decrease in real terms of the buying power of South African currency, coupled with increasing technological advances has resulted in libraries being forced to do more with less.

At the UCT, at the time of this investigation, money was allocated to teaching departments based on specific formulae, and paid for by the library's budget. The rapidly decreasing value of the South African currency in the international arena, in addition to UCT library budget cuts, however, had dire consequences for library services, including staffing, financial planning and collection management and development. The NCHE WGLIT reported that "exchange rate fluctuations in South Africa have had a multiplier effect on book prices. It took only 12 years, between 1980 and 1992, for the average prices paid for books by eleven South African universities to increase by ... 559 percent" (1996: ch.11).

Not only have academic library services in South Africa been gravely affected by continual reductions in funding, but also the low Rand-Dollar and Rand-Pound exchange rates have disadvantageously influenced the library's purchasing power. Figure 1 illustrates the Rand/Pound and Rand/Dollar exchange rate fluctuations over an eight-year period, from 1990 to 1997.

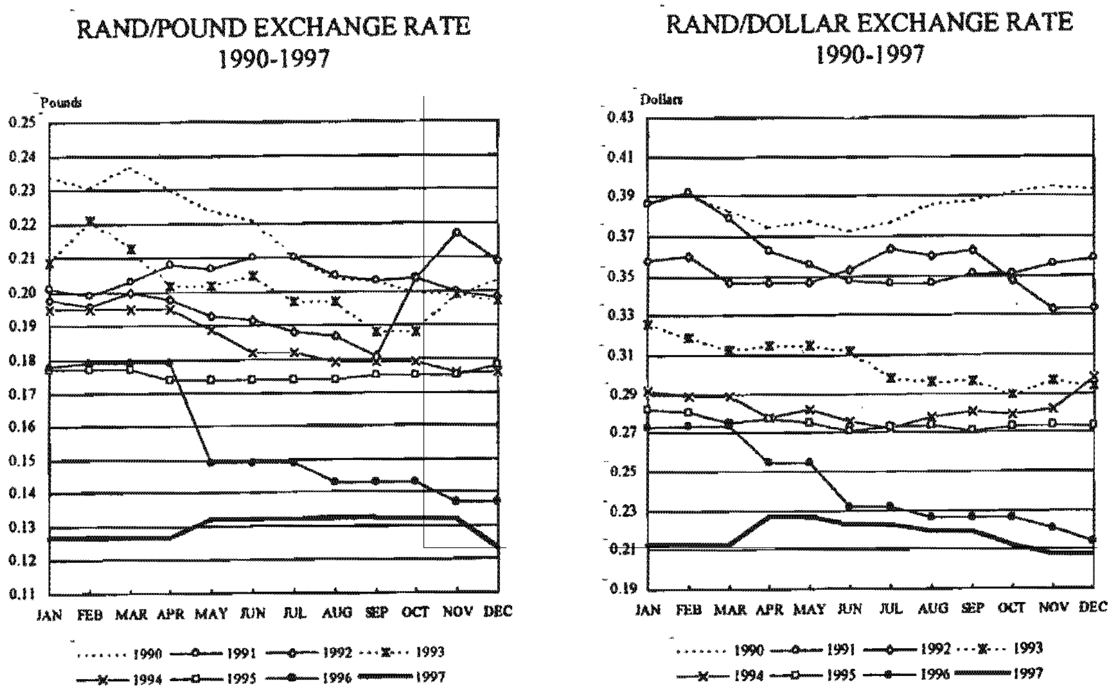


Figure 1: Exchange rate fluctuations 1990 - 1997

(University of Cape Town Libraries, 1998 (c): 4)

The UCT is itself restructuring its organisational and teaching programmes and operations to achieve a more streamlined and economically viable operation in the face of diminished resources. Rationalisation has resulted in a reduction in the number of faculties from ten to six, with the incorporation of four previously separate faculties into one Humanities Faculty: Education, Arts, Music and Social Science and Humanities (University of Cape Town. Vice-chancellor's Report, 1997: 8-9). The UCT's organisational restructuring will in some cases result in an increase in the number of departments, schools and centres occupying faculty space and resources. The university management's vision of interdisciplinary teaching will no doubt lead to interdisciplinary study and research, which will in turn impact on the provision of support by the academic library, in terms of its financial, materials and personnel resources. The impending amalgamation of the electronic library systems of the five tertiary institutions in the Western Cape, namely Cape Technikon, Peninsula Technikon, and the Universities of Cape Town, Stellenbosch and the Western Cape (the Cape Library Co-operative project or CALICO) will also have an effect on these resources (Calico, 1999). None of these changes however, came into effect during the period of the present investigation, so will not impact on any of the findings.

The UCT library, as an institutional organisation, has also responded to this rationalisation. "At the end of 1995, the Library Committee made available a Research Grant for the investigation into performance indicators which would assist in the evaluation of library services at the University of Cape Town" (de Jager, 1995: 1). In addition, Coopers and Lybrand performed an activity analysis of the library's services and systems in 1996, to determine where cost reductions could be achieved by improvements in operating methods. This initiative indicated that the library had become aware of the need for increasing accountability for expenditure, the need to streamline operations, make savings, and to demonstrate their value in measurable ways (Coopers & Lybrand, 1996: 1).

2.3. MANAGING THE COLLECTION: THE EFFECT OF CHANGING INFORMATION MEDIUMS, PROVISION AND DELIVERY

Technology offers a means of expeditious access to information. "Traditional [library] functions and services have had to be modernised in the light of technological applications which make the accessing and processing of information quicker and simpler." (Ward et al., 1995: 5) For example, ready access to study materials via the Internet could cost far less and employ far less effort on the part of the student. The nature of the library's collection will most certainly change with the advent of digital access and resources, and will impact on the traditional methods of evaluating and managing collections. However, new information technologies and electronic access have also had important implications for the support offered by academic libraries, most notably in the area of financial resources.

2.3.1. **Collaboration**

Collaboration with other academic libraries can be a cost-effective means of improving access to information as well as encouraging "the design of services with features that [users] really want and need. ... One way that libraries can reduce costs and improve accountability is to better understand user needs by gathering and analy[s]ing specific data on what is used and why" (Carpenter, 1996: 36).

The CALICO was created in response to low funds, increasing student numbers, decreasing state subsidies and escalating book and journal subscription prices.

> "Individual attempts to generate more external support for funding were met with criticisms to the effect that there was a lack of rationalisation, and that this led to duplication and potentially wasteful spending. The response of the three universities and two technikons in the Western Cape has been to work together to create a single, pooled library system. ... This kind of cooperation [is] based on institutional commitment, producing minimum duplication and maximum savings and access."
>
> (Calico, 1999)

The five tertiary institutions consist of both HBUs and HWUs, and one of the advantages the consortium is that it provides access to information which previously disadvantaged institutions may not have, and may not be able to afford. "CALICO is working towards the attainment of a single Western Cape Library Collection housed in different locations and drawing on the resources of the libraries of the region's five tertiary institutions" (University of Cape Town. Vice-chancellor's Report, 1997: 47). They are poised for amalgamation of their library databases in the form of the Shared Library and Information System (SLIS) project, thereby providing access to the library databases for all their students. "SLIS is a computerised library system which will realise CALICO's vision by making a range of library functions available to the five participating tertiary institutions" (University of Cape Town. Vice-chancellor's Report, 1997: 47). The CALICO project will increase the number of transactions, interlibrary and inter-institutional loans, and will have important implications for determining cost-effectiveness. The question whether the provision of information to external locations will be cost-effective in terms of acquiring, processing, shelving housing the material purchased by the participating libraries will arise. Some material will not be in the traditional print medium, but in electronic form, and library budgets will have to make provision for the computer memory, bandwidth and network capabilities which will be required for effective information provision to users. Overheads such as computers from which to access the information, as well as peripheral equipment such as printers should also be taken into consideration. The move from libraries as owners and purchasers of collections in the form of books, journals and multimedia, to providers of access to information and co-operative resource-sharing consortiums is facilitated by computerisation and networking.

However, "the bulk of formal scholarly communication exists in the pages of print publications. There is likely to be external expansion into ~~electronic media~~, but there is no indication that print publishing will disappear in the very near future" (Budd, 1998: 87). Therefore, expanded use of the collection and accelerated access to information via telecommunications will have implications for collection management methods, encompassing selection, acquisition, cataloguing, preservation, storage and housing of materials, weeding and electronic information, as well as the allocation of funds and resources.

2.4. WHERE ARE WE NOW?

In July 1997, the Centre for Educational Technology and Distance Education of the Department of Education prepared a discussion document promoting models for evaluation of school libraries and proposed that generic standards should be implemented in school libraries in South Africa (1997). It is however recognised that standards and benchmarks cannot be applied 'across the board'. Each school is situated in its own environmental locus, and has its own objectives and goals to meet, which differ between schools and regions. Services delivered would therefore have to be contingent upon and reflect local needs, and it must be noted that it will therefore be difficult to make benchmark comparisons between libraries. For many years, tables of public libraries' statistics with means and averages indicating desired levels of achievement have been published in the UK. While individual circumstances, goals and objectives are recognised, it is difficult for public libraries not to recognise favourable or unfavourable contrasts between libraries when analyses of their services are published as comparative tables. This pitfall is therefore to be avoided if such a procedure of comparative tables is to be implemented in academic libraries in South Africa, especially if evaluation is to be carried out at the CALICO institutions.

2.5. SUMMARY

National policies and political imperatives as well as business trends, which advocate greater efficiency and cost-effectiveness, have impacted on higher education institutions, including libraries and their management. While recommendations have been made for models of performance and service evaluation of both school and academic libraries in South Africa, the historical social and economic disparities between the various sectors of this society have to be taken into consideration if comparisons or assessments on any level and scale are to be initiated. Disparate community needs, management styles and practices also have to be considered. In the UK public libraries have long been collecting analytical statistics which are collectively assessed, but careful attention has been paid to the importance of not comparing dissimilar libraries or statistics. One should therefore be careful to compare 'like with like' in order to create points of reference and benchmarks for ascertaining where good practice exists without distorting the stated goals, objectives and missions of the various libraries.

CHAPTER 3

MANAGING THE LIBRARY COLLECTION

3.1. COLLECTION MANAGEMENT

Collection management and development in libraries is undergoing extensive transformation due to the new information ~~technologies, electronic~~ access and the increasing cost of traditional print information resources. These changes "lead to higher priority being accorded to planned and coordinated collection management and stock revision than used to be the case" (Jenkins and Morley, 1991: xvii). Academic libraries have to satisfy the teaching and research needs of their users, and consequently the services and materials provided must support their research performances and outputs, which are valued as significant measures of academic quality and institutional status. Understanding the strengths and weaknesses of a library's collection assists the library manager to manage the collection effectively, to develop the collection to meet future requirements, and to develop collection policies.

Collection development and management policies involve formal planning of all aspects of library activities and resources, informed by undertaking evaluations of these services. Evaluation of the collection, using collection-centred measures such as size, growth and quality as compared with external standards, and/ or user-centred measurement techniques, such as circulation statistics, which measure the utility of the collection, provide an assessment of how well the collection meets the needs of users (Jenkins and Morley, 1991: xxii).

3.2. COLLECTION DEVELOPMENT POLICIES

Within most university structures there is a member of academic staff in each academic department who is responsible for acting as a liaison between the department and the library. Law relates that this is a controversial issue, and that "one of the longest-standing debates in managing collection development is over their involvement" (1991: 4). It is a commonly-held perception that within the context of collection management and development, which encapsulates issues of weeding and stock relegation, librarians are subject-specialists with excellent knowledge of what information will potentially circulate and what will not, what is currently underused and which portions of their particular fields of speciality are overused.

Resource management, however, involves more than deciding which books to purchase or remove from the collection: it also incorporates budget allocation and therefore policy decisions. Written collection development policies have become necessary as the need for formal planning increases. Law expresses Gorman's views regarding collection policies: "[W]ritten policies [are] contracts between libraries and their users and this useful concept is a way of demonstrating to individuals within an institution precisely what they can expect of the library" (Law, 1991: 6). They are therefore necessary documents that are essential for the goals and objectives stated within the library's planning framework. These in turn should reflect the goals and objectives of the governing body. In South Africa, with the move towards quality in education, a national information policy would inform both universities and their libraries about their own collection management policies.

3.2.1. **Collection development at the UCT libraries**

By the end of 1998 book selection was still primarily an academic responsibility. De Jager's description of book selection procedures at the UCT in 1994 is still relevant for the period of time under investigation:

> "Each department is represented on a Faculty Library Committee (FLC). The FLC allocates the money for library materials to each of its departments and the FLC members are directly responsible for selecting books and sending completed orders to the library acquisitions department. There are no formal book selection policies to ensure accountability beyond instructions to avoid unnecessary duplication of materials. It is assumed that the rationale for this procedure is that subject specialists are most qualified to select materials in their specific areas of expertise."
>
> (1994: 81)

Since the 1980's, and until the time of the investigation, the UCT libraries used "departmental subject profiles" to assist them in the establishment of prices and title ranges of books for collection development purposes. These departmental subject profiles were combined to form a faculty subject profile, used in the allocation of formulae for the generation of funds for the purchase of library materials. These profiles compiled levels of collecting intensity for the various subject disciplines (see Appendix ii for an example of the profile). Although the time period is outside of the scope of this investigation, it should be noted that during 1999 the new university librarian at the UCT implemented new collection development policies, and book selection would eventually become the responsibility of subject specialists in the library. Responsibility for selection would no longer rested chiefly with departmental representatives.

> "For library staff involved in collection development and stock revision, an agreed policy helps to set quality standards for the inclusion and exclusion of materials and to minimi[s]e personal bias while improving consistency in selection and revision practice. [A] policy document can promote improved communication between the library, its users and institutional administrators: librarians gain a better understanding of courses and research, and therefore of the materials they should be acquiring; academic staff are made aware of the library's collecting plans and the constraints under which the library operates."
>
> (Jenkins and Morley, 1991: xxiii)

Policy documents provide a means of establishing rationale for funding or non-funding of departments, budget allocations, and the setting of priorities. Library services and resources should therefore be evaluated regularly, in order to determine how well and at what level they are operating. The advantage of having a librarian who is a subject specialist as the book selector, is that current and future costs can be calculated and contained if necessary. In addition, this will prevent the development of collections for particular researchers, and will safeguard the development of a balanced and effectively used teaching and research collection.

3.3. <u>THE EVALUATION OF LIBRARY SERVICES AND RESOURCES</u>

A library and information service delivers services and resources to its clients. In order to deliver the best value and best service while maintaining cost-effectiveness, efficiency and appropriate services and resources, the ways in which the resources and the services are delivered and maintained have to be continuously monitored. In this way it will be possible to measure the extent to which services and resources are integrated into the management process. The results of evaluation or assessment exercises are used as a management tool, and may be used for the following:

- to assist in the setting of goals, objectives and priorities
- to inform the decision-making process and the setting of priorities
- to measure the effectiveness of outputs such as services
- to relate activities to needs and demands
- to assess efficiency, effectiveness and cost-effectiveness
- to provide explanations and direction for courses of action.

(Abbott, 1994:1)

- "to establish a type of 'benchmark' to show at what level of performance the service is now operating. If subsequent changes are made to the services, the effects can then be measured against the benchmark previously established."

(Lancaster, 1993: 9)

- to allow for comparability both across time and between institutions
- the identification of problem areas

Hernon and McClure define evaluation as "the process of identifying and collecting data about specific services or activities, establishing criteria by which their success can be assessed, and determining both the quality of the service or activity and the degree to which the service or activity accomplishes stated goals and objectives" (1990: 1). Evaluation should be performed on an ongoing basis. Changes in both the external and internal environments, including budgetary constraints or changing student demographics, affect library services and resources, and the library as an organisation is obliged to respond to changing conditions.

Lancaster and McCutcheon refer to this as performance measurement on a macro or micro-level (1978: 13). Macroevaluation is simply concerned with evaluation of a particular activity, service or system, such as studying the percentage of document delivery success of the interlibrary loans section of a library. It tells us how we are performing *now* and provides a benchmark against which future changes in the system or service can be measured, but it tells us nothing about why it is operating at a particular level, or how it can be improved. For this purpose, micro-evaluation is needed, or evaluation at a diagnostic level: why is the service performing as it does, and how can it be improved, if needed? Interpretative analysis of the figures obtained from quantitative procedures are used to make reasonable decisions about what needs to be done to raise the levels of performance.

3.4. THE EVALUATION OF LIBRARY COLLECTIONS

Evaluation forms part of the collection development policies of the library. One of the most important purposes of evaluating the collection is to find out whether the library is achieving its stated objectives and satisfying user needs. In addition, accountability to funders or the library's parent institution has gained considerable importance in libraries that were traditionally regarded as not-for-profit support organisations. Increasingly, library managers have to justify not only the means of deciding what items to purchase to add to its collection, but also making the purchase itself. Measurement of the performance of the library's most important asset, the collection, can assist in the lobbying of support for increased resources, especially in today's economy of decreasing currency worth and competition for resources.

One objective for an analysis of collection use is "to identify strengths and weaknesses from previous patterns of use, thus leading to modifications in collection development policies in order to increase the relevance of the collection to the needs of the users. Another possible objective is to identify little used items so that they can be relegated to less accessible (and less costly) storage areas, or even discarded completely" (Lancaster, 1993: 53). Baker and Lancaster have however identified the main reason why libraries have relied increasingly on use: "mistakes in collection development are costly. Librarians may spend large sums of money buying, processing, and storing items that will never be used" (1991: 80).

Collection management and development are informed by measuring the performance of the library collection. Carbone has succinctly summarised the role of performance measurement in libraries: "The term 'performance' contains two suppositions: that of effectiveness of the service provided by the library and that of efficiency in using the resources. Good performance achieves a result that meets the objectives at the lowest possible cost. It is a balance between quality and economy" (1995: 274). This is achieved by using performance indicators to qualify and quantify outputs in terms of their effectiveness, efficiency and value for money.

3.5. PERFORMANCE INDICATORS AND THE RELEVANCE OF STANDARDS

A "performance indicator is a quantitative expression of the use or value of an aspect of library service. ... [T]he term 'performance measurement' is used to describe the activity of using performance indicators" (Abbott, 1994: 8). Performance indicators are not statistics. Traditionally, libraries, including the UCT libraries, have published input statistics that reveal statistics such as the library's financial budget, the number of books purchased or the budget allocation for journals. This system resource model, traditionally used by many academic library managers, assesses an organisation's ability to secure resources, "in the belief that counting inputs indicates library effectiveness" (Cullen and Calvert, 1995: 439). Libraries often produce statistical reports that describe output statistics such as the number of books catalogued and the number of introductory library seminars conducted, but this does not provide an analysis of library performance. Neither does it allow "users and public authorities ... to assess the value and usefulness of the financial investment in libraries" (Carbone, 1995: 274). Performance indicators are derived from statistics to form ratios, and usually involve mathematical calculations and analysis. They are not merely descriptions of data collected, but should informatively quantify performance by relating stated or written goals and objectives to what is actually achieved.

Abbott's description of the role of performance indicators in the planning cycle argues that "to derive the maximum benefit from the development of performance indicators they should be firmly rooted within a strategic management and planning framework" (1994: 10). The planning cycle illustrated in figure 2 shows that evaluation feeds into the management decision-making processes, and that re-evaluation of services and resources makes this a continual process using performance indicators, and not a once-off activity. "Performance indicators are both informed by and inform the strategic objectives" of libraries (Abbott, 1994: 13).

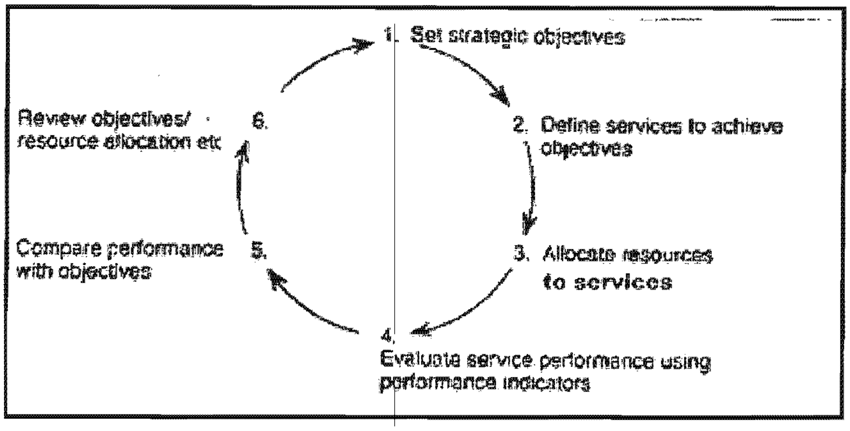


Figure 2: Performance indicators in the planning cycle

(Abbott, 1994: 10)

3.5.1. Inputs, Outputs and Outcomes

The library exists to produce certain outcomes as determined by both its own and its parent institution's goals and objectives. A library's services and processes can be conceptualised and evaluated as follows:

INPUTS →	OUTPUTS →	OUTCOMES
Primary inputs = funding Secondary inputs = staffing, information resources bought with funding, storage facilities. Consist of resources that are put into a library's operation.	The direct products of a library's operation, or the activities it carries out. These can be easily quantified, e.g. number of loans, number of enquiries answered.	Refers to the uses made by the consumer of a given output, and the degree of satisfaction felt with that output. Often intangible and not readily apparent.

Table 1: Conceptual model of library services and processes

(Adapted from Abbot, 1994: 16)

Thus a library service can be evaluated in terms of its inputs, outputs and outcomes, and the relationships between them provide performance indicators. Both primary and secondary inputs can easily be measured: for example, how much money has been allocated for each service, how many staff members are employed in the service, and the size of the collection, which are easily quantified. Outputs, while they can be quantified, are generally measured in terms of quality and value, for example, the number of loans per year. Inputs should therefore be evaluated in terms of the purpose they serve in achieving desired outputs. Outcomes are complex and often impossible to measure, because they are influenced by external factors such as changing political, social and economic circumstances beyond the control of the library. State policies may change, or information policies adopted, and even technological developments have an impact on outputs and outcomes achieved. A library might, for example, wish to assess the impact of their collection of material on careers by investigating the instances of their unemployed users who use the collection finding jobs. There are, however, obviously a plethora of variables at play that could contribute to their obtaining employment that could have nothing to do with the library service.

However, relationships do exist between the different elements in the ***inputs* → *outputs* → *outcomes*** model, and they are used to create performance indicators for the assessment of library services and resources.

3.5.2. **Types of indicators**

If planning is cyclical, then library inputs and outputs are not mutually exclusive, and the relationships between them provide indicator types. While various types of indicators exist, service level and operational performance indicators will be concentrated upon, with particular reference to the book collection of the UCT libraries. These include indicators of productivity, market penetration, effectiveness and cost-effectiveness. As the performance of the book collection will be evaluated, the criteria proposed by Orr for the construction of a performance indicator, as described by ~~Carbone,~~ should be upheld:

- Informative content. The information provided shall be of use for selecting programmes and drafting budgets
- Reliability. The indicator must produce the same results when repeatedly employed in the same circumstances, but variations are accepted if they have an identifiable origin, such as seasonal variations.
- Validity. The indicator must measure effectively what it is intended to measure, even if in certain cases it is an indirect measure or an estimate
- Accuracy. The object measured must be represented in a sufficiently precise way.

(Carbone, 1995: 275)

3.5.3. **Standards**

"When applied to libraries, ... standards refer to a set of guidelines or recommended practices, developed by a group of experts, that serve as a model for good library service" (Baker and Lancaster, 1991: 321). Having a standard suggests that a minimum level of performance must be set, in order to ascertain the degree to which goals and objectives have been reached. While *technical standards* such as cataloguing codes, which can be used in any type of library, can apply here, we will concern ourselves with *performance standards*. These are usually developed for libraries of a particular type (such as schools, academic or public libraries), and are "more general statements that are related to the quality or quantity of services offered" (Baker and Lancaster, 1991: 322). Standards are usually developed over a period of time, allowing for the collection of the required data. In addition, performance standards may be set internally by the library (internal standards), or funders may set minimum performance standards for the library in order to meet certain stated levels of service (external standards). In state-funded public libraries in the UK, performance in relation to standards is published in tabular format, comparing the performance of the different libraries. This may be problematic, as libraries are responsive to the needs and demands of the communities they serve, which differ in various communities. For example, interlibrary loans (ILL) may be especially active in some libraries, while in others, the library may have the necessary materials required by users, and may not have to rely on ILL. In essence, standards allow library managers to see at what level the measured service or resource is performing, in relation to past performances or published external standards.

The draft version of the ACRL College libraries section was released in 1999, and the final version will replace the 1995 edition. The draft emphasises that the library collection should be maintained through an effective collection development and resource management policy.

> " The library should provide varied, authoritative, and up-to-date information resources that are consonant with its mission and objectives and the needs of its users. Resources may be provided on-site or from remote storage locations, online or as hard copy, on the main campus or at off-campus locations, according to the needs of the users and the objectives of the library. The college library should provide resources in a variety of formats, including printed text, media, and electronic text or images. Within budgetary restraints, the library should provide quality resources in the most efficient manner possible. Collection currency and vitality should be maintained through judicious weeding".
>
> (ACRL CLS Standards Committee, 1999)

The draft standards document also emphasises that libraries should have a continuing and effective programme to evaluate the collection and resources, "both quantitatively and qualitatively". The maintenance of the collection through a continuing and judicious weeding programme is also advocated (ACRL CLS Standards Committee, 1999).

3.5.4. Standards at the University of Cape Town libraries

At the time of the investigation, no formally adopted standards were being used at the UCT libraries. The standards prescribed for university and college libraries by the International Federation of Library Associations and Institutions (IFLA), the Association of Research Libraries (ARL) and the Association of College and Research Libraries (ACRL) were perceived to be too dissimilar from university libraries in South Africa to be of use in the determination of aspects of collection development (Bruce, Interview: 1999). This perceived divergence is not only observed when international libraries are compared to South Africa (SA). As discussed in chapter 2.2.1, disparities exist within SA itself, between HBUs and HWUs. It would appear that it was very difficult to adopt standards in this context. This could also have been exacerbated by the fact that the onus of responsibility for book selection rested chiefly with academic departments, with some input provided by librarians. It was therefore very difficult to adopt collection management and development standards in the library, especially those associated with collection size and weeding policies (Bruce, Interview: 1999).

Standards such as those recommended by the ARL and ACRL were, however, referred to for financial and budgeting purposes. This reflects the status of university libraries internationally: library funding is decreasing, library managers are increasingly having to do more with less in a situation where, internationally, the cost of books is increasing.

This thesis does not seek to prescribe which standards to use for the attainment of a quality collection that serves the needs of its users adequately and satisfactorily. It is however worth noting that the collection development policies at the UCT libraries were under review at the time of this investigation, and that the implementation of standards is being investigated (Bruce, Interview: 1999). While organisations such as IFLA, and the ACRL seeking to establish generic standards and performance indicators which can be adopted internationally, this does not mean that the UCT libraries has to adopt them. Slote has observed that some libraries such as the Illinois public libraries in the US have created their own standards for collection development purposes (1994: 13). Therefore, the UCT libraries can create their own standards for their collection development and management policies, which could be used as internal standards, and do not have to be published. The following chapter will analyse the collection of the UCT's Main library, including the use patterns of new materials that are added to the collection, and the effectiveness and cost-effectiveness of those items circulating in the collection. The idea of creating internal standards will be further investigated by an attempt to create a benchmark against which future circulation of books in the collection can be measured. It is hoped that the results of these studies could be used as a basis for future developments in the area of collection management.

CHAPTER 4

THE USE-CENTRED APPROACH TO COLLECTION EVALUATION

4.1. USE AS A BASIS FOR EVALUATING LIBRARY COLLECTIONS

While factors such as the size of a library collection and the availability of materials are important determinants of how effectively a library serves its users, "the ultimate test of the quality of a library collection, however, is the extent and mode of its use" (Lancaster, 1977: 178). Maintaining an adequate collection and adding to it to keep up with new publishing is not enough if library managers are to provide value to their users. Books have to be purchased, catalogued and placed on the shelves, they require shelf space, and their upkeep and maintenance cost money and time. The mere acquisition of books is not cost-effective if this is done without supporting investigations into how the book collection is used, and who those users are.

One method of assessing the book collection is to undertake collection evaluation investigations that provide indications of who uses the collection, in which proportions they do so, and which divisions of the collection are most used, particularly in relation to subjects and age of materials. In other words, one has to measure inputs in terms of their usage by the university community, in order to determine their levels of effectiveness and cost-effectiveness.

4.2. PREVIOUS APPROACHES TO COLLECTION EVALUATION

4.2.1. The University of Chicago library studies

Fussler and Simon's (1969) investigations and findings derived during their classic study at the University of Chicago library, and most particularly their determination that one could accurately predict how often groups of books with defined characteristics were likely to be used in a research library, will inform the theoretical framework of the present study. They tried to predict the use of materials in the collection under three conditions:

1) When no record of past use was available,
2) when a record of use for five years back was available, and
3) when a record of use for twenty years back was available.

They recommended certain rules that were to be followed under each of these circumstances, based on the groups of books with defined characteristics being investigated. They recommended that records of past use should also be investigated, and that together use analysis and publication date could provide reasonably accurate predictions of collection use. Their primary finding was that an average item's past circulation could accurately predict its future use (141-146).

4.2.2 The University of Pittsburgh Studies

The investigation of Kent et al. into the circulation of new books in the system will provide the theoretical framework for the analysis of the movement of new books. They concluded that "the percentage of new items entering the circulating collection, peaks in the first year and then rapidly declines. In addition, ... the decline is rapidly 50% from one year to the next. At such a rate of decline it does not take long before new contributions are negligible" (1979: 20). The study also verified that there "is considerable built-in inertia associated with large communities" and that "in terms of the entire university environment, ... changes are relatively insignificant: (Baker and Lancaster, 1991: 82).

4.2.3. Approaches to the measurement of collection use

- *The Collection sample* consists of the selection of a random sample of items from the entire collection or selected subject areas, usually through the use of a shelflist, locating the books involved and plotting their circulation history from the earliest use to the present. Fussler and Simon (1969) used this method. The main purpose of this approach is to determine whether the rate of obsolescence of the collection in various subject fields equals the rate at which use declines with the age of the materials (Lancaster, 1993: 53). Due to computer space constraints (the researcher was informed by the library statistician that BOOK/PLUS system was unable to provide detailed circulation statistics for each title in 1996 and 1997), individual titles could not be studied for their circulation history. The following approach was therefore adopted:

- *The Checkout sample* consists of the analysis of all items borrowed during a particular period of time. It is used mostly to study the *subject* distribution of circulation, although it can also yield an *estimate of rate of obsolescence* when publication dates of items borrowed are analysed. Analysis of items due back into the library over a particular time period during a three-year period provided three synchronous studies of accumulated data, which allowed for investigations into subject distribution as well as estimates of obsolescence in relation to accession dates of borrowed items. One disadvantage of the checkout sample is that it cannot render a total computation for book use, as books that are used in the library but not checked out via the system are not included in the circulation data.

4.2.4. Total use studies versus relative use studies

Obviously, some books can be read and browsed in the library without being borrowed, and total use would therefore exceed recorded circulation statistics. Studies conducted at the University of Chicago by Fussler and Simon (1969), by Bommer (1973) and by Domas (1978) come to the conclusion that "the proportional use of parts of the collection was similar whether circulation or in-house use was considered" (Lancaster, 1993: 76). Hindle and Buckland state that "books that circulate little get relatively little in-house use and the higher the circulation the higher the level of in-library use" (1978: 270). The University of Pittsburgh study of circulation and in-house use of books showed that "75-78% of those books and monographs that circulate in-house also have circulated externally. ... [T]his percentage is increasing with time" (Kent et al., 1979: 29). Thus total use of the collection would include in-house use. Previous studies conducted have suggested that in-house use of materials is similar to circulation statistics, and this was assumed for the purpose of this investigation.

While studies such as that conducted by Selth, Koller and Briscoe (1992) at the University of California have found evidence that is contradictory to this view, this thesis will only draw conclusions about the circulating books in the collection.

Relative use, on the other hand, refers to an analysis of use of the collection by subject according to the various subdivisions of the classification scheme used in that library. The Pittsburgh studies involved intense investigations into collection evaluation over a period of 86 months at the Hillman Library of University of Pittsburgh and showed that "in terms of subject distribution, circulation records for only a few days give results remarkably close to those gathered for the whole period of 86 months. This provides some evidence ... that patterns of use of the collection change very slowly" (Lancaster, 1993: 57). Lancaster refers to this phenomenon as "inertia". The changes which occur in a large academic community, where courses and programmes change yearly (and correspondingly reading and reference lists change) and new programmes are established and existing ones discontinued, do not have a significant effect on the overall patterns of need and demand. He concluded that changes in the composition and interests of the population occur very gradually (1993: 51).

4.3. RESEARCH QUESTIONS

4.3.1. Predictions of use

The present study aimed to investigate whether the results observed in the 1992 investigation into the circulation of the book stock were supported by the data accumulated over the period 1996 - 1998, in relation to:

- The circulation patterns of books, particularly those that were newly accessioned,
- The rate of usage of particular subject areas of the book collection, and
- whether age is still an important factor in the usage rate of books at UCT.

(In other words, could the 1992 study reasonably predict what the 1996-1998 circulation patterns would look like, or anticipate the movement of the books?)

4.3.2. Selection and circulation of new materials

The study of Kent et al. at the University of Pittsburgh indicated that the percentage of new items entering the circulation peaks in the first year and then rapidly declines at a rate of fifty percent from year to year (1979: 19-24). Whether this was indicative of the situation at the UCT libraries was to be determined.

Who borrows the books? What effect does this have on collection use? Presently, users are divided into 26 categories of type of borrower, of which the four most important are undergraduate, postgraduate, staff and subscriber. (Appendix iii provides a list of those relevant to the investigation). The study will determine what proportion of the collection, including its new acquisitions, is borrowed by the various borrowers (such as undergraduates and postgraduates), since different types of user are allowed different borrowing periods, and this will affect the circulation intensity of books.

4.3.3. **Measures for evaluating the performance of the book collection**

What measures can be used to determine effectiveness and cost-effectiveness of the book collection? How does the circulation rate of new materials in the Main library compare to the acquisition of new materials, in respect of:

- new materials in circulation in comparison to the total number of new materials purchased for the Main library;
- the number of books available for circulation in comparison to the number of books actually circulating in the Main library;
- the percentage and categories (age and subject) of stock may be regarded as underused or overused. What are the implications of underuse and overuse of stock?

4.4. **METHODOLOGY**

This thesis will concern itself with the evaluation of library resources, specifically the browsing collection of the UCT's book stock in the library. A review of the different approaches to the assessment of collection use will be considered, and one chosen which suits the situation at the UCT library. The use studies conducted in university libraries by Fussler and Simon (1969), as well as Kent et al. (1979), will be used as a theoretical framework within which to conduct an analysis of the circulation patterns of both new and older books in the UCT libraries book collection.

4.4.1. **Research design**

Each year of circulation activity had been recorded into a database in Microsoft Access. In order to compare the movement of books in 1996, 1997 and 1998, a count of the frequency of circulation for each accession date was performed for each database, using Microsoft Access. These reports were imported into a Microsoft Excel spreadsheet (see Appendix iv for a printout of the relevant worksheet). From this the age of each book was entered into another spreadsheet in order to rank the books in order of age and circulation, as illustrated in the example in table 2. The 1992 circulation sample was available as a spreadsheet to the researcher, and it was compared to the pattern of book movement for the period 1996 -1998.

The "age" of a book is defined as its annual aging from its date of accession. For example, in the 1997 data series in Table 2, 51 books accessioned in 1997 are circulating, and are one year old. In the same data series, 93 books accessioned in 1996 are circulating, and are 2 years old. In the 1998 data series, 49 books accessioned in 1998 are circulating, and are one year old. In the same data series, 70 books accessioned in 1997 are circulating, and are 2 years old.

Accession date (years)	Number of books circulating in 1992		Number of books circulating in 1996		Number of books circulating in 1997		Number of books circulating in 1998	
90	78		33		51	→ 8 years old	31	
91	36	→ 2 years old	35		41		34	→ 8 years old
92	16	→ 1 year old	51		57		44	
93			83		72		67	
94			90		69		65	
95			70	→ 2 years old	86		54	
96			70	→ 1 year old	93	→ 2 years old	74	
97					51	→ 1 year old	70	→ 2 years old
98							49	→ 1 year old
Totals	965		1023		1031		1031	

Table 2: Determining the age of books circulating in the collection in order to rank them

The full ranking in order of the ages of books circulating for the period 1996-1998 is available in Appendix v (a). The information was used to compare the overall pattern of movement between 1996-1998, and 1992, to determine which broad subject categories accounted for the most use, and investigate the movement of the newer books in the system, and older book circulation patterns.

4.4.2. <u>Sampling constraints</u>

Subject areas housed in separate branch libraries are not very evident in the Main library, and thus the sample. These include Law, Architecture, Fine and Dramatic Art, Music, Education and Medicine.

Information about who borrowed the books (undergraduate, postgraduate, staff, subscriber) was not available for 1996, as BOOK/PLUS was not configured for this option at this time. Thus only 1997 and 1998 could be compared.

Difficulties were found when attempts were made to analyse collection use by subject, since books are purchased by the library according to CESM categories, but are classified by DDC in the library (see page 35). Therefore, where possible and where subject divisions were obvious, subjects were combined for analytical and comparative purposes, as displayed in table 3[2]. Philosophy and Psychology (DDC 100 class) and Religion (DDC 200 class) were combined. CESM categories do not separate Philosophy and Religion, which consists of the DDC 100 and 200 classes. Psychology forms a separate category in CESM, but it forms part of the DDC 100 class. It was therefore not possible to obtain accurate figures for purchases in each separate subject area, and they were amalgamated for analytical purposes.

[2] This information was obtained in spreadsheet format from Robin Gherasim of UCT Libraries, who produces their annual statistical report.

CESM CATEGORY NUMBER	CESM SUBJECT	BROAD DDC CATEGORY	PART OF MAIN LIBRARY CIRCULATION? (Y/N) [YES/ NO]
01	Agriculture	Not purchased by library	N
02	Architecture and Planning	700	N
03	Arts-Visual and Performing	700	Y
04	Business Science and Commerce	600	Y
05	Communication	300	N
06	Computer Science	600	Y
07	Education	300	N
08	Engineering and Technology	600	Y
09	Health care and Sciences	600	N
10	Home Economics	Not purchased by library	N
11	Industrial Arts	Not purchased by library	N
12	Language and Literature	800	Y
13	Law	400	N
14	Libraries and Museums	000	N
15	Life and Physical Sciences	500	Y
16	Mathematical Sciences	500	Y
17	Military Sciences	Not purchased by library	N
18	Philosophy and Religion	100 + 200	Y
19	Physical Education	Not purchased by library	N
20	Psychology	100	Y
21	Public Administration	300	Y
22	Social Sciences	300	Y
23	General	000	Y

Table 3: Reconciliation of CESM and DDC categories

The following categories could be reconciled into the subjects housed in the Main library on the open shelves:

DDC CATEGORIES	CESM CATEGORIES
Philosophy and Psychology, with the inclusion of Religion (DDC 100 + 200 class)	• Philosophy and Psychology • Religion
Social Sciences (DDC 300 class)	• Pubic Administration • Social Sciences
Natural Sciences and Mathematics (DDC 500 class)	• Life and Physical Sciences • Mathematical Sciences
Technology and Applied Sciences (DDC 600 class)	• Business Science and Commerce • Computer Science • Engineering and Technology
Literature and Rhetoric (DDC 800 class)	• Language and Literature

Table 4: Composition of final DDC Categories

For each of the samples 1996, 1997 and 1998 the frequency of circulation activity was divided into categories of observed circulation frequency, and is illustrated in table5.

Age distribution (Years)	Category of use derived from the average of 1996-1996	As a percentage of books in circulation			
		1996	1997	1998	Average
1-7 years	Highly used (≥39 circulations)	42.2%	45.5%	41.0%	42.9%
8-32 years	Average use (≤ 38 ≥ 10 circulations)	51.2%	49.3%	53.3%	51.3%
33 years and older	(≤ 9 circulations)	6.5%	5.2%	5.6%	5.8%

Table 5: Distribution of book age for the period 1996-1998 as indicated by use

4.4.3. Statistical analysis of data

The analysis of the relationship between the age of a book and the number of times it is borrowed was performed with the software package Microsoft Excel's add-in, Data Analysis. The statistical tool was used to test whether a relationship existed, and if it did what the strength of this relationship was. The null hypothesis was that there was no relationship between the age of a book and its frequency of circulation. For each of the circulation samples (1996, 1997 and 1998), Data Analysis was used to generate a set of descriptive statistics, which provided details such as the mean, median, t-test score and standard deviation. These details could be used to show whether a linear relationship existed (for the range in the samples of each year) between the age of a book and the number of times it circulated.

4.4.4. Comparing the 1996, 1997 and 1998 data

The three-year data was used to create a scatter diagram, which plotted the points of each year's circulation frequency scores in relation to the age of a book on a graph, and demonstrated whether or not a straight-line model fitted the data reasonably well. Then Data Analysis was used to draw a straight line that provided the best possible fit, called a fitted line or regression line. Regression analysis determines whether a linear relationship exists between the age of a book and the number of times it circulates, and assesses the strength of the linear relationship, denoted R^2. The percentage represented by R^2 represents the percentage of explained variations, while the rest is unexplained. Regression Analysis allows for the inclusion of the randomness that is part of the real-life model (such as variations in the number of books purchased or catalogued over time) in the model. The higher the value of R^2, the better the model fits the data.

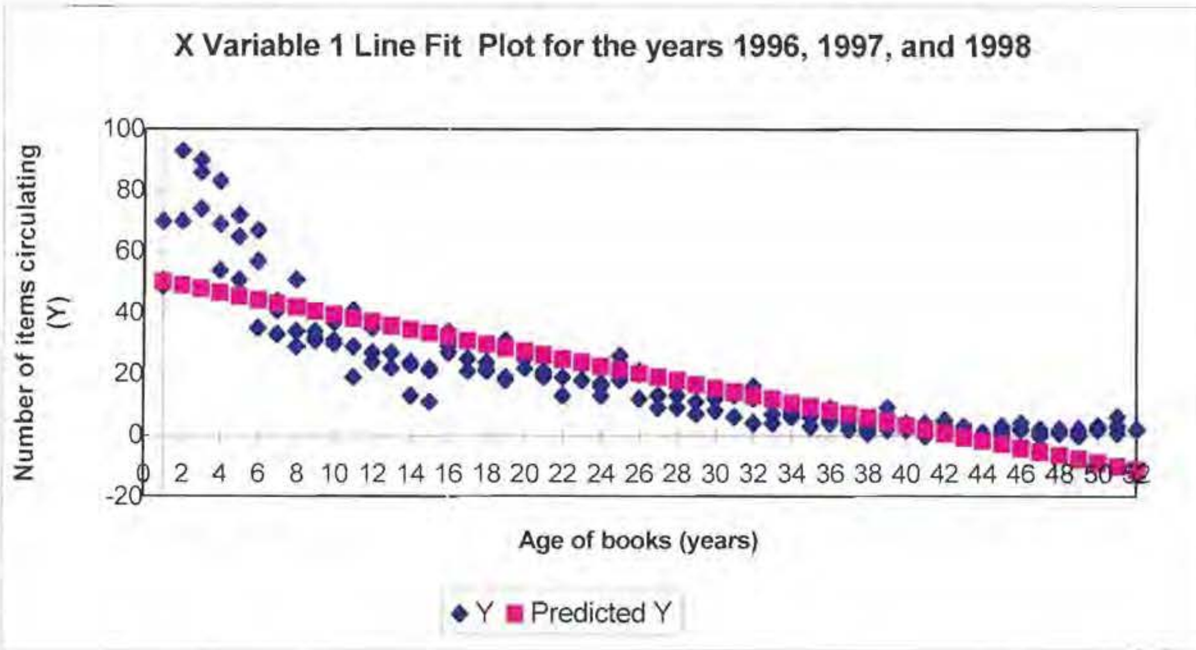


Figure 3: Scatter diagram with regression line of samples for the periods 1996, 1997 and 1998

4.4.5. <u>Assessing the model</u>

In assessing the regression behaviour it is important to establish with a level of significance that linearity does exist. The level of confidence chosen was 95%. The data sets were tested for normal distribution, and the t-test was performed to determine the strength of the linear model represented by the fitted line.

4.4.5.1. Normal distribution

A normal probability distribution produces a bell curve that represents a distribution that is roughly the shape of many empirical (i.e. real world) distributions, like height or weight. The normal curve indicates that most individual cases are grouped around the mean (which is the top of the curve) and as scores get further from the mean (left or right) their occurrence becomes more rare. The bell curve estimates the margin of error in the sample of the population (how far the sample is likely to be "off" from the entire population).

In order to determine whether the circulation "benchmark" established by the 1992 study could have predicted the 1996-1998 circulation rate of activity, a histogram was created, to plot the movement of books in relation to their age for the time period 1996-1998, where the bases of the rectangles correspond to series intervals created (grouped ages of books), and the height of each rectangle equals the number of observations in that series. The shape of the histogram provides information about what kind of distribution exists.

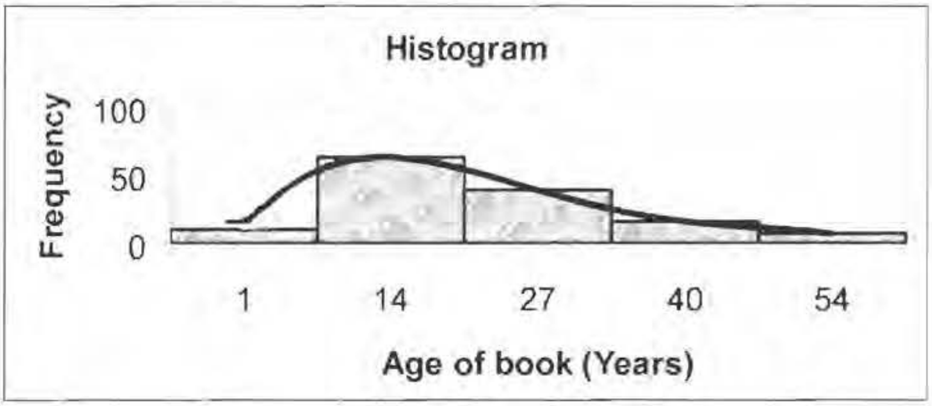


Figure 4: Positively skewed histogram of book distribution in relation to age

The distribution curve for the histogram in figure 4 is positively skewed, which indicates that there is large number of low or small points on the histogram. The large number of books aged 8-52 years that are still circulating in the book collection accounts for this phenomenon.

4.4.5.2. T-test

To assess the linear model to see how well it fits the data, the t-test of the slope was performed using the descriptive statistics derived with Data Analysis. If the fit is poor, the linear model should be discarded. The t-test uses the equation

$$t = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}}$$

If a two sided t-test is performed, using a significance level of 5% (95% confidence), then the value of the test statistic calculated is -20.086 with a p-value of 0 as indicated by the summary output or Data Description in table 6. The rejection region would be ±1.984, as illustrated in figure 5.

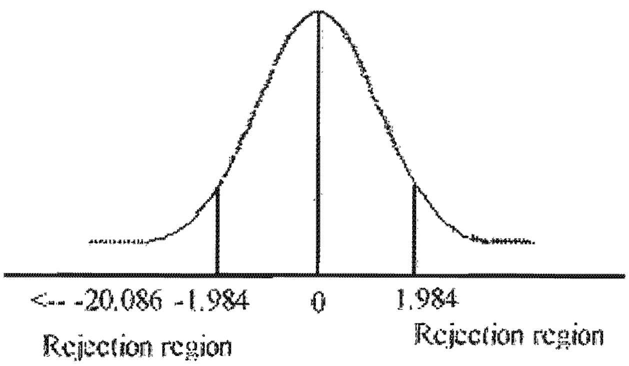


Figure 5: Sampling distribution of the t-statistic

This information indicates very strongly that there is a linear relationship between a book with an age range between 1 and 52 years and its circulation for the range of the data set, but as there are no observations outside this range, we do not know how the variables are related. Beyond the range no inferences can be made without extending the sample set, to obtain a larger sample.

4.4.5.3. Identification of outliers

An outlier is an observation that is unusually small or large, or lies on the outskirts of the scatter diagram. This could mean:

1. There was an error in recording the value
2. The point should not have been included in the sample
3. The observation was simply unusually large or small and was recorded properly, and it is therefore judged to be valid.

One book with an accession date of 1932 was entered into the database in 1996. It was however identified as an outlier that should not have been included in the sample. The unique identifying number of the book, available as part of the printout received from the UCT libraries, used 1932 as its first 4 digits was used instead of the accession date. Consequent investigation into the true date found that the accession number was not available, as it had not been recorded. This outlier was omitted from subsequent analysis.

4.4.6. **Discussion of statistical results**

The Data Description outlined in table 6 describes the summary output for the regression line that was plotted in figure 3. This line was used to whether a linear relationship exists between the age of a book and the number of times it circulates, and assesses the strength of the linear relationship, denoted R^2.

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.852263165
R Square	0.726352502
Adjusted R Square	0.724552189
Standard Error	11.0478728
Observations	154

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	49244.40266	49244.40266	403.4591257	1.27417E-44
Residual	152	18552.435	122.0554934		
Total	153	67796.83766			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	51.6090861	1.806627684	28.56653119	5.48105E-63	48.0397402	55.178432	48.0397402	55.178432
Age	-1.20664994	0.060073305	-20.08629198	1.27417E-44	-1.325336489	-1.087963392	-1.325336489	-1.087963392

Table 6: Descriptive statistical output from Data Analysis for figure 3

For the sample data sets obtained from the population sample, which is deemed to be representative of the entire population of books in the Main library, the coefficient "Age" is -1.2, which means that for each year that the book ages, its usage will decrease by an average of 1.2 circulations.

In practical terms, the negative slope indicated by the slope of the regression line in figure 3 is meaningless, although indicated on the graph. Practically, no book can circulate a negative number of times, although it can circulate 0 times. The regression line indicates that the age at which books (in the sample data set) are used 0 times is 42 years. This age range of books represents an average of 2% of the data sample, which can already be marked for weeding purposes, before further analysis occurs into obsolescence and weeding in the library.

The intercept is 51.6 representing the number of books in circulation, and is technically the point where the regression line and the y-axis intercept. This would mean that if the book were completely new (0 years old) it would have an average circulation of 51.6. This however is incorrect because in the sample set there were no books that were 0 years old.

The value of R square (R^2) = 73%, as indicated in table 6, the summary output for the years 1996, 1997 and 1998. This tells us that 73% of the number of circulations is explained by the variation in the age of the books. The remaining 27% would remain unexplained source outliers.

What is important about the value of R^2 is that the closer it gets to 1 the better the fit of the model to the data of the sample set. Note that the regression line (figure 3) slopes. A horizontal line would mean that the value of y is unaffected by the value of x, and that the resultant horizontal straight line would have a slope of zero. The null hypothesis specified that there is no linear relationship between the age of a book and its circulation frequency, which means that the slope is zero. We can therefore reject the null hypothesis, since there is enough evidence to infer that there is a linear relationship between the age of a book and its circulation frequency.

4.5. **RESULTS**

4.5.1. **Predictions of use**

Circulation data provides information about what has occurred in the past, and what is happening in the collection now. Or, as Lancaster advocates, "past use is a good indicator of present use, and therefore, present use may well be a good predictor of future use", ... [and] that one should use circulation data to reveal differences between actual and 'expected' behavior" (1993: 51-58). The 1992 synchronous study should then have predicted, with reasonable accuracy, the 1996-1998 book circulation patterns, providing there were no major changes such as a large decrease in the amount of books circulating, or the curricula taught.

The fitted lines of 1992 and 1996, 1997 and 1998 were compared to investigate whether a similar relationship existed between the age of a book and its frequency of circulation in 1992. A similarity would indicate that the model would have predicted the circulation activity of the latest in samples derived from the population. Figure 6 illustrates this comparison, with the values of R^2, as calculated by Excel, indicated on the graph.

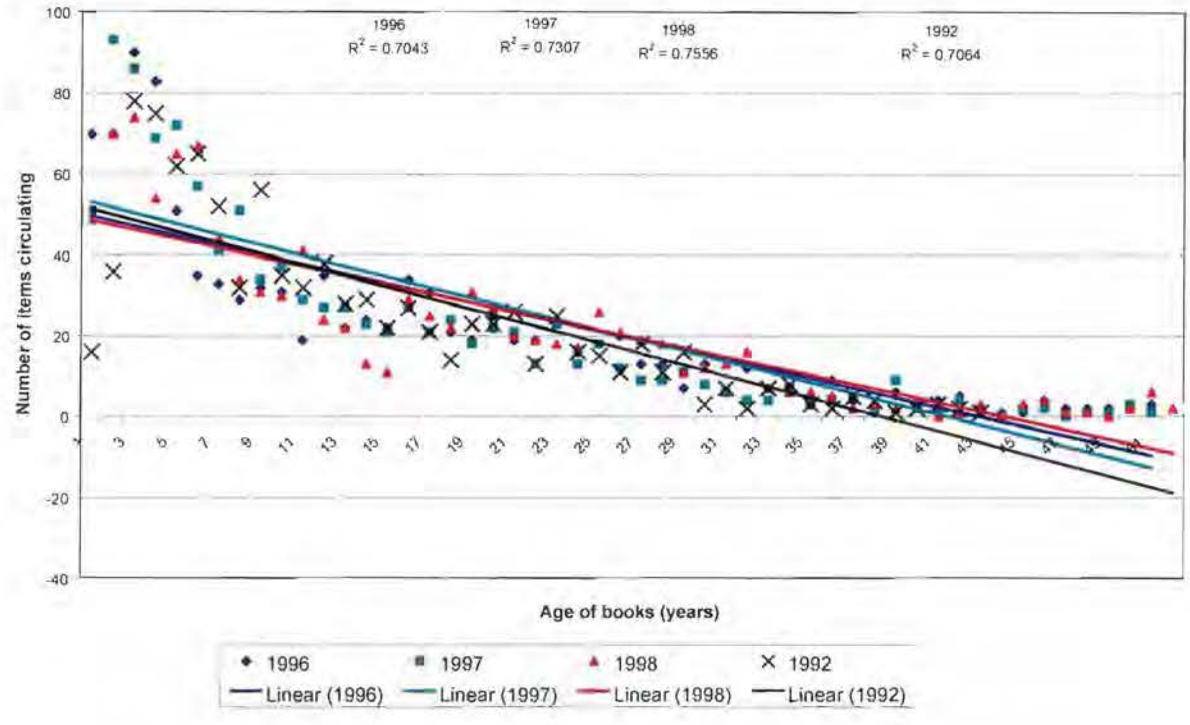


Figure 6: Comparison of 1992, 1996, 1997 and 1998 regression lines

The R^2 values for 1996, 1997 and 1998 were quite high - 0.70, 0.73 and 0.76 respectively, or 70%, 73% and 76% of the variations in the number of circulations of books could be explained. The R^2 in 1992 is 0.71 or 71%. The fitted lines were quite similar for new book movement, but diverged greatly at the bottom of the x-axis. This was probably due to the lack of data for the years between 1993 and 1995, where no data were accumulated. The negative slope was ignored, as a book cannot circulate a negative number of times.

It was observed that books aged 1 -7 years old were the outliers on the scatter diagram, while the other points were clustered quite closely around the fitted lines. The more outliers there are on a graph, the less the value of R^2 will be. Figure 7 illustrates that in 1992 of the use of books aged 1-7 years were more erratic than in 1996, 1997 and 1998, especially in relation to books aged 1-2 years. During the subsequent investigation a marked increase in the use of new books entering the system was demonstrated. The 1992 graph would have provided a useful estimate of future overall circulation activity, but not for the movement of new books in the collection. Figure 7 illustrates that in 1992 the circulation of the newest books, aged 1-2 years, was very slow, in comparison to future years, where the use of new books had increased dramatically. Therefore Kelley's observation that data used for comparative purposes should be systematically collected over time could be corroborated (1991: 30). There was a gap of three years when no data was collected, and this could have provided indications and perhaps warnings that the circulation patterns of new materials entering the collection were changing.

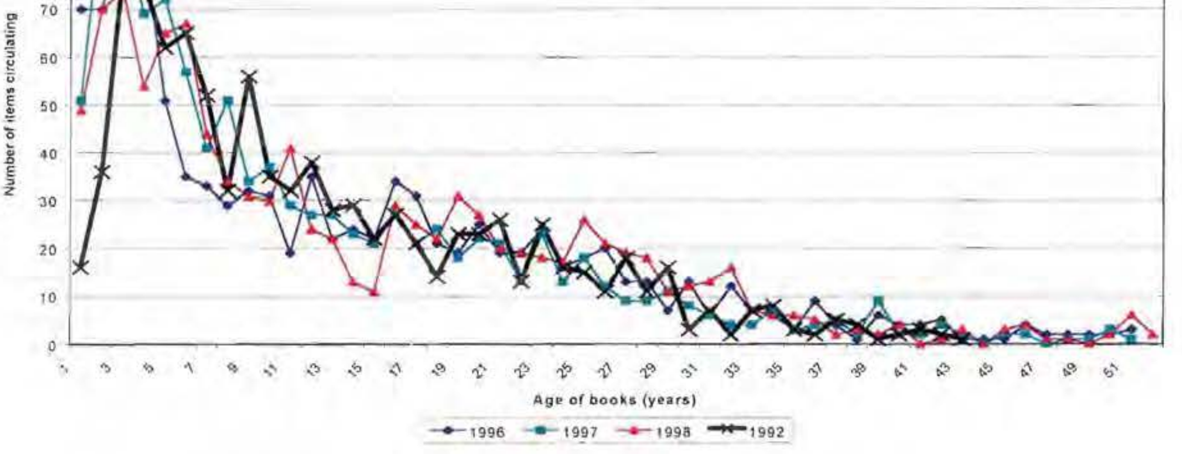


Figure 7: Comparison of 1992, 1996, 1997 and 1998 circulation activity

In general, the overall patterns of book circulation for the years 1996, 1997 and 1998, in comparison to 1992, were very similar. The "benchmark" established by the 1992 synchronous investigation into whether the use of books decreases with age illustrated that most book movement occurred in the range of books aged 2 - 3 years, but that books in the range 6-7 years of age were in general those that circulated most often. The sample derived for the 1996-1998 study confirmed this. Three general ranges of book movement were observed, 1-7 years, 8-32 years, and 33 years and older. In each instance newly accessioned books (1-year old books) were used less often than books aged 2-3 years, and most of the variation in the linear regression line or fitted line graph illustrated in figure 6 can be accounted for by the book circulation in the age range 1-7 years, which is notably higher than books in the other ranges. Books aged 33 years and older comprise an average of 5.8% of the circulating books, and the least movement occurs in this data range. Chapter 6 deals with this section of circulation activity.

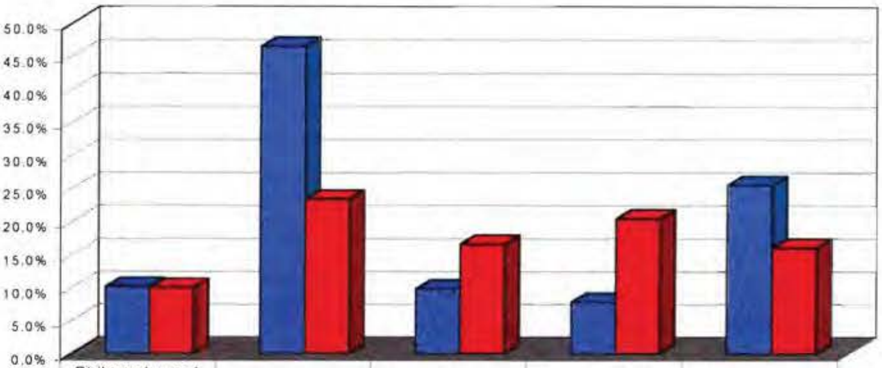
4.5.2. Subject usage

The quality of provision of services and resources can be monitored by using internal comparisons. If, as Orr (1973) advocates, the quality of a library lies in its capability to meet the needs of its users, "then the ratio of supply to demand will be an ideal indicator of the quality of a loan collection" (Wall, 1994: 194).

Investigating usage per subject can provide important internal indicators of whether the book collection is performing in an effective manner. If a subject occupies a certain proportion of the book collection, then it follows that its circulation rates must be proportionate to this. Lower or higher circulation percentages than subject library holdings percentages might be used to indicate underuse or overuse of a subject, and are important performance indicators in decision-making and collection planning. Figure 8 depicts the rate of circulation of books in selected subjects at the UCT libraries for the years 1996, 1997 and 1998, as indicated by the percentage of circulation activity for which each subject accounts in relation to the percentage of the total book population represented by the subject. Each subject will be discussed separately.

In general, the graphs show that some subjects might be regarded as circulating effectively, and others less so. The proportion of the collection that each subject occupies remained constant throughout the three-year period, while the number of books borrowed has varied from year to year, some more than others. Social Sciences and Literature and Rhetoric displayed a marked underuse of books in comparison to the number of books in those subjects that were available for borrowing. The circulation figures in the Social Sciences did, however, appear to be increasing from 1996 to 1998. The Natural Sciences and Mathematics and Technology and Applied Sciences displayed distinct overuse throughout this period of investigation.

1996: Analysis of collection effectiveness

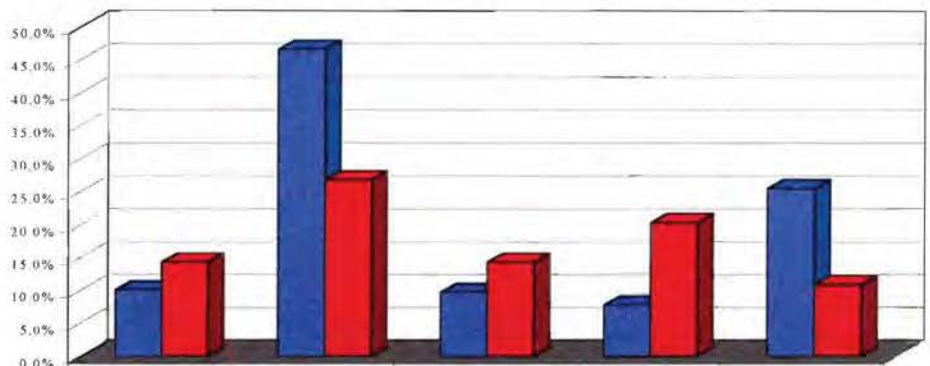


	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.1%	46.6%	9.8%	7.9%	25.6%
% of books circulating	10.0%	23.4%	16.7%	20.5%	16.1%

Subject class

% subject forms of collection % of books circulating

1997: Analysis of collection effectiveness

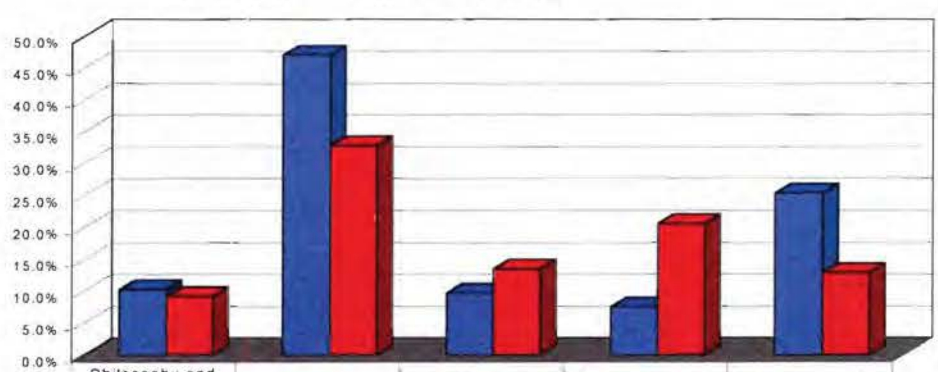


	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.2%	46.6%	9.8%	7.9%	25.6%
% of books circulating	14.4%	26.9%	14.4%	20.4%	11.0%

Subject class

% subject forms of collection % of books circulating

1998: Analysis of collection effectiveness



	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.2%	47.0%	9.7%	7.6%	25.4%
% of books circulating	9.2%	32.9%	13.5%	20.6%	12.9%

Subject class

% subject forms of collection % of books circulating

Figure 8: 1996, 1997 and 1998 comparison of books circulating and books available for circulation per subject

4.5.2.1. <u>Social Sciences</u>

It is most striking that the Social Sciences database represents the largest proportion of the collection, yet, although it represents the subject with the highest percentage of circulation activity, the use of the collection is not proportionate to the percentage of the collection it occupies. One may therefore propose that the Social Science collection is underused. In addition, the Social Science faculty had the second-largest proportion of students registered at the UCT (Commerce had the highest number of registrations). Students registered in the Social Science faculty represented 16.6%, 15.5% and 14.8% of total student enrolments during 1996, 1997 and 1998 respectively (University of Cape Town. Vice-chancellor's Report, 1996: 11; 1997: 18; 1998: 18). The observed decrease in the number of students in the Social Science faculty could account for the decrease in the number of uses the subject received in the Main library. However, there was a notable increase of 6% in the circulation figures from 1996 and 1997 in comparison to 1998: this could indicate that more books were being used. If this was the case then the effectiveness of this subject appeared to be increasing. Books in this subject were not circulating very effectively, although this did appear to be improving.

4.5.2.2. <u>Literature and Rhetoric</u>

This subject area displayed the same pattern of effectiveness as Social Science. The percentage of books circulating in the collection was not proportionate to the percentage of books this subject occupied in the Main library book collection, and this subject area may also be regarded as underused. In fact, since 1996, the use of books in this subject had decreased from 16.1% to 12.9%, while the proportion of the total Linear stock it occupied had remained relatively constant at 25%. Books in the subject area Literature and Rhetoric were not circulating effectively. The number of student registrations in the Arts faculty comprised 8.2%, 8.5% and 8% of the UCT's total enrolment in 1996, 1997 and 1998 respectively - the fifth-lowest figure in comparison to other faculties in each year respectively (University of Cape Town. Vice-chancellor's Report, 1996: 11; 1997: 18; 1998: 18). The student numbers are therefore relatively low, and this could explain the low circulation rates in this subject.

4.5.2.3. Philosophy and Psychology, including Religion

These subjects were circulating effectively in 1996, as the percentage of items in the collection and the percentage of uses were the same. In 1997 there appears to have been a demand for books that resulted in slight overuse of the subject as the percentage of use now exceeded the percentage of items in the collection by 4.2%. In 1998 the subject was not performing quite as effectively, as the percentage of the collection it occupied was 1% more than the percentage circulating. The data was too variable to draw any conclusions about future circulation patterns.

4.5.2.4. Natural Sciences and Mathematics and Technological and Applied Science

Books in these two broad subjects were circulating very heavily. The proportions indicated in figure 8 for each of the years under discussion demonstrate that the subjects were heavily overused as the percentage of books circulating far exceeds the percentage of items in the collection. Books in the Natural Sciences and Mathematics were not, however, in as heavy demand as books in the Technological and Applied Sciences. The circulation percentage was on average 1.4 times higher than the percentage of books circulating in the collection. However, the Technological and Applied Sciences displayed an even higher figure of overuse and demand. The percentage of books circulating consistently outweighed the percentage of books in the collection by an average of 2.6 times. This could be accounted for by the fact that Commerce formed part of this subject, and the Commerce Faculty at the UCT had the highest number of student enrolments, i.e. 22.1%, 22.9% and 24.6% during 1996, 1997 and 1998 respectively (University of Cape Town. Vice-chancellor's Report, 1996: 11; 1997: 18; 1998: 18).

4.5.3. **Implications of overuse and underuse of the collection**

- A failure to meet user needs
- Overuse indicates that the collection lacks the strength in the particular area concerned to meet the current volume and variety of user demands and needs. "The more overused a class, the lower the probability that any particular book will be on the shelf when looked for by a user" (Baker and Lancaster, 1991: 94).
- The more overused a class, the less valuable it will be to a user, due to shelf bias, where the user's ability to find books that are valuable and useful decreases as the selection of books available decreases over time

- "An underused class is one whose contents seem to exceed present user needs" (Baker and Lancaster, 1991: 94).
- Underused classes might reflect that the selection of books are not of much interest or use to the community. It may reflect that the collection selection is bad, or that user needs have changed over time. It may also indicate that the books available are too old to meet user needs or desires, and the collection should be weeded and new books added or made visible.

(Baker and Lancaster, 1991: 94)

Relative use data can also provide information about collection use over time, including whether the use of specific classes is increasing or decreasing over time, in order to inform collection development and policy decisions. It must however be noted that using the DDC broad classes on their own is not enough to inform decision-making. The classes consist of narrower subject categories, where variations in overuse or underuse can affect circulation results. Jenkins and Morley emphasise that there might be a problem where it is assumed that the entire collection is to be treated uniformly. "It should be clear that different criteria must be used for different parts of the collections" (Jenkins and Morley, 1991: 12-13).

4.5.4. **The circulation of new materials**

An investigation into the type of user who borrows library materials can provide valuable information about levels of demand and how well these are being met, which can be used in library planning and decision-making. Figure 9 illustrates the circulation levels for the different categories of user in the Main library. There are currently 26 user categories, but only the 4 categories where most circulation activity occurs are displayed on the graph, while the residuals are labeled "other" (see Appendix iii).

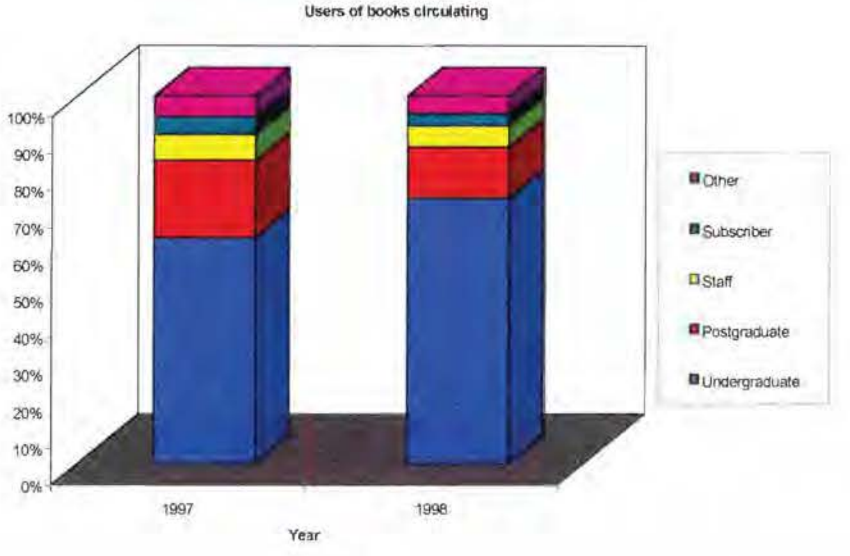


Figure 9: Users of books circulating in the Main library during 1997 and 1998

Undergraduates account for the majority of circulation activity, which concurs with and reinforces de Jager's observation that the Main library was used mainly for studying and teaching purposes (1995: 216). She also observed that the library was not used primarily for research purposes, and the circulation figures for postgraduate use of books in 1997 and 1998, 21% and 14% respectively, as well as the staff circulation figures for 1997 and 1998, 7% and 6% respectively, support her conclusion.

If a library were used mainly for research purposes, the majority of the users of materials would be postgraduates and staff. For teaching and research purposes, these users require access to the latest, up-to-date information, and one would expect to see higher circulation activity than was demonstrated during the years under investigation. This phenomenon was investigated further by examining the circulation rates of new materials entering the library book collection, to determine who borrows the books, and in what proportions they do so.

A comparison of the circulation of new books in 1996, 1997, 1998 and the number of new volumes added to the stock of the Main library revealed that very few of the books purchased during each year actually circulated in that year: 0.99% in 1996, 0.83% in 1997 and 0.73% in 1998, as illustrated in figure 10. This was also found in 1992 and would seem to suggest that the newest books were consistently not in high demand.

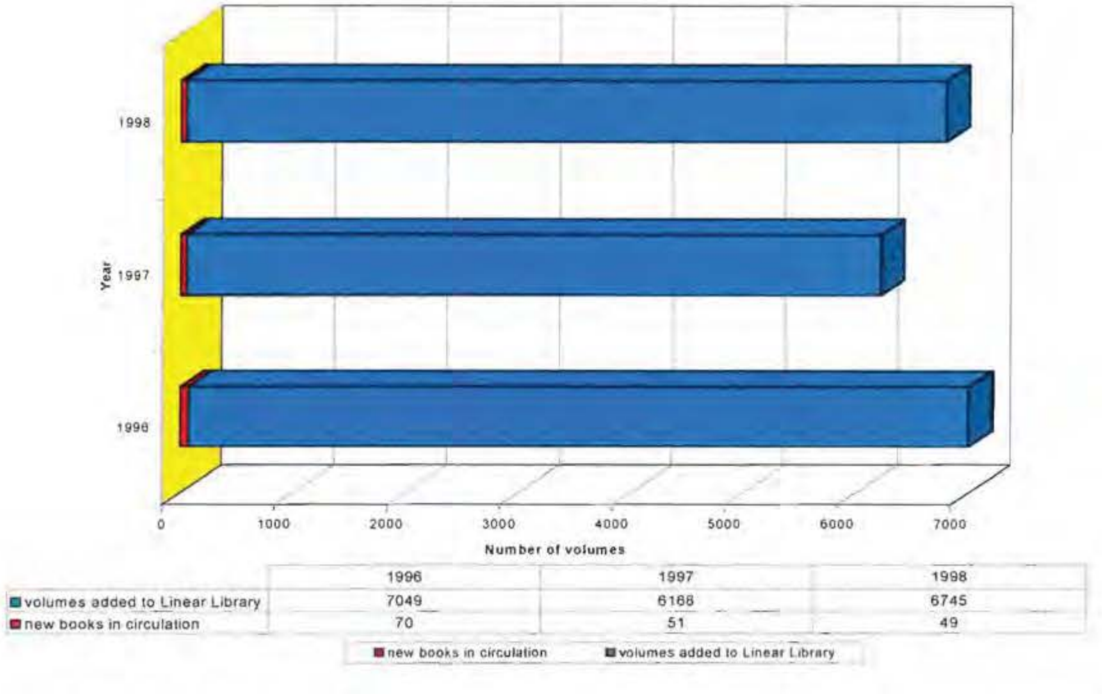


Figure 10: Use of books aged 1 year in comparison to new books added to the Main library stock

Different user types at the UCT libraries are granted different loan periods, which could impact on the use of new materials in the collection. These periods are as follows:

USER CATEGORY	LENGTH OF TIME A BOOK MAY BE BORROWED
Undergraduate	1 week The loan period may be extended 3 times at 1-week intervals, provided no one else has reserved the book.
Postgraduate	35 days The loan period may be extended 3 times at 35-day intervals, provided no one else has reserved the book.
Member of staff	3 months The loan extension period may be extended once, for a further 3 months

Table 7: Borrowing periods for library users

(University of Cape Town. General rules for degrees and student rules, 1998 (a): 71)

The 3-month lending period for staff could account for the low rate of use of new books entering the system, since books which are ordered by departments are made available exclusively to the staff members for their perusal for a period of one week, after which time staff may borrow these new books for a period of 3 months. However, most of the users of 1-year old books are undergraduates: in 1997 61% and in 1998 63% of users were undergraduates, and only 8 % constituted staff members! Books in the collection are used mainly for study purposes, as demonstrated by de Jager's investigation (1995: 215-216).

4.5.4.1. The use of new books in specific subjects

The use of new books was investigated to determine whether the phenomenon of low circulation of one-year old books existed in the specific subject categories as well. The average circulation frequency of the three-year period was calculated for each subject, to obtain the values for their overall performance. The results for each subject confirmed that the circulation activity of new books had the same patterns of movement as was demonstrated in the overall circulation activity (as illustrated in figure 7). New books peaked in their use when they were two or three years old, then circulation gradually decreased over a period of time. The Social Sciences and Technology and Applied Sciences had the heaviest recorded use of new books, and the Social Science, Engineering and Commerce faculties at the UCT appear to have been the heaviest users of the newest books in these areas. Books aged 1-3 years represented, on average, 26% of the total circulating in Social Science, and 20% in Technology and Applied Sciences. Figure 11 illustrates the average circulation patterns for each of the broad subject categories under consideration.

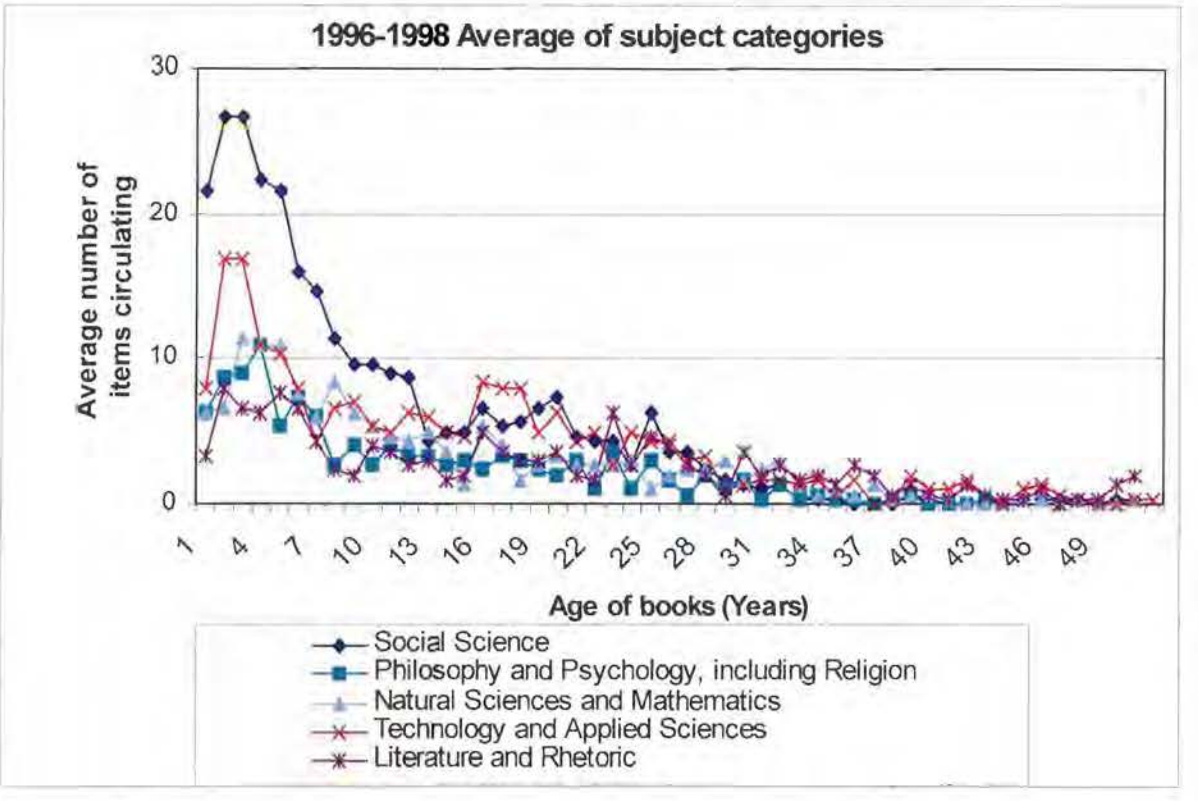


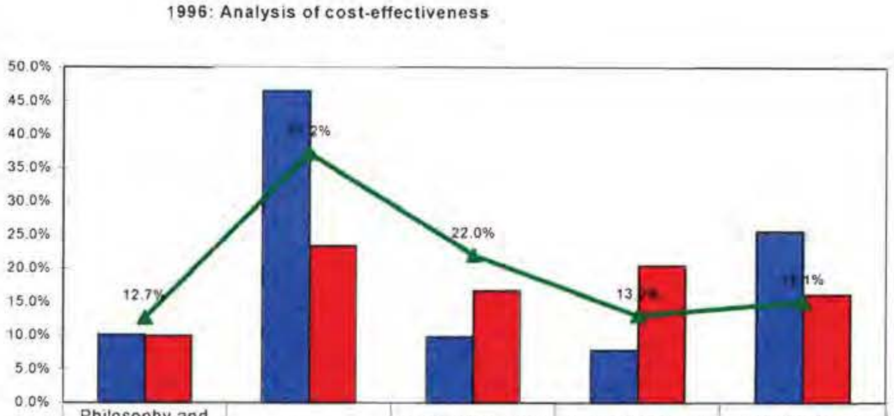
Figure 11: Average uses per subject

It has been shown that new books were not in heavy demand in the Main library. De Jager's investigation concluded that in the Main library "a book circulates a few times, if at all, in the first year or two after entering the system. Gradually over the next few years an item becomes known and might appear on recommended reading lists when demand escalates" (1995: 216). This study of the circulation patterns of new books confirmed this. The circulation of new books in the Main library was a low 0.85%. New books were not in demand, and this concurred with de Jager's observation that the circulation of books appeared to be "supply driven rather than demand driven in a situation where students use[d] recommended rather than the most recent books" (1995: 216).

4.5.5. **Effectiveness and Cost-effectiveness Measures for evaluating the performance of the book collection**

"A cost-effectiveness study looks at return on investment" (Lancaster, 1993: 277). In the library, resources such as time and money are spent on purchasing and preparing books for placement on the shelves, and cost-effectiveness would entail the optimal allocation of these resources so that the returns on investment, which can be outputs or outcomes, do not outweigh the inputs. For example, the input cost for a book in the library includes staff time and salary cost for processing acquisitions orders, cataloguing, and shelving new materials, as well as the money spent on purchasing them. If any book does not circulate subsequent to it being shelved and available for use, then it can be said that the expenditure has been wasted, since it has not met user needs - no one is using it. The analysis of circulation activity in the various broad subjects has demonstrated that some subject fields are experiencing low levels of effectiveness, since their levels of circulation are far below the stock circulation potential. If the input costs are compared to the circulation frequency of books, the cost-effectiveness of the subjects in the collection can be demonstrated.

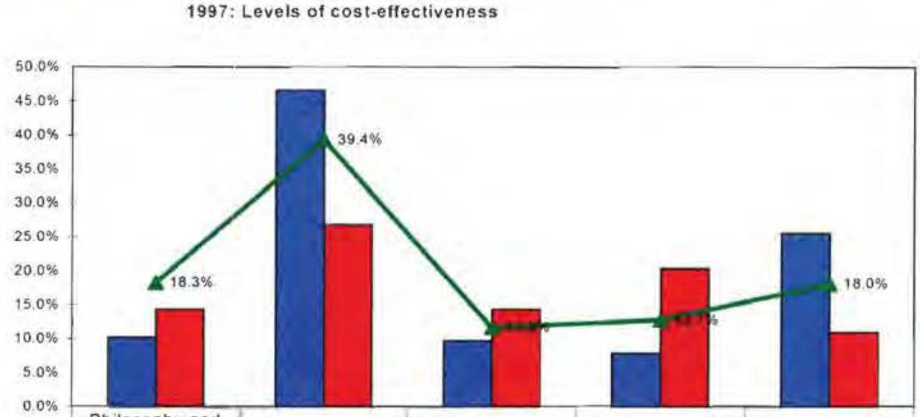
Total input costs (including shelving space costs) were not available to the researcher, and thus only the purchasing costs were used to compare the percentage of the library budget spent on purchasing new *books* per subject with the percentage of *books* circulating in the collection per subject. The results are illustrated in figure 12.



	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.1%	46.6%	9.8%	7.9%	25.6%
% of books circulating	10.0%	23.4%	16.7%	20.5%	16.1%
% of acqusitions expenditure	12.7%	37.2%	22.0%	13.0%	15.1%

Subject class

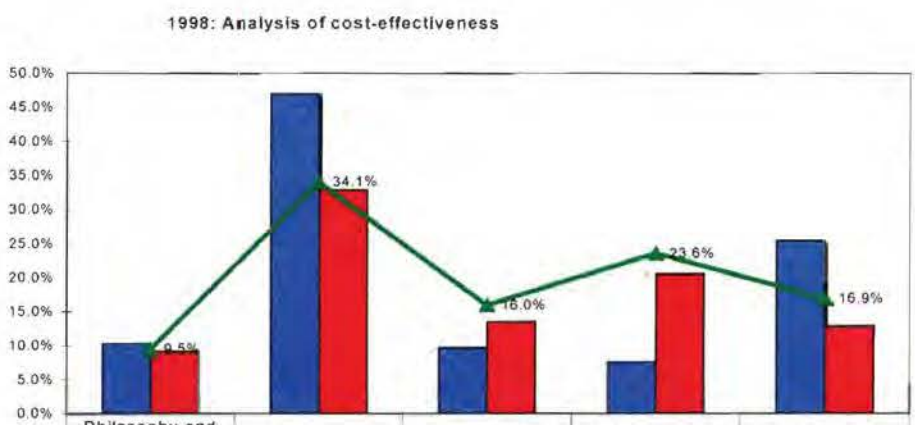
% subject forms of collection % of books circulating % of acqusitions expenditure



	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.2%	46.6%	9.8%	7.9%	25.6%
% of books circulating	14.4%	26.9%	14.4%	20.4%	11.0%
% of acquistions expenditure	18.3%	39.4%	11.6%	12.7%	18.0%

Subject

% subject forms of collection % of books circulating % of acquistions expenditure



	Philosophy and Psychology, including Religion	Social Sciences	Natural Sciences and Mathematics	Technology and Applied Sciences	Literature and Rhetoric
% subject forms of collection	10.2%	47.0%	9.7%	7.6%	25.4%
% of books circulating	9.2%	32.9%	13.5%	20.6%	12.9%
% of acquisitions expenditure	9.5%	34.1%	16.0%	23.6%	16.9%

Subject class

% subject forms of collection % of books circulating % of acquisitions expenditure

Figure 12: Expenditure per subject in relation to books circulating and total subject holdings

The cost-effectiveness of the book collection would be affected if books receiving no use or little use were to be retained in the collection. The graphs in figure 12 demonstrate how much money (excluding staffing costs or the cost of maintaining the materials on the open shelves) was spent, per subject, on purchasing books in the Main library. If one compared the percentage of library book budget spent on each subject per year, and the percentage of materials that circulated in that subject, levels of cost-effectiveness become apparent.

At the time of the investigation, each Faculty received a budget from the UCT libraries based on the formula for book allocations at UCT. The largest percentage (between 34-39%) of the book budget went to the Social Sciences during each year that the study was performed. The book circulation in this subject did not however meet with the percentage of the budget allocated to it. The percentages of books that circulated during 1996, 1997 and 1998 were consistently lower than the budget allocated to this subject. During 1998, Literature and Rhetoric constituted 25.4% of the book collection, yet this subject area only accounted for 12.9% of the books in circulation, and received 16.9% of the budgetary allocation. Books in both the Social Sciences and Literature and Rhetoric do not appear to be circulating very cost-effectively, and indications are that budget allocations should be reviewed. The underuse of books in this subject could be due to incorrect book selection, resulting in ineffective books and low circulation figures.

Books in the Natural Sciences and Mathematics and Technology and Applied Sciences seemed to be heavily overused. Their book stock formed on average

9.8% and 7.8% of the total book collection respectively, and the percentages of books that circulated in these subjects were consistently higher than these figures (see figure 12). Technology and Applied Sciences appeared to be particularly badly off, since the demand for books appeared to be triple the number that was available! Both Natural Sciences and the Technology and Applied Sciences displayed distinct overuse, and it could be argued that demand was so high that it indicated that budget allocations should be reviewed.

Philosophy, Psychology and Religion appear to have reached a stable position, where the percentage of books circulating and the percentage the books formed of the total stock differed by 1% from 1997 to 1998, and the budget allocation fell midway between the two percentages.

The cost-effectiveness analysis showed that even though the amount of money allocated to book purchases for the Social Sciences had decreased from 39.4% in 1997 to 34.1% in 1998, circulation in this subject area had increased. The percentage of books circulating had increased by 6% from 1997 to 1998, while the percentage of books purchased had decreased by 5.3%. It appears that more books were circulating in this subject, and they were doing so in a more cost-effective manner. In 1996 Literature and Rhetoric, displayed cost-effectiveness with the percentage of book circulation exceeding the percentage of acquisitions expenditure. However, this cost-effectiveness appeared to have regressed in 1997 and 1998, with expenditure exceeding book circulation by 7% and 4% respectively. In addition, the average circulation statistics in figure 11 illustrated that the demand for new books in Literature and Rhetoric was the lowest of all the subjects under consideration. New books in this subject constituted an average of only .0.33% of the average number of books circulating during 1996-1998. In comparison, new books in the Social Sciences comprised an average of 0.62% of the average book circulation during the same period.

The Natural Sciences and Mathematics and Applied and Technological Sciences appeared to be consistently heavily overused, and budget allocations seemed to have taken this high demand into account. In the latter subject area, during 1996 and 1997, the percentage of books circulating exceeded the budget allocations by just below 8%. The amount of money allocated for purchases (approximately 13% of the acquisitions budget) did not appear to be adequate to meet user needs. The amount of money allocated in 1998 was increased by 11%, and resulted in the percentage of acquisitions expenditure exceeding the percentage of books circulating by 3%. The percentage of books circulating in the Applied and Technological Sciences as well as the proportion the subject formed of the total book collection remained very constant during the three-year period. It is suggested that this aspect be taken into account when decisions regarding allocations for purchases are made, since it can assist in arriving at a constant budget allocation.

The Natural Sciences and Mathematics maintained a constant proportion of 9.8% of books in the collection during the three-year period. As with Applied and Technological Sciences, demand had exceeded availability during each year, but the percentage of books circulating decreased from 16.7% in 1996 to 14.4% in 1997 to 13.5% in 1998. Circulation and by inference effectiveness appears to be decreasing, while the University of Cape Town's Vice-chancellor's reports show that the number of students registered in the Science faculty has increased during 1996 to 1998. It is difficult to draw any inferences regarding cost-effectiveness, as the budget allocations for Natural Science and Mathematics appeared to be irregular, ranging from 22% of the overall budget in 1996 to 11.6% in 1997 to 16% in 1998. It is recommended that some consistency in budget allocation be attained if cost-effectiveness is to be pragmatically measured.

4.6. CONCLUSIONS AND RECOMMENDATIONS

Statistical analysis into whether there is a relationship between the age of a book and its circulation frequency can determine whether a relationship exists, but it cannot be stated that the age of a book determines the number of uses it will receive, or that there is a causal relationship.

The present investigation did not concur with the observations of Kent et al. at the University of Pittsburgh, that new items entering the circulating collection peaks in the first year and then rapidly declines at a rate of 50% per year. In the Main library, new books are not immediately in heavy demand in the circulating collection – they constituted an average of 1% of circulation in the first year of acquisition in the samples derived for 1996, 1997 and 1998. The rate of usage does not decline rapidly after its first year of circulation as Kent et al. observed. Most circulation activity occurs during the first seven years from the date of accession, with circulation frequency peaking during the second and third years after accession.

In general, the overall patterns of book circulation from year to year are very similar. However, in comparison to 1992, the usage of new books has increased. Usage peaks in the second and third years in all the samples, which indicated that the newest books are not in heavy demand. The longer borrowing period for staff, and the preference given to academic staff for the perusal of new materials after accession, could account for the low circulation of new materials. This has, however, been refuted, since most of the borrowers of new books are undergraduates, reinforcing de Jager's observation that the library was used mainly for study and teaching purposes, and not for research.

The summary output from Data Analysis showed that for every year a book ages, its circulation would decrease by a factor of 1.2. The average circulation frequency for new books entering the system for the period 1996-1998 was 56 uses. If the number of uses a book receives decreases by –1.2 per year, then statistically, the book should circulate for 47 years before it receives no use at all. This is in stark contrast to the observations of Kent et al. that a book's circulation rate peaks in the first year, then rapidly declines at a rate of 50% from one year to the next (1979: 20).

The investigation into the use of books in the broad subject areas of Philosophy and Psychology, including Religion; Social Science; Natural Sciences and Mathematics; Technology and Applied Sciences; and Literature and Rhetoric showed that the proportion of the collection these subjects occupied remained constant from year to year. Although the exact percentages of books circulating in each subject varied, the overall use pattern remained similar for each year under consideration. On average, Social Science accounted for the highest circulation rates (27.7%), Technology and Applied Sciences accounted for the second-highest usage (20.5%), Natural Sciences and Mathematics the third-highest (14.9%), Literature and Rhetoric the second-lowest (13.3%) and Philosophy and Psychology, including Religion had the lowest circulation frequency (11.2%).

The student enrolments in each faculty affect the circulation of books in these subject areas. The Commerce and Engineering faculties have the highest student enrolments, and correspondingly, circulation figures are the highest in the subject Technology and Applied Sciences, which represent these two faculties. This subject and Natural Sciences and Mathematics are circulating effectively, since their outputs (% of circulation) are greater than the percentage they occupy in the collection.

Social Science and Literature and Rhetoric seem not to be circulating effectively. Their circulation figures are not proportionate to the percentage of holdings they represent in the collection. There is evidence of underuse of the books in these subjects, but Social Science has consistently received the greatest proportion of funding for the three years under consideration. It is possible that there are large numbers of older material in these subject collections that are not circulating, and an investigation into the usage of specific titles is recommended to determine whether this is true. Removing obsolete items from the collection can make newer material more visible on the shelves. A weeding exercise at the UCT libraries has been implemented since the 1998 sample was collected, and the synchronous study should be repeated, to determine whether circulation percentages in relation to subject holdings has improved in these subjects during 1999.

Books in the subject area Literature and Rhetoric do not appear to be circulating cost-effectively. Its circulation constituted 12.9% of books circulating, yet 16.9% of the book expenditure budget was allocated to it in 1998. Its cost-effectiveness did not improve during the 3-year period, and it is recommended that purchasing for this subject be reviewed. The low circulation figures could be a result of incorrect selection polices, and this may be corrected in the future when library subject specialists and not only academic staff members perform book selection. Where indications of overuse or underuse could be demonstrated, co-operation between libraries may alleviate the problems of over-demand for books, or books which are underused may be in demand at another university library; moving them to a central storage facility could be a cost-saving measure.

Undergraduates are responsible for the majority of collection usage in 1997 and 1998. The low usage by postgraduates (21% in 1997 and 14% in 1998), and staff (7% in 1997 and 6% in 1998) indicates that the library collection is used mainly for study and teaching, and not for research. This could also account for the low usage of the newest materials, since one would expect high rates of usage of the newest books in a research library. Yet, new books constituted, on average, slightly less than 1% of materials circulating! This concurs with de Jager's observations, and reinforces the conclusion of Kent et al. that patterns of use of the collection change very slowly.

Thus the circulation patterns described here could be used as a model against which future circulation of the collection can be measured.

In summary, the percentage of books in specific subjects circulating in the collection in relation to the percentage of the total collection which the subject occupies can be used as an indicator of effectiveness. If each of the subjects occupy a particular percentage of the library's total collection, then their circulation could be expected to be proportional to that percentage. It was demonstrated that there are subjects that are overused and underused in the book collection, but that the Natural Sciences and Mathematics and the Technological and Applied Sciences are in heavy demand in the library. Literature and Rhetoric appears to be underused, and the proportion of this subject circulating in the collection is decreasing. It was recommended that that an investigation into specific title usage be undertaken in this subject, as there may be a large number of obsolete books in the books collection, which could influence the circulation figures. Removing them from the collection will make newer items more visible, and could increase the circulation figures of new books. If the circulation activity does not improve, it is suggested that the resource allocation formula for the departments that represent this subject should be reviewed.

The following two chapters will examine aspects of collection management: the creation of a benchmark for estimating future use of the book collection, and stock relegation and disposal, or weeding of the books in the Main library collection.

CHAPTER 5

BENCHMARKING FOR QUALITY

5.1. INTRODUCTION

> "Benchmarking provides a means of comparison between processes or activities and is usually used for comparing an organi[s]ation's own standards and capabilities with those of rivals in the same field of business. It can be internal and carried out between similar departments, sections or divisions in order to identify the most efficient way of working and to improve standards throughout the organi[s]ation. Alternatively internal benchmarking can be carried out over time to find out if service is declining, staying the same or improving".
>
> (Brophy and Coulling, 1996: 98)

Benchmarking the levels of circulation activity has important implications for the decision-making process. If decisions for improvement in cost-effectiveness levels of resources such as the book collection are made, an assessment of how the service is performing NOW can provide a guideline by which future activities can be measured. If any changes are made to a service, activity or resource subsequent to benchmarking, the impact thereof can be measured by a comparative assessment. If the changes are not positive or cost-effective, contingency plans can be made - improvements may be made or the service scrapped altogether. Therefore, any modifications based on performance measurement must be accompanied by an assessment of the reaction of services or resources. Benchmarks can serve as vehicles for the self-monitoring of processes or activities by Library and Information Services.

5.2. **BENCHMARKING IN LIBRARIES**

Performance assessment should be accomplished with a specific aim in mind, and the evaluation of the UCT library's browsing collection can provide important indicators for internal benchmarking, which is often "used within large organizations such as multinationals to compare the performance of one division or department against others" (Brophy and Coulling, 1996: 99). Therefore, an overall model or guideline of circulation activity of the browsing collection will be presented, against which future circulation activity of the book collection can be compared. However, Fussler and Simon have advocated that patterns of book movement vary between the different subject disciplines (1969: 45-52). Therefore the performance of the books in subject disciplines will be investigated in order to determine the performance of the different divisions against each other. Thus the benchmarks generated will provide a model of circulation rates for current book activity in the Linear Library, and can provide information about what the expected future activity will look like. If any changes are made to the collection, or library practices, such as increasing the number of books catalogued and made available on the library shelves for use each month, then this achievement should be reflected by an increase in the circulation activity of newer materials. When CALICO is implemented the level of activity should once again be investigated to determine what effect the increased users of information and increased access of UCT's users to external sources of information will have.

5.3. WHY BENCHMARK?

"Benchmarking is a means by which targets, priorities and operations can be established that will lead to improvement or to competitive advantage" (Brophy and Coulling, 1996: 98). It deals with the monitoring of inputs so that the outputs and outcomes derived from these can be measured, and the results of this assessment used for improvements. Because of the changing nature of libraries and the impact of technological advances (such as multimedia CD-ROMs, on-line full text databases and the Internet) on information usage, benchmarking needs to be a continuous activity, for ensuring quality of service provision.

Benchmarking is one method used to ensure or pursue quality control, by using data to aid problem solving and decision-making, and identify areas for improvement. Monitoring of the benchmark, once it has been established, and of service provision in comparison to the benchmark is one way of providing continuous quality control of activities.

5.4. QUALITY MANAGEMENT

Total Quality Management (TQM) is a practice that many businesses have adopted for improving their productivity and performance. TQM is based on the objective of continuous improvements. The three principles of customer focus, process improvement and total involvement are its cornerstones. The support of leaders and managers, continuous education and training, good communication structures and rewards and recognition are other vital components, as well as the identification of key performance indicators which enable the organisation to measure the performance of its service and activities, monitor customer satisfaction, and benchmark, either internally or against what is perceived to be the best in the field (Brophy and Coulling, 1996: 69-70).

5.5. MEASURING QUALITY

Quality of service for resource provision can be measured within and between an organisation's own departments and divisions, as well as in relation to a competitor's activities, in order to identify how quality is being achieved. While comparative measurement provides information on which services are not performing optimally, there must, by definition of measurement, be some guideline, model, benchmark or standard against which the current performance of the service can be measured and compared. Comparisons can occur internally as well as in relation to other institutions. Internal comparisons can provide useful information regarding various divisions, since most variables within the organisation can be controlled. Comparisons with external organisations are difficult since variables and inputs such as money are uncontrolled, and often not all data is included in published reports. In the UK, the Library and Information Statistics Unit at Loughborough University (LISU) publishes annual library statistics which feature trend analysis of UK academic and public libraries, and includes calculated performance indicators and trends. It also provides data on collection usage, book issues and expenditure, thus producing a medium for comparisons between similar libraries. "The published statistics can be used by individual managers for comparison purposes and as a rather crude form of benchmarking" (Brophy and Coulling, 1996: 128).

5.5.1. **Standards and guidelines**

Over the years, the LIS sector has developed many sets of standards, including the publication Measuring quality: international guidelines for performance measurement in academic libraries, published by IFLA in 1996. The guidelines aim to provide methods for assessing library quality and guidelines for improvements to the library, and to assist academic libraries to "apply their resources in a cost-effective way and use new management techniques" (Poll and te Boekhorst, 1996: 15). Amongst others, they also discuss performance indicators to "determine the use of the collection, and, therefore, the quality of the collection" (Poll and te Boekhorst, 1996: 56).

In the UK, the SCONUL has long been involved in the collection of statistics for performance measurement by libraries within higher education institutions, so that comparisons could occur between libraries, at a national level. Brophy and Coulling report that recently, the SCONUL has focussed on the quality of service provision in relation to the university's mission and performance (1996: 154), refocusing the emphasis of quality provision from nationally-set standards of service to the promotion of "autonomous units" rather than "national norms" (1996: 130).

5.6. LIBRARIES AND QUALITY

The majority of works published in the arena of quality management in LIS has concentrated on case studies and the application of quality management to specific libraries, and have been mainly descriptive in their analysis. The evaluation of library services and resources has, in the past, relied heavily on qualitative methods, and subjective user opinions in order to determine levels of quality, and perceived "value" of services. Where quantitative analysis has occurred, the movement to measure library performance by investigating the actual use made of library resources and inputs has been a slow process from theorising about measurement to creating highly mathematical and statistical models to assess collections and their use, to the development of practical evaluative measures, to the development of generic performance indicators that could be universally applied. It is only recently that the realisation that qualitative together with quantitative methods of evaluation are necessary has come to the fore: quantitative assessments provide a context for the qualitative evaluation of inputs and outcomes, thus yielding indicators which pinpoint where discrepancies are occurring. Quantitative assessments answer the question of how well a service is performing, while qualitative measurement reveals why the service is performing as it does.

In 1990 Nancy Van House et al. published Measuring academic library performance: a practical approach, which was widely used in North America, and influenced the IFLA and the ISO in their development of performance indicators for libraries. The manual was designed to help academic and research libraries with the move from performance measurement theory to practical methods of quantifying their services (Van House et al., 1990: 3). The ISO Standards published in the UK were initially intended for the manufacturing and industrial service sectors. "The way in which the standard imposes structure and maintains management control was recognised as the benefit of quality management systems. ... Collection and analysis of performance data is a vital component of the type of quality system derived in ISO 9000 and to many of the tools and techniques associated with Total Quality Management" (Ward et al., 1995: 20). The emergence of the ISO 9000 standard lent credibility to the philosophy that the benefits derived in the industries which the standards were originally designed for would be beneficial in the service industry. Quality assessments could take place by the utilisation of quantitative statistics, and within the context of relating the assessment of inputs and outputs to the attainment of the goals and objectives of the library or its institution, as outlined in their mission statements.

This view was adopted by the University of South African (UNISA) libraries, which reviewed its policy of a focus on a goals-based performance measurement approach in the late 1980's, to refocus on client satisfaction in 1993. "Whilst performance satisfaction measures a specific interaction, service quality evaluates the perceived quality of a generic service and the extent to which a service achieves its goals or even mission and vision" (Thomas, 1998: 230). Thomas emphasises that the measurement of performance can no longer occur in terms of quantitative analysis of services, but that these have to be related to goals and objectives, which in turn should take client expectations into account (1998: 213).

5.7. BENCHMARKING THE COLLECTION

Kinnell and MacDougall have suggested that "tangibles" should be the basic delivery processes for library services that could be benchmarked (1998: 348). The collection is the most tangible resource and asset that a library possesses. It is probably for this reason that studies which research the evaluation of libraries have traditionally concentrated on the collection, and been very quantitatively slanted. Recent research has however advocated the use of Total Quality Management, the setting of standards and the use of best-practice benchmarking in libraries, in order to counteract increasing competition from organisations providing fast and easy access to information media. The measurement of services should take quantitative as well as qualitative data into consideration, if any changes or improvements are to be made. Quantitative analyses such as benchmarking do, however, provide the basis for this, as it can supply information about where services are not performing and where improvements could be made, in order to enhance quality of service provision.

5.7.1. **Benchmarking at the UCT libraries**

De Jager's study of collection use at the UCT Main library concluded that the "results of the present study should ... remain relevant for some time. It would thus be possible to plot active circulation against the age of materials, using the established benchmark for the circulation of open shelf books at any time" (1995: 221). This investigation was followed up in 1996, and it was found that there was "[c]onsiderable similarity in the use of open-shelf material" (Parker and de Jager, 1998: 198). De Jager (1995: 221) has advocated that the study should be repeated over time, and Spiller has concluded that the data to be used for effective benchmarking should be "collected over a period of time so that they can show trends (rather than the blurred snapshot of a single year's performance)" (1998: 431). Therefore, the synchronous study of "snapshots" in time was repeated during 1996, 1997 and 1998, with the aim of collecting data on circulation activity which could be analysed for similarity, and averaged in order to obtain a benchmark of the circulation rate of the book collection, against which future activity could be measured and compared. The UCT initiated major undergraduate curriculum changes in 1999, and a repeat of the study during this year could provide valuable insights as to how the collection is being used by undergraduates, and whether it cost-effectively satisfies the demands placed upon it.

5.7.2. **Aims of the benchmarking investigation:**

This part of the study aims to test and build on the following suggestions made with regard to the initial investigation in 1992:

5.7.2.1. A suggestion that the graphical image of age in relation to circulation intensity could be used as a benchmark against which to measure future patterns (de Jager, 1995: 221). Kelley has advocated that "[a] one-time study ... lacks the credibility of systematically collected data" (1991: 30). While the purpose of the 1992 study was to provide a snapshot of use during a particular period of time, the present study will use the information provided from this in order to determine whether the circulation patterns in 1996-1998 could have been predicted by the initial study, indicating whether the circulation rate is constant or varied, and the suitability of the snapshots for benchmarking.

A model of overall book activity was generated, in order to provide a representation of the performance of the browsing collection. Each subject division will be examined and compared, in order to arrive at a "benchmark" of circulation intensity in relation to age, against which future book circulation can be measured.

5.8. METHODOLOGY

5.8.1. Creating the overall benchmark of circulation activity

The creation of a benchmark involved an analysis of the samples derived for each year. The data analysis as set out in chapter 4.5 was used as the basis for this part of the investigation. A scatter diagram of the average of the frequency of circulation for the period 1996-1998, and the 1992 circulation figures was created. A regression line was drawn for each series, which represented the best possible fit for all the data points on each of the two graphs.

The average of the frequency scores for the period 1996-1998 were calculated, using Microsoft Excel, and this data was tested for its value of R^2. Although R^2 has no critical value, or "cut-off" point where one can say that the percentage it represents is valid or not, the closer R^2 is to 1 or 100% (this would occur when all the points on the scatter diagram fit on the regression line and there are not outliers), the better the model.

5.9. RESULTS

The fitted lines of 1992 and the average of 1996-1998 were compared to investigate whether a similar relationship existed between the age of a book and its frequency of circulation in the two periods. A similarity would indicate that the model developed in 1992 would have predicted the circulation activity of the latest in samples derived from the population. Figure 13 illustrates this comparison, with the values of R^2, as calculated by Excel, indicated on the graph.

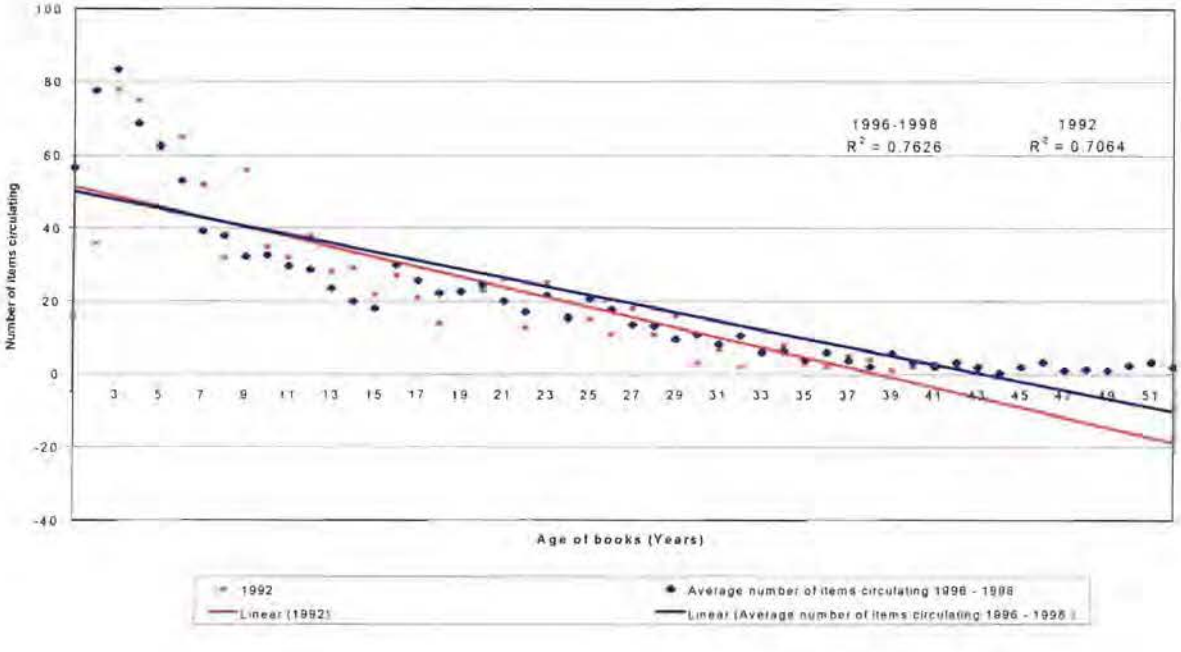


Figure 13: Comparison of 1992 and 1996-1998 average regression lines

The R^2 of the average 1996-1998 data is quite high - 0.76, which converts to 80% of variables which can be explained. The R^2 in 1992 is 0.71 or 71%. The two fitted lines are quite similar for new book movement, but diverge greatly at the bottom of the x-axis. This is probably due to the lack of data for the years between 1993 and 1995 where no data was collected, and reinforces Kelley's observations that data should be collected systematically over time, to be able to track changes and trends effectively (1993: 30). Once again, a negative slope has emerged, but as has been discussed before, this is meaningless and need not be considered, as no book can circulate a negative number of times.

It can be observed that books aged 1 -7 years old are the outliers on the scatter diagram, while the other points are clustered quite closely around the fitted lines.

The more outliers there are on a graph, the less the value of R^2 will be. However, the two regression lines overlap and follow the same pattern, indicating that the overall movement of new books is fundamentally similar. The 1992 benchmark established by de Jager would therefore have provided a useful estimate of future overall circulation activity, but not for the movement of new books in the collection.

5.9.1. The 1992 benchmark

The benchmark developed by de Jager that represented the synchronous study in 1992 is illustrated in figure 14.

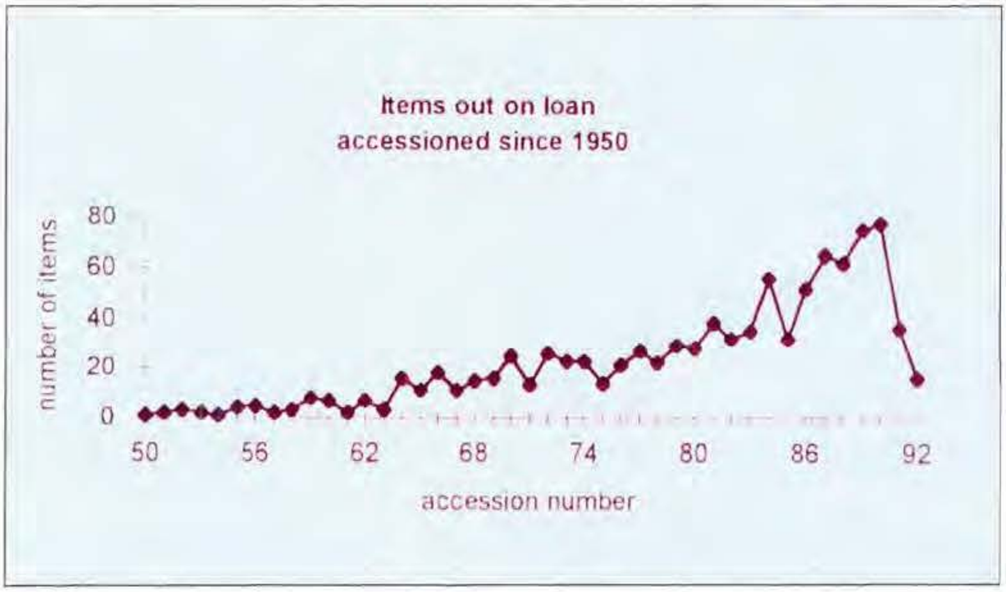


Figure 14: benchmark of book circulation in relation to accession date developed for the 1992 synchronous study

For the purposes of this study, the accession dates of the books in 1992 were related to their age at the time: books with an accession date of 1992 were 1 year old, and those with an accession date of 1991 were 2 years old, and so on. The Excel spreadsheet in Appendix v (a) demonstrates this. This resulted in the graph of circulation activity in relation to the age of a book illustrated in figure 15. The models for 1992 and the average of 1996-1998 could then be compared to each other.

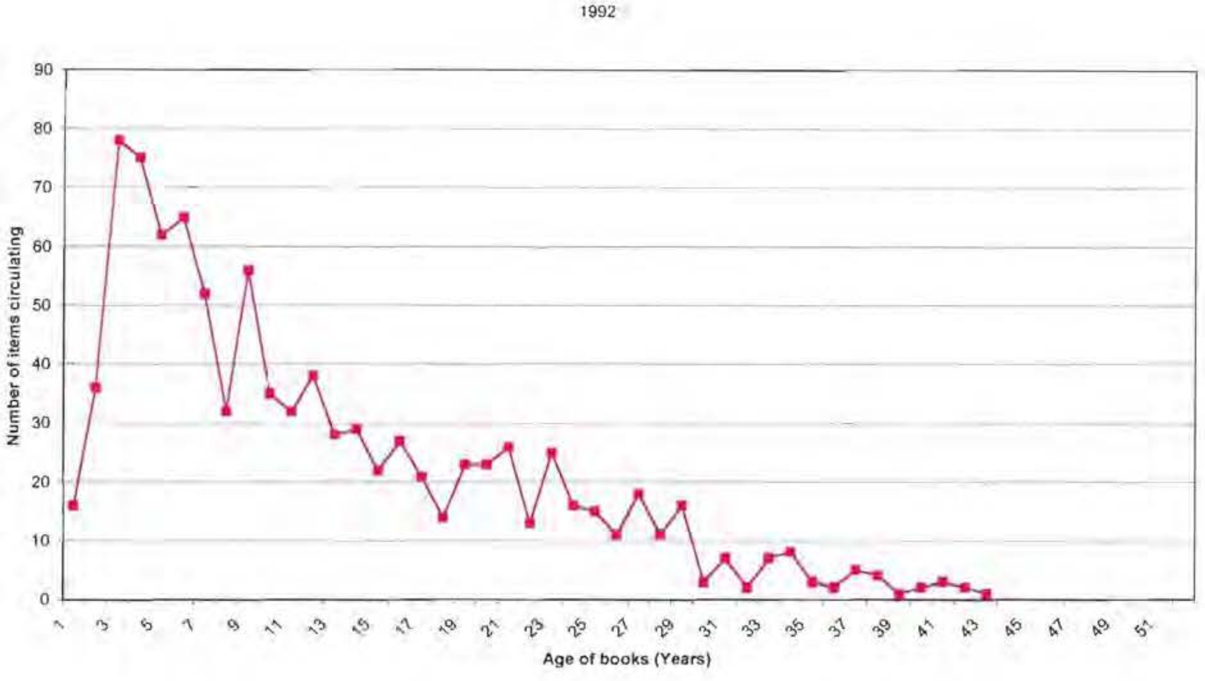


Figure 15: Book circulation in relation to book age: 1992

5.9.2. <u>The 1996-1998 benchmark</u>

In order to arrive at an average of circulation activity, and not to base the benchmark on the circulation frequency of one year's results, the 1996, 1997 and 1998 circulation frequencies in relation to book age were combined and averaged, and a scatter diagram was created to test for the value of R^2. The data was tested using Data Analysis, as before, and the results of yielded the model illustrated in figure 16.

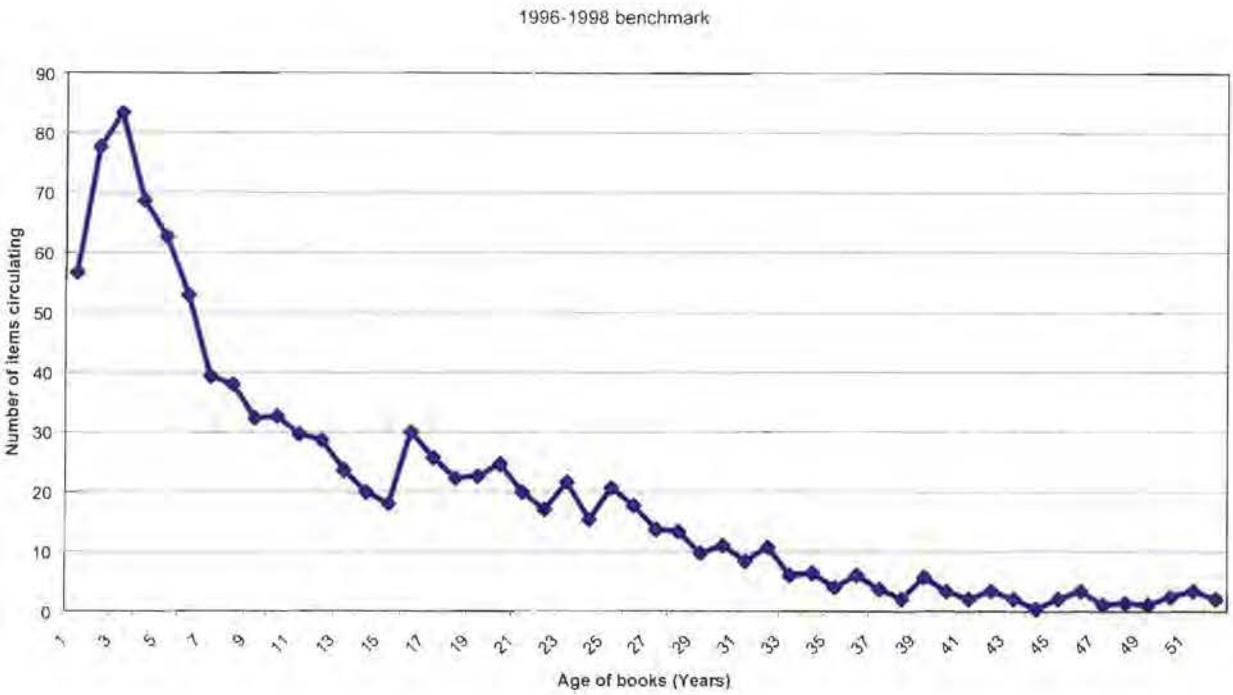


Figure 16: Benchmark of book circulation for the period 1996-1998

The model represents the overall performance of the book collection for the period 1996 to 1998. New books entering the system do not peak during their first year, but reach the peak of their circulation frequency when they are two to three years old. The number of times they circulate then decrease, but still remain relatively high, until the age of six to seven years. Books then undergo a period of average use, until the age of about 33 years, when they begin circulating, on average, less than 9 times per year.

The two models were compared to determine whether the 1992 model could have estimated the circulation of books during the period of the current investigation. This comparison is illustrated in figure 17. It was found that the 1992 benchmark showed similar patterns of book movement for older material circulating in the collection, but that the circulation of new books has increased in the Main library since the 1992 investigation, and this is reflected in the benchmark. The benchmark could therefore be a useful method of gauging how the collection is performing at a specific moment in time, and for comparing that performance to future assessments.

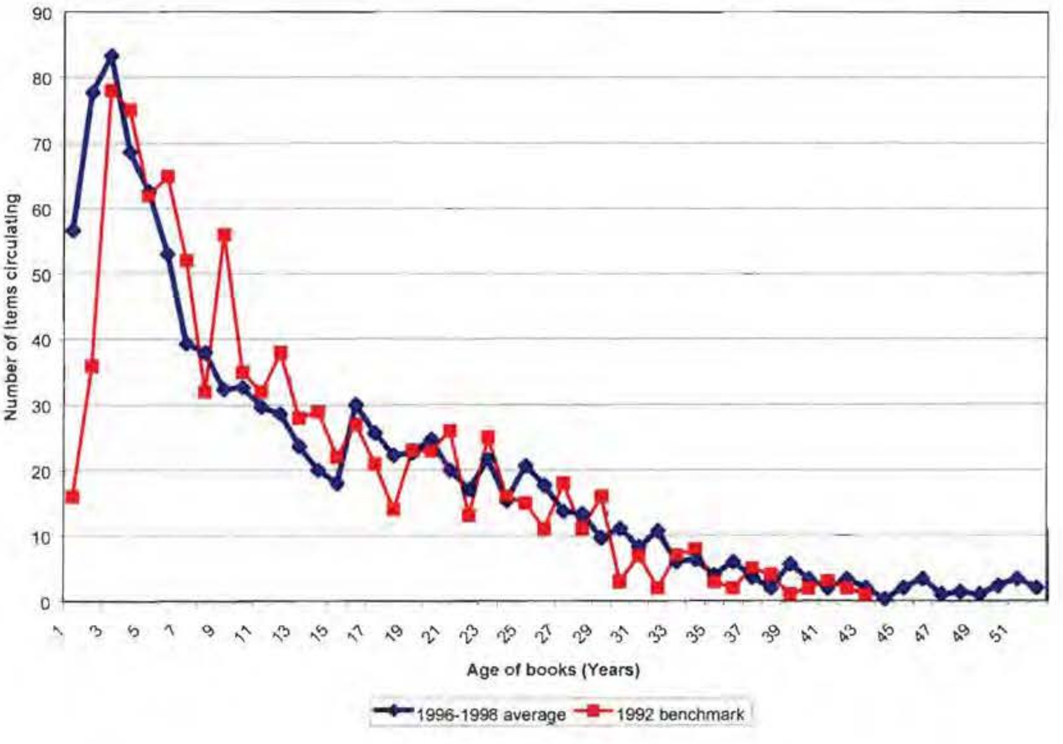


Figure 17: Comparison of 1992 and 19996-1998 benchmarks of book circulation

5.10. <u>CONCLUSION AND RECOMMENDATIONS</u>

Circulation data provides information about what has occurred in the past, and what is happening in the collection now. Comparisons of circulation activity from one period of time to another can reveal differences between the actual behaviour of the collection and the expected behaviour. It has, for example, been demonstrated that the circulation behaviour expected of specific subjects in the Main library differed from the actual circulation that occurred, and provided indications of where the collection was overused and underused (chapter 4.5.2.). This could be useful for decision-making purposes, where more or less funds could be allocated by taking this into consideration, in combination with indicators of effectiveness and cost-effectiveness. The studies by Fussler and Simon (1969), Kent et al. (1969) and others have proven that "past use is a good indicator of present use, and therefore, present use may well be a good predictor of future use" (Lancaster, 1993: 51-58). The 1992 synchronous study should then have predicted, with reasonable accuracy, the 1996-1998 book circulation patterns, providing there were no major changes within the library or the institution it serves.

The reorganisation of the current ten faculties into six in 1999 and the relocation of books in the branch libraries to the Main library, together with the impact of CALICO, will probably result in changes in the circulation behaviour of the collection, and thus the expected behaviour of the circulating collection will probably change. It is recommended that this investigation be repeated to determine whether the actual behaviour reflects this change. The results could provide useful indicators of where more funding may be needed to improve services to users.

The adoption of standards, the use of nationally agreed guidelines and the monitoring of statistical measures are methods Library and Information Services have sought to provide and monitor the quality of their services. "While formal benchmarking - detailed examination of and comparison with the best in the sector, ... has been limited, libraries have used a number of cross-sectoral approaches to provide an indication of how good as service is being provided" (Brophy and Coulling, 1996: 129).

5.10.1. **Benchmarking for quality provision**

Whereas benchmarking for comparisons between similar libraries have occurred at a national level in the United States (US) and European libraries (most notably public libraries in the UK), it is not recommended that this practice be adopted in the current context of disparate LIS resources in South Africa. Internal benchmarking, which is often used "within large organizations such as multinationals to compare the performance of one division or department against others", is recommended instead (Brophy and Coulling, 1996: 99). Internal benchmarking presents models of expected performance from each department, and it would be useful if the performance ratios derived from the appropriate performance indicators were used for comparative purposes between the UCT Main library and the branch libraries. With reference to the book collection, this would involve a breakdown into subject-specific analysis of circulation activity.

Brophy and Coulling have recommended that LIS organisations examine competitors, not only in their own field, but also by investigating the increasing competition from rival organisations with businesses related to the field of information storage, analysis and retrieval, such as bookshops, video shops and, increasingly, Internet cafés and other outlets where information can be obtained (1996: 98). With the advent of the Internet and its provision to private users in SA, even the person with a connection to an Internet Service Provider (ISP) can be classified as a rival! The library has to demonstrate its value, and continuously improve upon the quality of its service provision to both users and potential users. This might even mean that LIS organisations should examine best-practice benchmarks, "whereby the leaders set the standards, whatever their particular business", and use these as a basis for improving their organisation's effectiveness.

CHAPTER 6

OBSOLESCENCE AND WEEDING IN THE LINEAR LIBRARY

6.1. INTRODUCTION

While different measures of quality exist (such as availability of material for the observed proportion of demands found by users), this chapter will concentrate on the utilisation of resources as measures of collection quality. Wall observes that "other things being equal, it should only be necessary to increase the utili[s]ation of the collection to demonstrate an improvement in quality, because utili[s]ation follows demand which in turn follows from the capability of the library as perceived by its users" (Wall, 1994: 194).

The use of the collection can be increased by removing materials which appear to be underused or little used, thereby making newer materials more visible to users can increase the use of the collection. Usage of books is partly represented by circulation figures as discussed in chapter 4.2.4. It may appear to be contradictory to remove items in order to increase the circulation of books in the collection. For this reason the core collection of books which are circulating has to satisfy a predetermined percentage of user needs. As it would be too costly to satisfy 100% of user needs all the time, library managers have to decide on a level of user requirements that will be met by the collection. Library standards can assist with this decision, and Slote recommended that between 95 - 97% of user needs should be satisfied by the core collection: books which are likely to retain 95% of their future usage should be retained in collections (1994: 42).

The information provided from assessment studies should be used to improve the quality of the collection. However, costs are always incurred when decisions for improvement are made. Maintaining or improving the cost-effectiveness of the library's collection necessitates an evaluation not only of the circulation patterns of books on the shelves, but also an assessment of costs involved in keeping them there. Books are expensive to maintain on the open shelves, and this cost increases as libraries expand. Financial resources are needed for expansion, and in the context of decreased funding and financial shortages, this can lead to critical space shortage. Space shortages lead to the need for new buildings, which occupy space and cost money to purchase or rent. If this is not a feasible option for libraries, books may have to be moved into storage, where they may be cheaper to house, but become less accessible to users.

Choices regarding the removal of books from the open shelves are often problematic and difficult. The older a book becomes, or the longer a title is kept and maintained in the library, the more expensive the investment in its storage, upkeep and preservation becomes. Books become worn out, spines break, and rebinding and repair may become necessary with usage over time. Weeding of the collection has also been based on criteria such as:

- Appearance or condition of the items (worn-out or badly-bound volumes)
- Superfluous or duplicate volumes, including editions of books which have been superceded by newer editions
- Poor content, including dated information and improved editions
- Languages not supported by the university
- Age of books
- Books in specific disciplines or classes that have specific ages for weeding criteria, such as ephemeral materials and encyclopaedias

(Slote, 1989: 18-24)

Where financial resources are limited, and the real purchasing power of money is decreasing, it makes more sense to invest in the storage of useful books than in the storage of less useful books. Buckland observes that "[i]f there is a tendency for books to be used less and less, then the returns on the investment in continued storage (and maintenance) must diminish" (1975: 39). Therefore the removal of books from the open shelves, either to secondary storage facilities if books are still in circulation, or by weeding obsolete items from the collection completely, can be a cost-saving measure for the library. The cost of storage and retrieval from storage on request should cost less than the cost of maintaining the books on the open shelves. This chapter will concentrate on decisions regarding which books to mark as "obsolescent" and remove from the open shelves at the UCT's Main library.

The identification of the age at which books cease to be used is a useful method of attempting to identify which books might be removed from the collection. It is time-consuming and costly to perform diachronous studies of stock use and obsolescence, which are based on drawing collection samples, and plotting the use of these items over time, to determine the rate at which various subject fields are aging (examining usage over time) (Lancaster, 1993: 111). It is much less time-consuming to perform synchronous studies, which use snapshots of current circulation activity to plot, backwards in time, the publication dates of materials borrowed (Lancaster, 1993: 111), especially if computers are used to simplify the process. In a computerised environment, it is a relatively simple procedure to run a query and request the accession or publication dates of books currently out on loan.

6.1.1. **Obsolescence**

"The term 'obsolescence' as applied to library materials, refers to the decline in use of these materials as they get older" (Lancaster, 1993: 109). Lancaster observes that this phenomenon has also been referred to as the aging or decay of materials, and Burton and Kebler's (1960) "half-life", which is obsolescence as expressed by the period of time up to which an item receives one half of all the uses it will receive (1993:109). However, the age of an item is not an absolute indicator of how it will circulate. Fussler and Simon investigated various variables such as language, age, publication date, accession date, and subject of materials to determine the rate of obsolescence of monographs, and concluded that age of library materials is a good predictor of their use (1969:143). However, they also found that different subjects showed different patterns of aging and use (45-52). Based on publication date alone, they advocated the removal or retirement of the oldest 25 percent of the collection (Baker and Lancaster, 1991: 83).

Lancaster (1993) used the current circulation of materials in specific subjects to plot, backwards in time, the publication dates of materials borrowed, and determine their "median use age". Keller and Warrack define the "median of a set of measurements [as] the value that falls in the middle when the measurements are arranged in order of magnitude" (1997: 108). The median is a measure of central tendency. It is the midpoint in a distribution, where at most half the scores fall above it, and at most half below it. Lancaster's median use age would refer to the midpoint in his distribution of number of items borrowed per publication date. "The shorter the median use age, the more rapidly a field is obsolescing" (1993: 109). Lancaster's method will be investigated to determine if it is a useful measure for the UCT libraries.

6.1.2. **Weeding**

It is important to examine current use in order to determine which percentage of the book collection is unused or underused, so that they may be removed in order to improve cost-effectiveness. Weeding refers to the retirement of books to less accessible storage or their complete removal from the library (Lancaster, 1993: 113). However, Lancaster has also cautioned that the weeding process does involve costs, including identifying which materials to discard or relocate, the alteration of catalogue records, changing shelflist records to indicate new locations, and the retrieval of materials from remote storage when requested by users. Books are continually added to the collection, and consequently "a retirement policy [is] likely to have a negligible effect on the overall performance of the library (Lancaster, 1993: 113).

6.1.2.1. Factors discouraging weeding

- An emphasis on collection size as an indication of quality:

  Traditionally, library size has been viewed as an indicator of value: the bigger a library's collection, the more valuable it was to its users. Figures regarding collection size were often reported in libraries' official statistics. Thus, in libraries where size is important, the removal of books from the collection would signify a decrease in the worth of the library.

- Collection sanctity:

  "There are emotional and intellectual blocks against removing books from a collection. Many people consider books to be valuable records of human heritage and therefore almost sacred. The removal of books becomes painful" (Slote, 1989: 5).

- Weeding is time-consuming, and has to be completed as a task outside of the 'normal' activities of librarians. Not only does the actual physical removal of materials have to be implemented, but also the actual decisions about what to remove from the open shelves also have to be made.

- Difficulties may be encountered in deciding which books to remove from the shelves and the criteria for their removal. Different methods exist for different types of libraries. University libraries appear to have the most serious collection management problems, due to their multi-purpose functions as preservers of knowledge, repositories of national heritage and archive collections, and providers of facilities and resources for teaching, studying and research, to a multi-faceted community with different needs.

6.1.2.2. Advantages of weeding

- Items can be moved to less accessible, but also less costly storage, or totally removed from the collection. Cost-effectiveness can therefore be improved.

- "The weeding of a library collection, by getting rid of "dead" materials, should make the items displayed on the shelves more attractive to readers and thus improve circulation and turnover rates" (Lancaster, 1993: 115). Roy has however theorised that "new acquisitions to the collections tend to balance the discards (keeping the turnover rate constant) and that a more radical (more than 10 %) weeding, followed by weeding on a continuous basis, would be needed to increase the turnover rate" (Lancaster, 1993: 116). Whether Roy's views can be proven will have to be the subject of a continuing investigation, since the weeding of the UCT library collection, based on the recommendation of the UCT Library Planning Group (University of Cape Town Principal's Circular (c), 1998:26) that 20 percent of materials should be removed from the open shelves, was initiated in late 1998, and continued throughout 1999. It was therefore beyond the time-scale of this investigation.

- "When old and unused books are removed, the shelves appear more attractive to users and it is easier for them to find the newer or more popular items they are likely to be looking for" (Lancaster, 1993: 116).

Slote's investigation led him to the conclusion that an effective weeding programme can improve circulation, and libraries that have employed his methods have agreed (Slote, 1989: 64-73).

- The identification of core materials:

  Slote states that "[c]ollections of old textbooks, workbooks, out-of-date and useless nonfiction, low quality giftbooks, and books that have never been used at all abound" in most university and college libraries. He advocates that the transfer of books from the open shelves to secondary storage should be the "basic form of disposition of noncore works" (1989: 42).

6.1.2.3. Standards relating to weeding

Some libraries use published standards to provide objectives against which to evaluate their performance. According to Brophy and Coulling (1996: 129) Standards for University libraries (1986) recommend that the library's collection should remain relevant to the university's needs, and that those items in the collection which are irrelevant, or do not meet these needs, should be removed from the collection. The Association of College and Research Libraries (ACRL) published Standards for college libraries, 1995 edition, in which Standard 2: Collections stated that "the library shall provide as promptly as possible a high percentage of materials needed by its users" (ACRL, 1995: 247). They further comment that "[t]he library collection should be continually evaluated against standard bibliographies and evolving institutional requirements for purposes both of adding new titles and identifying for withdrawal those titles which have outlived their usefulness. No title should be retained for which a clear purpose is not evident in terms of academic programs or extracurricular enrichment" (ACRL, 1995: 247). At the time of conducting this study, the standards were in the process of being updated.

At the time of the investigation, a weeding backlog existed at the UCT libraries. The collection development recommendations, standards or guidelines (which encompassed weeding) of organisations such as the ACRL or ARL were not used for collection management, since there was too much disparity between South African university libraries and the college and university libraries in the US. However, Slote has observed that Illinois public libraries have created their own weeding criteria, based on quantitative performance measures in their libraries (1994: 13). The UCT libraries could also implement their own weeding criteria, and suggestions for their implementation follow.

6.2. REVIEW OF THE APPROACHES TO OBSOLESCENCE AND WEEDING

Many studies on weeding have been published, and these generally concentrate on two weeding criteria, based on the use of the collection:

1) The age of a volume

2) "The length of time a volume remains in the library between successive uses or the number of uses in a given period of time (shelf-time period)" (Slote, 1989: 49).

Studies such as Grieder (1950) and Lister (1967) have also concentrated on finding methods for computing and comparing the costs of various kinds of primary and secondary storage, and the testing of complex mathematical formula to determine costs (Buckland et al.: 1970).

Lister's study of three academic branch libraries at Purdue University advocated the removal of materials from the collection, in order to make access to the bulk of the materials desired easier and quicker (1967: 12). He concluded that age was not a good indicator upon which to base weeding decisions (1967: 103), and that "the selection of an item for storage should be based entirely upon its current (or immediate past) rate of usage" (1967: 233).

On the other hand, Slote observes that Jain's very mathematical investigations into identifying criteria useful in selecting books for storage led him to the opinion that previous studies had overemphasised usage histories as an indicator of the usage of monographs. He advocated investigations into relative usage of books, based on age rather than actual usage. He questioned the use of the borrowing history of monographs as a foundation for weeding decisions based on a reliance on record keeping. His study concluded that "age is a significant variable in studying usage of monographs. [W]hile usage rates of individual monographs have considerable variation even over a short period of time, the usage rates of various age groups do not show any significant differences over time" (Slote, 1989: 59).

There has thus been debate regarding the best criteria to use for the determination of which books to remove from the browsing collection, but most investigations concur that the age of materials does impact on usage.

Fussler and Simon's 1969 study of use patterns affirmed their theory that "past use, where sufficient data are available, was found to be the best single predictor of the future use of a book" (15). However, where no record of past use is available, they attempted to examine variables such as accession date, publication date, and language as indicators of future use. They found that "characteristics such as the age of a book and its language are less satisfactory in predicting future use than is past use" in the Social Sciences than the Scientific disciplines (1969: 31). The accuracy with which future use can be predicted can be increased where knowledge of the past use of records is available (e.g. how often it has been borrowed in the previous five years). They concluded that "based on publication date alone, the oldest 25% of the collection would be retired" (Lancaster, 1977: 181). The latter rule was tested at the collections at of California, Berkeley and Northwestern Universities, and produced similar results (Lancaster, 1977: 182).

Trueswell's (1964) study of weeding in large academic library systems was approached from the point of view of its "applicability to data processing and computer techniques" (Slote, 1989: 61). His work was premised on the theory that only a very small part of the collection is in circulation very frequently, or the 80/20 rule - that 20 percent of the collection is responsible for 80 percent of circulation. This 20 percent he defined as the core collection, or the books currently circulating, and analysed them in terms of their age, and last circulation date (Slote, 1989: 62). His method was used to estimate the size and composition of a core collection capable of satisfying a fixed percentage of demands (Lancaster, 1977:188). Books not forming part of the core collection could be removed from the open shelves and placed in limited-access storage.

The study of Kent et al. at the University of Pittsburgh library found that books are subject to rates of aging and obsolescence, and that as books get older, first-time use is reduced (1979: 20). Their study found that the percentage of new items entering the collection peaks in the first year, and then rapidly declines. Books in certain subjects such as Economics therefore became obsolete very quickly. It must therefore be noted that determinations of obsolescence of materials based on age cannot be standardised, but merely estimated, since usage differs across subjects.

Slote (1989) investigated weeding in public libraries by "determin[ing] whether the pattern of use of the volumes currently in circulation (books actually out of the library at the time of the study) was as valid a predictor of future use as are historical reconstruction of usage over much longer periods of time" (Slote, 1989: 64). He studied the imprint age of books currently out on loan versus the length of time a book remains on the shelf between circulations (shelf-time period), and concluded that the imprint age is a weaker predictor of future use than past use patterns. The shelf-time period is highly predictive of future use, and can be used to create meaningful weeding criteria (Slote, 1975: 81). His weeding methods, called the

"Slote Method", have been widely tested and verified in public libraries (Slote, 1989: 70).

6.2.1. **Previous studies at the UCT libraries**

The obsolescence study conducted in 1992 by de Jager can be summarised as follows:

> "The study aimed to establish ... whether the accepted phenomenon of decline in use with age, or obsolescence, would be supported in an environment where a reduction in the purchase of new books was evident. ... Evidence suggested that older books, do not exhibit the expected characteristics of obsolescence and, while a certain measure of decline of use with age was demonstrated, such decline may be reversed in times of decreasing resources or increasing demands from existing resources".
>
> (de Jager, 1994: 71)

The 1992 investigation advised that books little used for 25 years and more should be removed from the open shelves via an informed weeding policy. The aim of this follow-up investigation is to determine whether the results of the 1992 investigation are still valid, and will investigate the subject-specific patterns of circulation intensity of materials. The suitability of Lancaster's observations of median use age as a measure of obsolescence of materials will also be investigated.

6.3. **RESEARCH QUESTIONS**

6.3.1. The 1992 investigation suggested that the main library instigate an informed weeding policy, that would enable it to remove from the shelves those materials that had remained unused or little used for 25 years or more. Has this suggestion been implemented, and if so, can its success or failure be seen in the analysis of circulation patterns of new books?

6.3.2. Can obsolescence of a book be measured and adequately estimated in relation to its age and a quantitative analysis of circulation statistics? How can circulation patterns estimate, with any accuracy, whether and when a book will become obsolete and flagged for removal from the shelves?

6.4. **METHODOLOGY**

The publication date, advocated for collection obsolescence studies by Fussler and Simon, is unavailable as part of the computerised collection database. Therefore, the accession date, as used by Ernst and Shaffer's study at the Massachusetts Institute of Technology (Fussler and Simon, 1969: 18-23), will be used as the preferred variable for determining estimates of obsolescence of books in the UCT Main library's browsing collection. Lancaster's "median use age" will be used to determine the average age of those books which are used in the library, and the results of each year will be compared to determine whether consistency exists in the circulation of books.

The spreadsheet of frequency of circulation in Appendix v (a) in each consecutive year was used to compare the movement of books in each year. This became the basis for most calculations, which were done using Excel's Data Analysis. The data in Appendix v, outlined in chapter 4.3.1., were used to determine the circulation of an average book for the period 1996-1998, and this was compared to the pattern of movement in 1992, to determine whether any discrepancies existed. The data was tested for normal distribution and standard deviation using computerised statistical means.

6.4.1. **Testing the sampled data**

6.4.1.1. Regression Analysis

Regression Analysis allows one to include in the model the randomness that is part of the real-life model. Obsolescence analysis of the present collection will involve using the deterministic model, or what we know about the relationship between the age of the books and their circulation, to determine whether a linear relationship exists, and to assess the strength of the linear relationship, denoted R^2. The following procedure will be followed:

1. A scatter diagram will be created for each year of circulation, which will reveal whether or not a straight-line model would fit the data reasonably well.

2. The scatter diagrams will be combined and a straight line which would provide the best possible fit will be drawn for each year. Because some of the differences will be positive and others negative, a canceling effect might produce a straight line that does not fit the data at all. To eliminate this, the line must represent the minimised sum of squared differences, i.e. represented by the equation:

$$\sum_{1=1}^{n} (y_i-\hat{y}_i)^2$$

Where y_i represents the observed value of y and $\hat{y}_i$ represents the value of y calculated from the equation of the line, i.e.

$$\hat{y}_i=\hat{\beta}_0 +\hat{\beta}_i x_i$$

The technique that produces the line is called the least squares method, and the line itself the fitted line or the regression line. The differences between the points and the line are called residuals, denoted r_i. These are the observed values of the error variable.

3. To assess the linear model to see how well it fits the data, the co-efficient of determination method will be used to measure the strength of the linear relationship, denoted by R^2.

$$R^2 = \frac{SS^2xy}{SS_x.SS_y}$$

The percentage represented by R^2 represents the percentage of explained variations, while the rest is unexplained. The higher the value of R^2, the better the model fits the data.

6.4.2. **Median use age**

Lancaster proposed the use of the "median use age" as an estimate of aging, and an indicator of how rapidly a field is obsolescing (1993: 109). He based this on the grounds that a book will circulate rapidly during its first year of accession, after which circulation would rapidly decline to half of its first year's during its second year. Therefore the point at which it receives half of all the use it will receive, is half its life, as described by Burton and Kebler in 1960 (Lancaster, 1993: 109). The median represents a score that tells us about the centre of the data, where half the scores are above the median, and half below it. This however, is not a measure of overall class performance, which uses the mean. The mean is computed by adding all the scores and dividing it by the number of cases, and thus provides a measure of overall performance of the data set. It is therefore recommended that the mean be used for data analysis purposes (1993: 109).

In order to determine the median use age of books that are circulating in the UCT Main library's collection, the average age of each sample was calculated. "Averages, or measures of central tendency, comprise a type of descriptive statistic that indicates the 'most typical or representative score in the group'" (Hernon, 1994: 94). Hernon describes three types of averages, the mode (the measure of the most frequently occurring score), the median (the midpoint of a distribution) and the mean (the average, or sum of all the scores divided by the number of scores). He observes that the mean is the "more precise measure than the other two measures of central tendency, ... used with interval ratio" (1994: 96). The interval ratio ranks the years of accession which fall in order along a dimension - one-year periods, and one can quantify the differences between the categories, which have equal distances from one another. This satisfies the requirements for interval scales as described by Hernon (1994: 60). The data was not grouped into periods, and therefore the point around which the average use of books was clustered was a single year. The measurement of the point of central tendency was based on the formula to calculate the mean:

$$\bar{x} = \frac{\sum X}{N}$$

Where $\bar{x}$ is the mean, $\sum X$ is the sum of the scores, and N is the number of cases in the distribution.

Whereas Lancaster advocated the use of the publication dates of items, this investigation used the accession date to determine obsolescence. The two dates are different: the publication date reflects the date in which the item was printed and released for purchasing, while the accession date indicates the date on which the item was added to the library system. There is usually a time lag between the time when an item is published and when it is added to the library collection. The publication date was not available as part of the printout received from the UCT library, but the accession date was used. The use of this date was advocated by Ernst and Shaffer's study in 1964, who observed that "accession date was more closely related to the use of a book than was publication date" (Fussler and Simon, 1969:23).

6.4.3. **Estimation of obsolescence by subject analysis**

The subject categories of the circulation sample were also studied to determine whether Lancaster's observation that specific subject areas have different obsolescence patterns could be observed at the UCT libraries (1993; 111). Fussler and Simon came to the same conclusion in their investigation of more specific subjects, Teutonic Languages and Economics. The subject divisions outlined in table 4, chapter 4.4.2. were used to analyse the various broad subject disciplines of Philosophy and Psychology and Religion; Social Science; Natural Sciences and Mathematics; Technology and Applied Science; and Literature and Rhetoric.

The results obtained for each subject category in each year were combined into spreadsheets, and the standard deviation for each category was calculated. The method for calculating the mean or central tendency is discussed in 6.4.2. The standard deviation "measures the dispersion of scores around the mean. The greater the scatter of scores, the larger is the standard deviation" (Hernon, 1994: 98). The *sd* formula is:

$$sd = \sqrt{\Sigma (X - \bar{x})^2 / N - 1}$$

Standard deviation is calculated by taking the square root of the variance, where *sd* is the standard deviation, Σ is the sum of the deviation of each score from the mean squared $(X - \bar{x})^2$, and N - 1 is the number of cases in the distribution -1. The calculation is based on a sample and not the population, and N - 1 indicates the number of deviations about the mean that vary.

6.5. **RESULTS**

In general, the results of the 1996-1998 investigations into obsolescence produced patterns of book circulation that were consistent in comparison to each other. The pattern of book movement for each year is illustrated and compared in figure 18, and confirmed that there are not very significant OVERALL changes in the usage rate of books in relation to their age during the three-year period. The bulk of circulation activity occurs in the most recently accessioned books, older books are used less than newer material, and occupy a very small portion of books circulating.

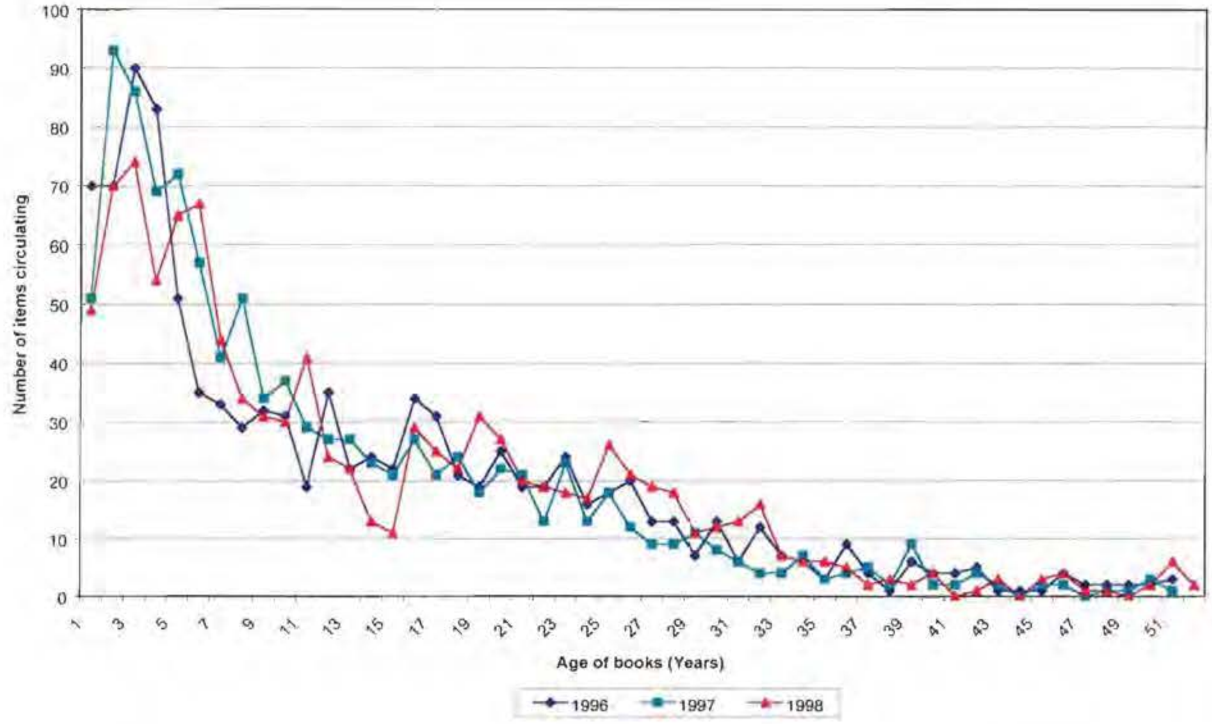


Figure 18: Book circulation as per age of books for the period 1996-1998

Books aged 52 years old are still circulating in the system, but most circulation activity occurs in books aged 1 - 7 years. This indicates that there is a decreased demand for books aged 8 years and older, but also that there is even less activity in the range of books aged 33 years and older, as illustrated in figure 19. In comparison to each other, each year's circulation activity in the range of books aged 8-32 years appears to be very erratic, while the range of books aged 33 years and older appears to be that with the most similar circulation rates.

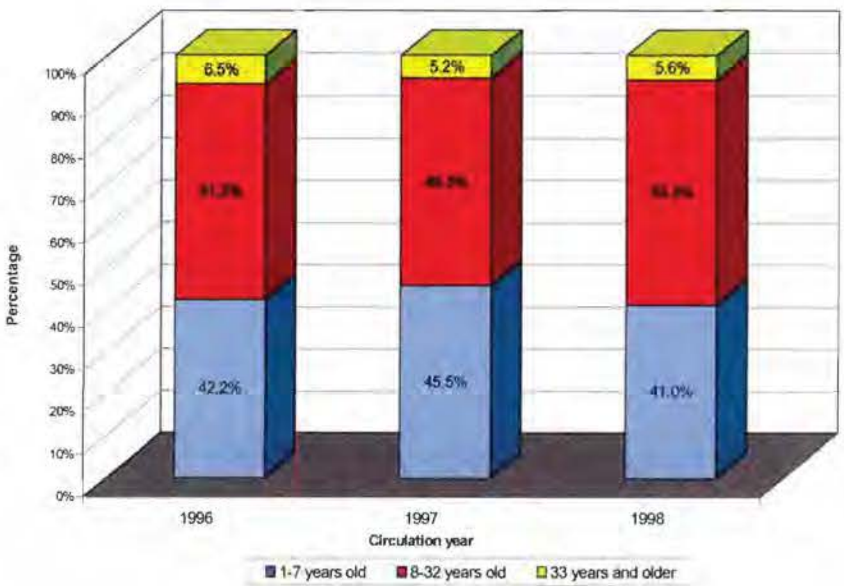


Figure 19: Age distribution of books circulating

Thus the use of books can be divided into three categories: Books which are highly used, aged 1 to 7 years, books which receive an average amount of use, aged 8 to 32 years, and books which are little-used or underused, ages 33 years and older. This distribution is shown in table 5, chapter 4.4.2.

A comparison of the 1992 and 1996-1998 book circulation patterns is illustrated in figure 20. The patterns for the ranges of books aged 33 years and older and 8 - 32 years are very similar, and confirmed Fussler and Simon's conclusion that past use is a good indicator of future use (1969: 31). The 1992 patterns could have provided an estimate of the movement of books during the period 1996-1998. The observed patterns of movement of newer material have been dealt with in chapter 4.5.4.

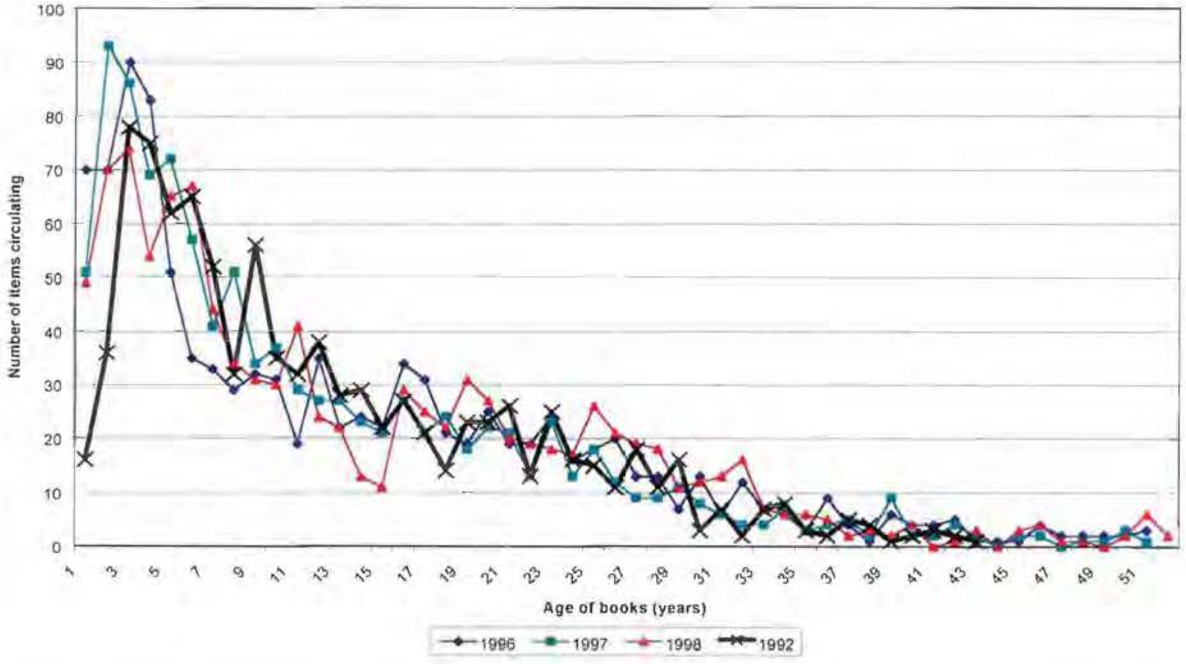


Figure 20: Comparison of 1992, 1996, 1997 and 1998 circulation patterns in relation to book age

6.5.1. **Probabilistic modeling**

Figure 21 illustrates the linear model representing the fitted line for the circulation activity during 1996, 1997 and 1998. The fitted lines are very similar, and the R^2, or the explained percentage of the variation, is relatively high in each case: 71% in 1996, 73% in 1997 and 76% in 1998. The percentage of variables that cannot be accounted for has decreased with each year.

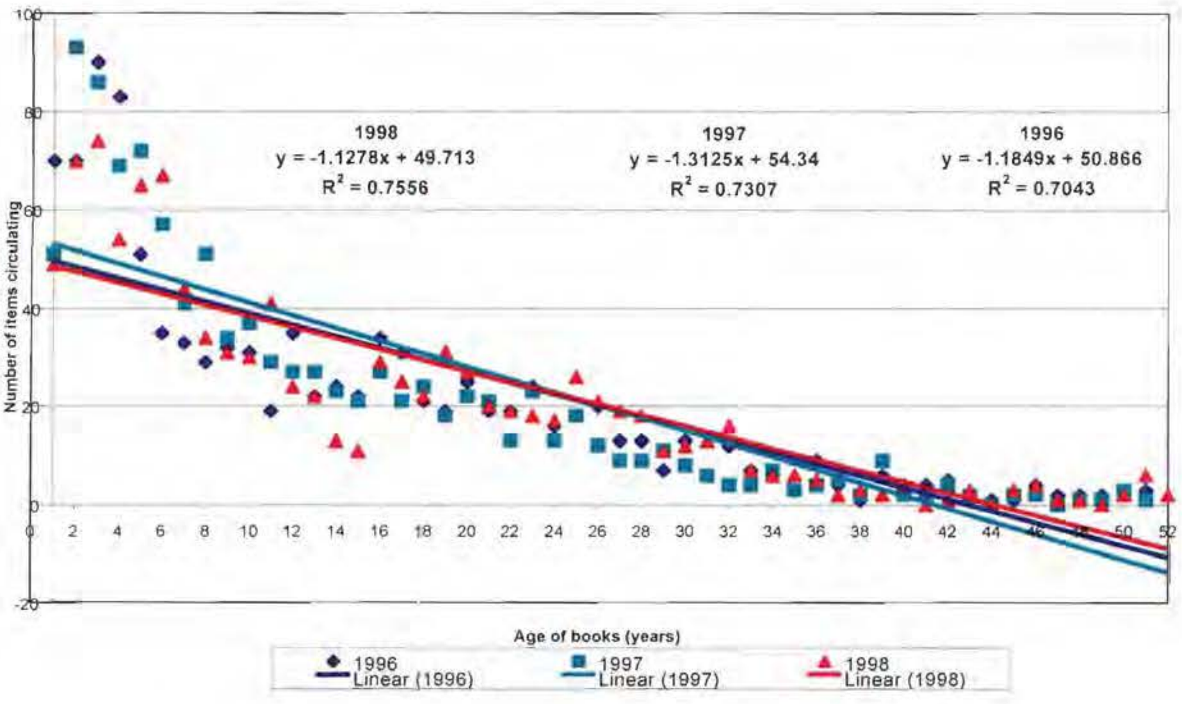


Figure 21: Probabilistic model of 1996, 1997 and 1998 book movement

The range of books aged 33 years and older form the focus of this chapter, and this will be concentrated upon here. The negative regression line indicates that the movement of books in this age range will decrease as the books get even older. In practical terms, the negative slope indicated by the slope of the regression line is meaningless, although indicated on the graph. No books have a negative number of uses.

6.5.2. <u>Calculating the mean use age</u>

The circulation patterns for 1996-1998 were amalgamated and averaged to obtain a model of circulation activity which could be used to approximate the future use of the browsing collection of the Main library. The results obtained from the

1992 study were compared to this average, or mean circulation activity model, and are illustrated in figure 17 in chapter 5.

In each of the circulation samples, for the years 1996-1998, the mean was calculated in order to determine the point of central tendency. The average age of books circulating in the collection was determined to be 20 years. If one concurs with Lancaster's theory that the median use age can be accepted as an estimate of obsolescence, then books aged between 12 and 16.5 years (see Appendix v (b) for data description) with an average accession date of 14.5 years and older should be removed from the browsing collection. This consists of 37.1% of books circulating!

The mean or average age of books in circulation in the library during 1996-1998 was 20 years. There was, in general, a decline in the use of books after they reached this age. In 1996, books aged 20 years and older constituted 24.1% of items in circulation, in 1997 19.5 % and in 1998 26%, as illustrated in figure 22, which provided an average of 23.2%. Thus, if we accept that Fussler and Simon's rule that the oldest 25 percent of the collection should be retired (which was based on publication date versus the current study's accession date) (1969: 66) is true, then the books accession dated 20 years and older should be removed from the open shelves into storage, or weeded.

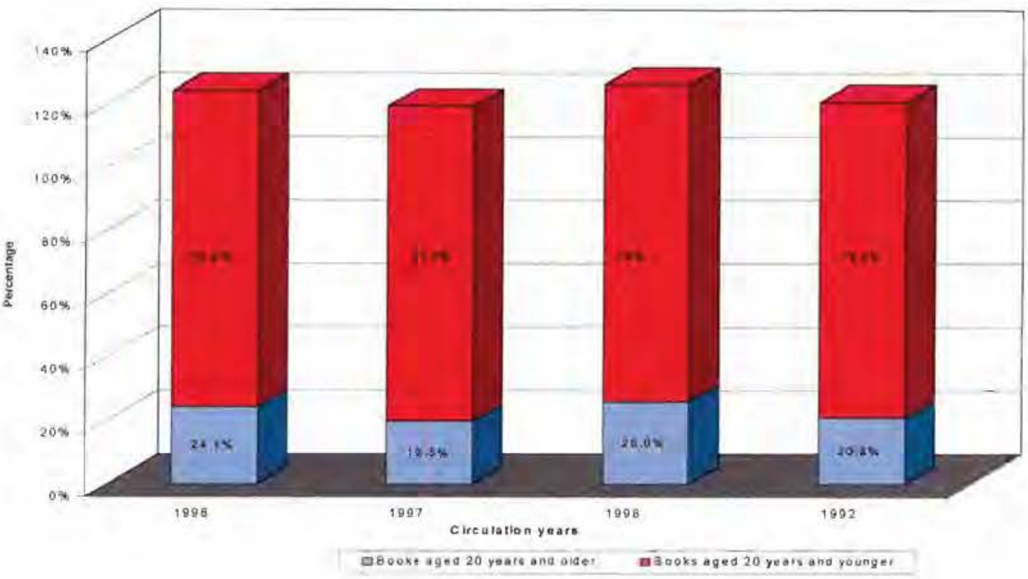


Figure 22: Percentage of books 20 years and older circulating in the book collection during 1996, 1997, and 1998, in comparison to 1992

However, the observations of standard deviation should also be noted, as displayed in table 8.

	1996	1997	1998	1992
Mean	20.05882353	20.21568627	19.82692308	22.44186047
Standard deviation	20.98896068	22.82569931	19.66156912	20.5777299

Table 8: comparison of means and standard deviation of circulation samples 1996, 1997, 1998 and 1992

Books "older" than 20 years, or those that can be classified as "underused", according to Fussler and Simon's rule, constitute an average of 23.2 percent of those books in circulation. However, if as in 1997, 81.5 percent of the collection is composed of books which are still circulating heavily, then the removal of 25 percent may result in the removal of books which could still viably circulate, and may be doing so cost-effectively. The mean of 20.2 years and the standard deviation of 22.8 years for 1997 indicate that books as old as 43 years might still be in substantial use. Subject fields should be analysed in order to determine the rate of obsolescence of the different disciplines. Fussler and Simon, who found that there were vast differences between the rates of aging between different subject disciplines in their investigation (1969: 143), corroborated this.

The average age of books in use has decreased from 22.4 years in 1992 to 20 years in 1996-1998. In 1992 de Jager theorised that the fairly high demand for older books could have been influenced by a reduction in the library's ability to purchase new books. She also stated that the use of older materials had increased as users turned to older material in the book collection to try and satisfy their needs. In 1992, the number of books added to the collection per full-time equivalent (FTE) student was 1.08 (University of Cape Town libraries, 1998 (b): 11). In 1997, this number had increased to 1.28 (University of Cape Town Libraries, 1998 (c): 11). This could explain the decrease in the mean age of books circulating. Since more new books are available, students are turning to these to meet their needs.

6.5.3. <u>**Estimation of obsolescence by subject analysis**</u>

Fussler and Simon's study of collection circulation at the University of Chicago confirmed that the age of library materials is a good predictor of their use. However, they recognised that the collection consists of different fields or subject areas that circulate and age differently, as confirmed by their study of Teutonic languages in the Humanistic discipline and Economics in the Science discipline. Therefore the rate at which the various broad subject fields of Social Science and Engineering and Technological Sciences age within the UCT Main library system was investigated. This provided useful information regarding use over a period of time, which in turn could be used as an estimate of obsolescence of library materials during the period 1996-1998. Regression Analysis was used to test the measures of randomness in the relationship between the use of a book in relation to its age. The mean use age of the subject categories was also investigated. If past use is a good predictor of future use, then the estimate of the average age of books circulating in the library system can provide valuable information about the cost-effectiveness of maintaining materials on the open shelves which are little- or underused.

6.5.3.1. Mean use age of books in subject disciplines

The average age of books circulating in the various broad subject fields are outlined in the table 9 below. The samples for each year were combined in the defined categories, and their medians and standard deviation were calculated using Excel's Data Analysis. See Appendix vi for details.

General Subject Area	**1996**		**1997**		**1998**	
	Mean use age (years)	Standard deviation	Mean use age (years)	Standard deviation	Mean use age (years)	Standard deviation
Philosophy and Psychology , including Religion	2.6	2.7	3.5	3.9	2.2	2.1
Social Sciences	4.7	6.5	5.4	8.1	6.6	8.1
Natural Sciences and Mathematics	3.4	3.2	2.9	4.1	2.7	2.6
Technology and Applied Sciences	4.1	5	4.0	4.2	4.1	4.3
Literature and Rhetoric	3.3	2.4	2.2	2.2	2.6	2.7

Table 9: Mean use age

Movements in the different subject categories vary from the overall circulation of books, indicating that specific subject investigations must occur in order to analyse rates of obsolescence and identify areas of overuse or underuse of books. If there is very little circulation activity in older books in specific subjects, it is an indication of underuse.

The data in table 9 shows that there is considerable variation in the mean use age of the different subject areas. It ranges from 2.2 years in Literature and Rhetoric to 6.6 years in the Social Sciences as the average age of books (from the date on which it was accessioned into the library system) which are circulating in the browsing collection. However we cannot rely solely on the mean use age for the estimation of obsolescence in subject categories. For example, the data above shows that books in the Social Sciences would be removed from the shelves into storage facilities when they were between 4.7 and 6.5 years old. However, the standard deviation indicates that the possibility exists that these books may have been 'useful' and valuable to users for an additional number of years that range between 6.5 and 8.1. Figure 23 illustrates the movement patterns of books in the Social Sciences, with the R^2 values for each year indicated on the graph.

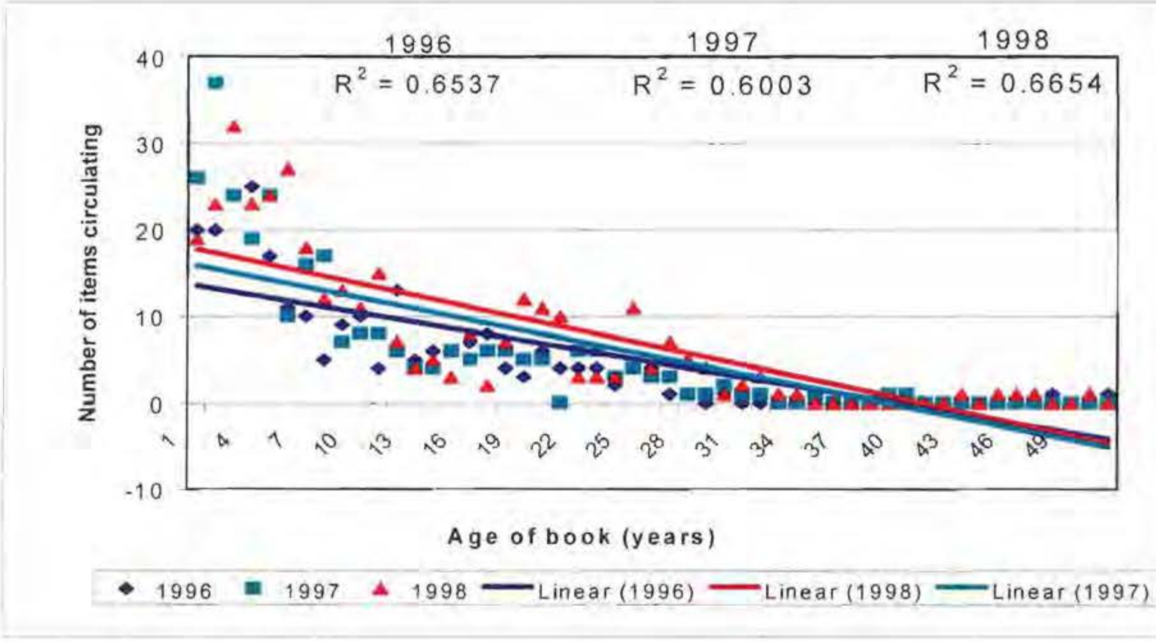


Figure 23: Pattern of book movement in the Social Sciences

The mean use age indicated that books should be removed from the shelves when they reached a maximum of 6.6 years of age (1998 figure in table 9). The illustration above shows that for the sample sets, R^2 is between 60 and 67%, which is not very good. Although R^2 has no critical value, this percentage means that only between 60 and 67% of the variables in the sample data can be explained. The regression line indicates that books in the Social Sciences will probably stop circulating when they are approximately 40 years old. However, the percentage of residual values that can be explained is too low for such an inference to be made. The circulation of books in the Social Sciences cannot be analysed for obsolescence solely by using the current methods. The variations that cannot be explained could be due to sampling error, or to other variables such as an increase or decrease in the number of books catalogued, or a decrease in books purchased, while the user population remains constant or increases. Mean use age cannot be solely relied upon as an estimate of obsolescence in different subjects. Thus one could concur with Fussler and Simon's observations that the prediction of use based on age is not very successful in the Social Sciences ("humanistic disciplines") (1969: 31).

The 25 percent of the subject collection which should statistically be removed as recommended for the Scientific disciplines (1969: 143-144) would constitute books aged from 14 years in 1996, 15 years old in 1997, to 19 years old in 1998 in the Social Sciences - well above the mean age use. In addition, the Social Sciences has the highest student enrolment rates, and is heavily underused, as illustrated by figure 8 in chapter 4.

De Jager advocated that books which were unused or little used for 25 years or more should be removed from the UCT's browsing collection (1994: 81). Books little- or underused in the overall 1996-1998 samples were found to be those in the age range 33 years and older, and this is depicted by their low levels of circulation activity, illustrated in figure 24.

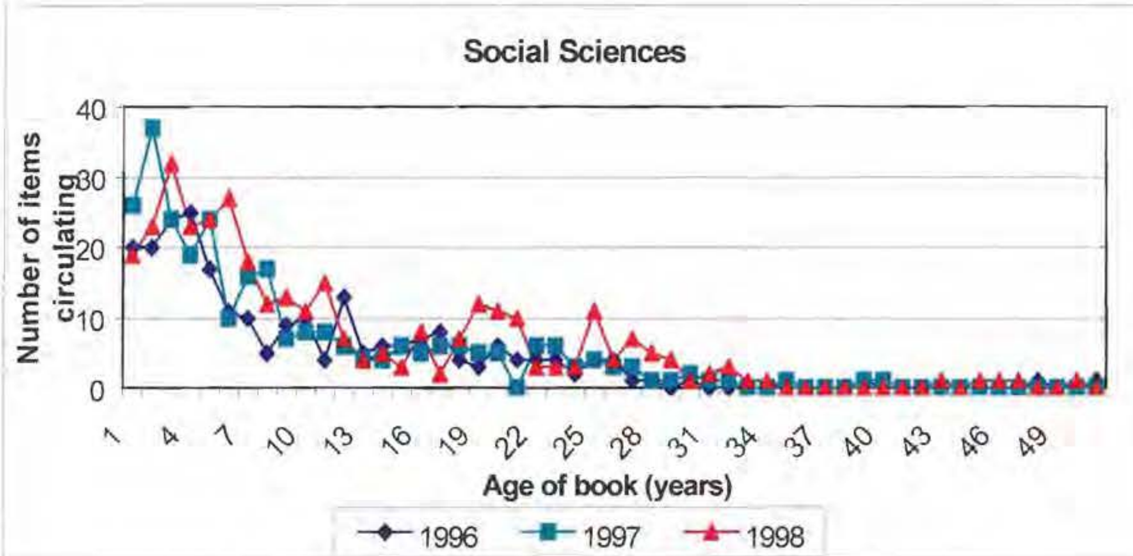


Figure 24: Circulation activity for Social Sciences during the period 1996, 1997 and 1998

Books aged 33 years and older form 1.2%, 1.1% and 2.1% of the Social Science data sets for the years 1996, 1997 and 1998 respectively, which are small proportions of the books in circulation. Removal of these items should not, therefore, have too large an effect on circulation statistics, especially since this subject accounts for the most circulation activity in the data samples, namely 23.6%, 26.9% and 32.9% in 1996, 1997 and 1998 respectively. In the Social Sciences, it is therefore very difficult to base weeding exercises on the age of a book.

The book movement and estimates of obsolescence in the Social Sciences was compared to the Sciences. Fussler and Simon found that age was a good predictor of book use in the latter. The use of books in Technology and Applied Science is graphically illustrated in figure 25.

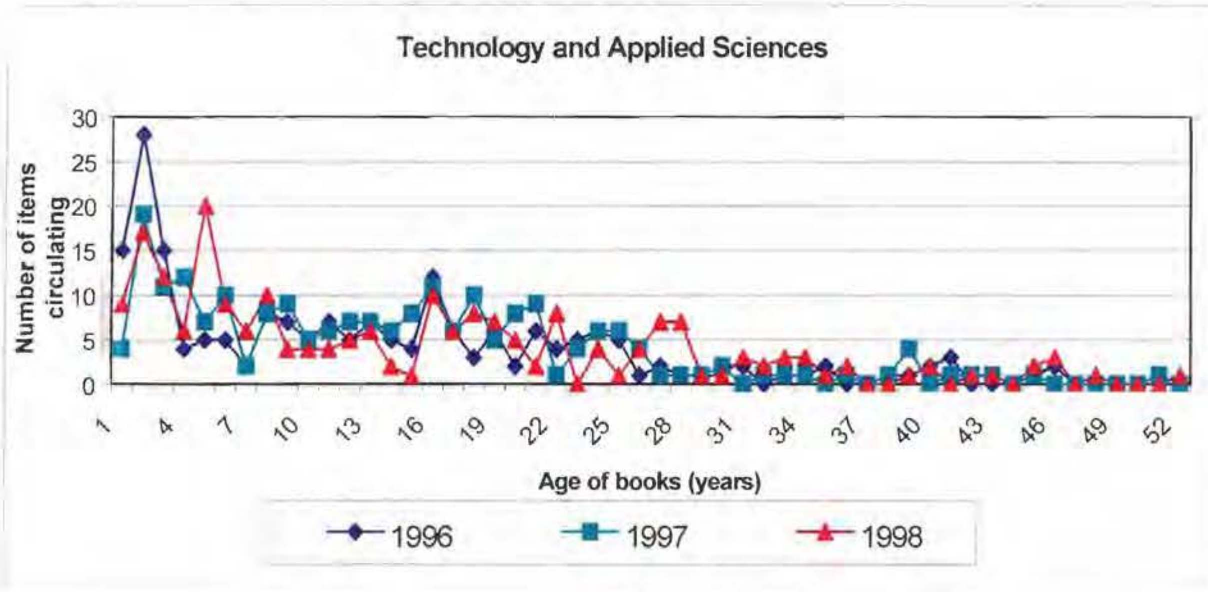


Figure 25: Pattern of book movement in the Technology and Applied Sciences

While older books are still very much in evidence as circulating in the collection, the median use average indicates that 4-year old books are most active. Therefore, theoretically, this field is obsolescing very rapidly (Lancaster, 1993: 109). Figure 25 demonstrates that book movement patterns decrease from the age of 27 to 25 years, concurring with de Jager's observations that little or unused books aged 25 years and older can be removed to storage.

6.5.4. **Impact of new additions to the collection on rates of obsolescence**

Fussler and Simon have suggested that the decrease in the use of all books may be perceived "as the natural outgrowth of adding more books" to a collection (1969: 91). In other words, the rate of aging of books may be perceived to be as a result of additions to the collection, where circulation of material already in the collection decreases as new additions are made. This can be measured by examining the overall book purchases in relation to circulation activity. A comparison between the circulation of new books in 1996, 1997, 1998 and the number of new volumes added to the stock of the Main library (see chapter 4.5.4.) revealed that very few of the books purchased during each year actually circulated in that year: an average of 0.85%. This would seem to corroborate that the newest books are consistently not in high demand, and do not have a marked effect on the use of other books in the collection.

6.6. CONCLUSION AND RECOMMENDATIONS

The objective of an obsolescence and weeding exercise is to remove from the core collection (that part of the collection actively circulating) those materials which are least likely to be used by library patrons. These can then be located in secondary storage, where they are less accessible to users, but cost less to the library in terms of space. Decisions regarding which books are to be removed from the core collection revolve around determining what percentage of future use the books in the collection can expect to receive. It also involves determining what percentage of usage of the core collection to retain as weeding proceeds. Collections also contain books that are not circulating, and therefore form part of the non-core collection. This study has however not undertaken to determine methods for removing non-circulating items from the collection, as they do not form part of the printed list of items due back into the library, which forms the basis of this investigation.

Previous studies such as those by Kent et al. have found that the use of books entering the collection peaks during the first year, then rapidly declines (1979: 20). The current investigation showed that in the UCT Main library, new books are not used often in their first year of accession, but that 2 to 3 years after they are first accessioned into the system, their circulation rates peak. Books aged 2 - 3 years old are in much heavier use and demand than the newest materials. New books entering the system seem to peak in their use when they are 2 - 3 years old, are heavily used until they are approximately 7 years old, enter a phase of average use which can last until the age of 32 years, and then have relatively little use from the age of 33 years. The results of investigations into the aging patterns of books at the UCT libraries therefore do not concur with the findings of Kent et al. at the University of Chicago, that books age very quickly after two years. They concluded that books are subject to rapid rates of obsolescence and that as books get older, first time use is reduced (1979: 20).

Fussler and Simon determined that the oldest 25 percent of the general collection should be removed, since their investigations indicated that material in this range was little used or unused. The investigation at the UCT libraries found that if mean use age of books circulating is considered, then the results concurred with this conclusion. The oldest 23.2% could be removed to storage or weeded completely from the collection, but they would still fall within the range of average use. If however, subject areas are investigated, then we find that books aged 33 years and older constitute on average of 5.8% of the sampled database. It is therefore recommended that if cost-effectiveness is to be achieved, and no study is to be done into specific titles usage in specific subjects in the Main library, that books aged 33 years and older or bear no evidence of recent use be removed from the collection. The cost of maintaining them on the shelves would be more than the cost of removing them to storage facilities, and they should therefore be removed from the collection, in order to make newer material more visible to users. "The accuracy with which use can be predicted increases considerably when records of past use are filtered in" (Baker and Lancaster, 1991: 83).

It is recommended that subjects be analysed in order to obtain a more detailed picture of circulation of books. The value of R^2 should be determined for each subject on a year-to-year basis. If the values of R^2 continue to be low, or much variation in the value from year-to-year is displayed, this could be explained by sampling error, or other variables as discussed under 6.5.4.1. It is therefore recommended that the sample size be increased (especially if the collection is added to annually). In addition, it is recommended that the data sample be derived twice a year: once during the first and then again during the second semester. This will provide for any subject bias that could have entered the sample due to courses not being offered during the second semester. There is, however, no guarantee that this will provide an increased percentage of R^2, as it is impossible to predict what the following year's circulation analysis will be. The inferences about the relationship between a book's age and its usage can provide *estimates* of what *could* happen in the future, but predictions cannot be made with any accuracy or certainty. An investigation into the usage of specific titles is therefore recommended, which studies the circulation dates of books in specific subjects, in order to determine whether a usage pattern exists, and indeed whether a book is being used at all.

It could be shown that the overall circulation rate of books in the Main library has remained fairly consistent. This could be due to the fact that the student population in faculties represented in the Main library has remained consistent at 71.2%, 71.1% and 71.0% for the years 1996, 1997 and 1998 respectively (University of Cape Town Libraries, 1999), and therefore an increased demand for books did not occur. It has been shown that mostly undergraduates use 1-year old books. Although 1-year old books constitute only 1 percent of the books in circulation, it has been shown that the demand for new books is not by staff, whose 3-month borrowing period could influence the circulation rates: on average, 62 % of new books are borrowed by undergraduates. This indicates that there is high demand for books in this category, but weeding the collection and making the newer books more visible to users could increase the circulation figures in relation to older materials. If they are not doing so, lecturers could include the newest materials on their reading lists.

Fussler and Simon found that books in the Sciences and Social Sciences age differently. This investigation has shown that Technology and Applied Sciences and Social Science books in the Main library do have different circulation and obsolescence patterns. The nature of publications in the Technology and Applied Sciences is such that books do become obsolescent very quickly; the most recent findings and investigations are published in Scientific journals, and the library purchasing statistics for this subject reflect this. In 1998 the cost of periodicals in

Engineering and Technology amounted to R1 711 143. The Technology and Applied Sciences' total journal stock amounted to 31 729 volumes, in comparison to a total book stock of 24037 volumes. In comparison to this, the Social Sciences have a much larger book stock of 221843 volumes, and a periodicals stock of 61375 volumes. The Engineering department at the UCT spent 84.5 percent of their library budget allocation on periodicals, while the Social Science faculty spent 64.6 percent if its budget on periodicals (University of Cape Town Libraries, 1999: 5). While the high cost of journals, as well as the relatively higher average prices of journals in the Scientific disciplines in comparison to the Social Sciences is acknowledged, the Engineering Faculty spends 20 percent more of its budget on journals than the Social Science faculty, emphasising the very current nature of their required information. In addition, many of the older books that are used in the library are basic texts, which cover fundamental theories which do not change, and are well-used in the core courses. The very nature of books in this discipline demands that qualitative input be recognised as imperative for any weeding exercises which take place. This can be achieved by the input of the subject librarian as well as the user in order to determine which books can be categorised as underused and removed from the open shelves. It might also include an analysis of individual titles, in order to specify which specific titles should be removed from the shelves.

It is recommended that books in the Social Sciences accession dated 33 years and older be removed from the open shelves, as they circulated, on average, during 1996-1998, 1.5 times, and their circulation represented only 1% of the total circulation activity.

With the amalgamation of the Education, Arts, Social Science and Music faculties, and the Fine Arts department into the Humanities Faculty in 2000, branch libraries will be amalgamated into the Main library. As a result, the Main library can not only expect much more activity, but also an increased book stock, which requires more space for books on the open shelves, and if necessary, in storage facilities. While the new Central Library will accommodate the increased book collection, weeding of the collection will become imperative if new materials are to be made visible, new materials added, and cost-effectiveness is to be achieved and maintained.

CHAPTER 7

CONCLUSIONS AND RECOMMENDATIONS

Within an environment of limited resources and funding in Higher Education in South Africa, it is important for academic libraries, such as the UCT libraries, to evaluate and measure the performance of their largest tangible asset, the collection. In response to the decreasing budget of the UCT libraries, the fundamental objective of this study was to determine whether library resources, specifically the book collection, were being used in an effective and cost-effective manner. In addition, methods for streamlining and managing the book collection of the UCT library's Main library were sought.

The investigation followed up a study conducted in 1992, which aimed to establish the proportion of books in the library which were actively circulating and whether the use of books was declining as they grew older. The 1992 study found that there was heavy demand for that proportion of books in the library that were circulating during the previous six years (1987-1992), and recommended that a weeding policy be implemented in the library, as large proportions of books were no longer in active use. It was found that heavy pressure existed for a limited number of items in high demand (de Jager, 1995: 214). A follow-up study, conducted in 1996, showed that there was considerable similarity in the use of books on the open shelves between 1992 and 1996, but that the proportion of new books circulating in 1996 was markedly higher than in 1992. It was however difficult to draw any conclusions based on one "snapshot" of data. Based on de Jager's suggestion that the snapshot be repeated (1995: 221) and the recommendation by Kelley that accumulated data be used for analysis (1990: 30), data were collected over three years in order to measure the overall performance of the book collection.

The objectives of the current investigation were threefold:

1. The circulation and rate of usage of new books entering the collection were investigated, in order to determine the proportion of new books that were actively circulating, and provide indications of the effectiveness and cost-effectiveness of new acquisitions. Circulation patterns in broad subjects were also investigated.

2. It was known that the impending amalgamation of the catalogues of the five tertiary institutions in the Western Cape would produce changes when it was implemented. In order to provide comparative data that could be used for decision-making and planning, a pre-implementation benchmark of circulation frequency of books in relation to their age was created.

3. The viability of retaining unused or little-used books on the open shelves, instead of moving them to compact storage facilities or weeding them from the collection altogether was also investigated.

The investigations demonstrated that in general, the patterns of year-to-year book movement are very similar. In the Main library, new books are not in heavy demand in the circulating collection. They constituted an average of 1% of overall circulation activity during 1996 to1998. Books circulate most often during the first seven years after accession, with usage peaking during the second and third years after accession into the system. This indicated that the newest books are not in heavy demand in the Main library. Undergraduates are responsible for the use of the majority of books in the circulating collection, including the use of new books entering they system, which reinforces de Jager's observation that the library was used mainly for study and teaching purposes, and was less likely to be used for research.

The investigation into subject usage demonstrated that some subjects are heavily overused, representing high demand, while others display marked patterns of underuse. It has also been demonstrated that levels of collection effectiveness vary from subject to subject, and because books are either heavily overused or underused, the effectiveness levels or return on the investment of resources are correspondingly either high or low.

The actual use in relation to the total stock available for use in the Social Sciences and Literature and Rhetoric show that these subjects appear to be underused. Although these two subjects did not appear to be circulating very effectively at the time of the investigations, there does seem to have been an improvement in the performance of the Social Sciences. The Natural Sciences and Mathematics and Applied and Technological Sciences appeared to be consistently heavily overused, and budget allocations seemed to have taken this high demand into account. It is recommended that some consistency in budget allocation be attained if cost-effectiveness is to be pragmatically measured. This problem may however be overcome if new selection policies are implemented in the future, with subject specialists as well as academics being accountable for book selection.

Older books that are still available on the open shelves and circulate relatively few times per year have a negative impact on the performance figures of the book collection, as they still form part of the total book population and are used for analytical purposes. It is therefore recommended that books that receive relatively little use in comparison to other books in the collection be removed to compact storage facilities. Consequently, books aged 33 years and older, representing 5.8% of the collection, with an average of less than 9 uses per year over the three-year period under consideration, could be moved to storage. Here they could be less costly to maintain than keeping them on the open shelves. They would nevertheless be accessible via the catalogue.

Poor collection performance could be attributed to poor selection criteria. At the time of the investigation, there were no collection development policies at the UCT libraries. It is therefore recommended that a collection development policy be implemented in order to streamline collection development and management, especially in the broader context of accountability for decisions. If performance indicators are to be used to evaluate resources such as the book collection, standards such as those published by the ARL, the ACRL and IFLA could be studied, as they do propose certain generic indicators that can be used to compare library performances. These need not be used for comparisons between different libraries, but could serve as a method of comparing the performances of the different branch libraries of the UCT libraries.

The established model of circulation activity in chapter 5 can assist the collection management process, since any major changes to the book collection will have an impact on circulation rates. Benchmarks can serve as a method for self-assessment and self-monitoring of activities, for the provision of continuous quality control. Comparison of circulation activity, using the established benchmark, can reveal differences between the actual behaviour of the collection and the expected behaviour. A comparison of the 1992 benchmark and the 1996-1998 model showed that there were variations in the expected behaviour: the use of the newest books had improved. The benchmarking activity is therefore a useful measure of the performance of the books in the library collection. It is not recommended that benchmarking for comparisons between libraries are adopted in the current context of disparate LIS resources between HBUs and HWUs in South Africa. Internal benchmarking is recommended, and other libraries or businesses outside the LIS field should be investigated for evidence of best-practice benchmarks. These could be used as a basis for improving effectiveness levels in libraries.

It is also suggested that specific subjects in the broad subject categories be analysed to obtain a more detailed picture of annual book circulation. In addition, this study should be performed during each semester, to reduce the bias that could result if courses not offered in the second semester are not represented in the sample. Usage of specific titles should be investigated to prevent books which are still circulating relatively well from being sent to storage facilities, where their retrieval could prove to be costly, and for the identification of books which are not circulating at all, which this study of obsolescence could not accomplish.

In summary, the study has demonstrated that performance measurement must involve both quantitative and qualitative measures if the perceived behaviour of the book collection is to be explained. It has also been suggested that the library's collection management policy should adopt expressed levels of service goals and objectives, so that there is a model or guideline against which levels of performance can be measured. An attempt to do this has been undertaken with the development of the benchmark for circulation activity in this thesis. It is clear that quantitative measures can show where such changes are occurring, but may not be able to demonstrate why. It is therefore apparent that qualitative indicators should be viewed in conjunction with quantitative indicators in order to provide reasons for the actual performance levels.

The amalgamation of the library holdings of the five tertiary institutions in the Western Cape will have an extensive impact on the circulation activity of books in the library. It is therefore recommended that this study be repeated once these systems have been implemented, since improved access to materials can nominally create some measure of equality between the library collections of the Historically Black Universities and Historically White Universities, and create pathways for improving co-operative collection development in a cost-effective manner. This would be consistent with the drive for economy of service provision which is being displayed in Higher Education in South Africa, and indeed globally.

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APPENDICES

Appendix i

UNIVERSITY OF CAPE TOWN LIBRARIES

Statement of Goals and Objectives

UNIVERSITY OF CAPE TOWN LIBRARIES

GOALS AND OBJECTIVES

1. GOALS AND OBJECTIVES

1.1 The basic goal of the University of Cape Town Libraries is the effective development of library and information services to all sections of the University community to promote the educational, research and service programmes of the University. At the same time the University Libraries recognise their obligation to support the intellectual activity of scholars and students, regionally, nationally and internationally, through their involvement with other libraries and library organisations in view of the unique nature of UCT's library collections.

1.2 The Libraries of the University of Cape Town strive to fulfil this goal by:

1.2.1 Selecting and acquiring as much of the recorded knowledge of mankind as is appropriate for the current and expected educational and research requirements of the library users within the limitations of available financial resources.

1.2.2 Maintaining close relationships with officials of the University and with academic departments to ensure optimal use of the limited resources available to promote the development of the Library in accordance with University objectives and plans.

1.2.3 Organising, processing and housing material acquired so that it is physically and intellectually accessible to the Libraries' users.

1.2.4 Interpreting the collections to the users so that they can fully exploit and have maximum benefit from the information resources of the libraries, while also obtaining access to reading information located elsewhere.

1.2.5 Maintaining all information and literary materials contained in the collections in excellent condition consistent with the need for accessibility to the user.

1.2.6 Maintaining constructive working relationships with other research libraries, library associations and co-operative organisations for the promotion of scholarship and the development of mutually advantageous collection policies and interlibrary loans.

2. THE UNIVERSITY'S LIBRARY SYSTEM

which contains over 690,000 volumes and currently receives over 8,600 periodical titles, consists of a main library complex and ten branch libraries throughout the campuses.

2.1 The J W Jagger Library, situated along University Avenue on the Upper Campus, is the headquarters of the University Library Service.

2.1.1 It contains the union catalogues of both monographs and periodicals, which reflect the entire holdings of UCT Libraries.

2.1.2 The J W Jagger Library is linked via the Menzies Building to the Leslie Social Science Building in the south and to the Immelman Building in the north. These four components constitute the Linear Library.

2.2 Other libraries on the Upper Campus are:

- 2.2.1 African Studies Library, in the Leslie Commerce Building
- 2.2.2 Architecture Library, in the Centlivres Building
- 2.2.3 Bolus Herbarium Library, in the Botany Building
- 2.2.4 Brand van Zyl Law Library, in the Kramer School of Law Building
- 2.2.5 Jewish Studies Library, in Rachel Bloch House

2.3 In addition, there are the following libraries on other campuses:

- 2.3.1 Carleton Harrison Education Library, in the Education Building on the Middle Campus
- 2.3.2 Hiddingh Hall Library (which caters for the Departments of Drama and Fine Arts), on the Hiddingh Campus
- 2.3.3 Medical Library, on the Medical Campus
- 2.3.4 Institute of Child Health Library (a sub-branch of the Medical Library which specialises in all aspects of paediatrics), in the Red Cross Children's Memorial Hospital
- 2.3.5 W H Bell Music Library, in the South African College of Music on the Lower Campus

3. GENERAL FUNCTIONS OF UCT LIBRARIES

These can be divided into two: public and support services.

PUBLIC SERVICES

Linear Library (Jagger, Menzies, Leslie, Immelman):
- Circulation
- Current Periodicals Reading Room
- Film Loan Services
- Interlibrary Loans
- Reference Centre
- Short Loan Centre
- Union catalogues

Branch Libraries:
- Architecture
- Bolus Herbarium (Botany)
- Education
- Hiddingh Hall (Fine Art; Drama)
- Institute of Child Health
- Law
- Medical
- Music

African Studies & Special Collections:
- African Studies Library
- Government Publications Department
- Jewish Studies Library
- Manuscripts & Archives Department
- Rare Books & Special Collections Department

SUPPORT SERVICES

Administrative:
- Accounts
- Building maintenance
- Establishment control
- Records management
- Secretarial services
- Security
- Van

Bindery

Computerisation

Conservation Department

Development

Photocopier Unit

Photographic & Microform Units

Technical:
- Acquisitions Department
- Cataloguing Department
- Periodicals Department

4. ORGANISATION

The head of the Libraries is the University Librarian and Director of University Libraries. He is assisted by two Deputy Directors, five Chief Librarians and a Financial Manager. The areas of responsibility are as follows:

4.1 Deputy Director

4.1.1 *Administrative Services:*
Accounts Office
Library Supervisor
Photocopiers
Secretarial Services

4.1.2 *Branch Libraries:*
Architecture Library
Bolus Herbarium Library
Education Library
Hiddingh Hall Library
Law Library
Music Library

4.1.3 *Linear Library:*
Circulation
Engineering & Science Library
Interlibrary Loans Department
Reference Centre
Short Loan Centre

4.2 Deputy Director

4.2.1 *African Studies and Special Collections:*
African Studies Library
Government Publications Department
Jewish Studies Library
Manuscripts and Archives Department
Rare Books and Special Collections Department

4.2.2 Bindery

4.2.3 Computerisation

4.2.4 Conservation Department

4.2.5 Development

4.2.6 *Medical Library Services:*
Medical Library
Institute of Child Health Library

4.2.7 *Technical Services:*
Acquisitions Department
Cataloguing Department
Periodicals Department

5. ADMINISTRATION

As in the University as a whole where the Committee system operates, so too in the Library a number of Committees have been constituted in order to assist the University Librarian in the implementation of his responsibilities. These are:

5.1 Binding Committee
5.2 Conservation Committee
5.3 Library Co-ordinating Council
5.4 Library Health & Safety Committee
5.5 Library Staffing Committee
5.6 Senate Library Committee
  5.6.1 Collections Development Sub-Committee
5.7 Steering Committee for Library Computerisation
5.8 Strategic Planning Committee
5.9 Technical Services Committee

6. **STATISTICS** (1996/97)

6.1 LIBRARY STAFF [filled posts] (1997)

Professional librarians	54
Library assistants	63
Administrative and clerical staff	10
Technical officers	2
Departmental assistants	55
Total	184

6.2 USERS (1997)

Staff	4,350
Students	15,608
Subscribers	764

6.3 LIBRARY STOCK (1997)

Books:	
Volumes	690,376
Titles	552,968
Periodicals:	
Volumes	371,172
Titles - current	8,674
Titles - total	17,317
Audiovisual materials	95,523
Manuscripts (linear metres)	2,361

6.4 INTERLIBRARY LOANS (1997)

Jagger Library	17,522
Medical Library	10,671
Music Library	338
Total	28,531

6.5 BUDGET (1996)

Library materials		9,593,916
General operating & computer costs		2,279,736
Salaries and staff benefits		11,612,121
	Total	23,485,773

6.6 CATALOGUING (1997)

Books and theses		15,974
Periodicals		358
Audiovisual materials		3,021
Pamphlets		1,354
	Total	20,707

6.7 CIRCULATION (1997)

Books		482,253
Periodicals		103,962
Microform		2,037
Audiovisual		29,102
Manuscripts and Archives		13,990
Photocopies		80,208
	Total	711,552

6.8 BINDING AND RESTORATION (1997)

Binding	16,892
Restoration	560

6.9 OTHER (1997)

Photographic & Microform Units:	
Negatives copied	460
Prints made	365
Slides	35
Microfilm (16mm)	6,837

RJG
6.98

Appendix ii

UNIVERSITY OF CAPE TOWN LIBRARIES

Departmental Subject Profile used in the allocation formula

to generate funds for the purchase of library materials.

UNIVERSITY OF CAPE TOWN LIBRARIES

DEPARTMENTAL SUBJECT PROFILE

Department .... **Date Due** ....

Aim: To establish (a) a profile of departmental subject interests as it affects the buying of library materials, and
(b) the level of academic use for which purchases are made.

Use of profile: To establish price and title ranges of books for collection development purposes. Departmental subject profiles are combined to form a faculty subject profile which is used in the allocation formula to generate funds for the purchase of library materials.

Levels of collecting intensity:

A. Comprehensive: The aim is exhaustiveness.

B. Research: Major published source materials required for postgraduates and independent research. (It includes all major reference works, specialised monographs, an extensive collection of journals and the main indexing and abstracting services in the field.)

C. Study: Supports undergraduate and graduate course work. (It includes a wide range of basic monographs, complete collections of the works of important writers, selections from the works of secondary writers, a selection of representative journals and the reference books and fundamental bibliographic apparatus pertaining to the subject.)

D. Minimal: Very basic works.

E. Not collected: Subject areas that are deliberately excluded from the library's collection.

How to enter your profile on the enclosed SUBJECT DESCRIPTORS sheets:

a) Use the left-hand column headed "B" to enter the level of collecting intensity (A, B, C, etc.) against each pertinent subject.
b) Additional subject terms not found on the lists can be entered on a separate sheet along with their ratings.
c) You may also enter ratings against the **SA** ("See Also" or related) terms and the **SU** ("See Under" or preferred) terms on the right-hand side.
d) SN (Scope Notes) are merely definitions which clarify the meanings of terms and therefore need no ratings.

YOUR LIBRARY CONTACT IS:

Name ....

Telephone ....

Appendix iii

UNIVERSITY OF CAPE TOWN LIBRARIES

Breakdown of library user categories

Library User BOOK/PLUS description	Details of description
A	Undergraduate
B	Postgraduate
P	Staff
S	Subscriber S
W	Tutor
V	Subscriber V
Q	Architecture and Planning
H	Botany undergraduate
T	Branch loan
L	LLB
Y	Temporary undergraduate
N	Botany postgraduate
O	Retired staff
E	Education spec
J	Music undergraduate
Z	Temporary postgraduate

Appendix iv

Excel Spreadsheet of 1996-1998 accession dates of books,

in relation to 1992

Accession date	1992	1996	1997	1998
1932		1		
1946		3		
1947		2	1	2
1948		2	3	6
1949		2	1	2
1950	1	2	1	0
1951	2	4	0	1
1952	3	1	2	1
1953	2	1	2	4
1954	1	1	0	3
1955	4	5	2	0
1956	5	4	4	3
1957	2	4	2	1
1958	3	6	2	0
1959	8	1	9	4
1960	7	4	2	2
1961	2	9	5	3
1962	7	3	4	2
1963	3	6	3	5
1964	16	7	7	6
1965	11	12	4	6
1966	18	6	4	7
1967	11	13	6	16
1968	15	7	8	13
1969	16	13	11	12
1970	25	13	9	11
1971	13	20	9	18
1972	26	18	12	19
1973	23	16	18	21
1974	23	24	13	26
1975	14	19	23	17
1976	21	19	13	18
1977	27	25	21	19
1978	22	19	22	20
1979	29	21	18	27
1980	28	31	24	31
1981	38	34	21	22
1982	32	22	27	25
1983	35	24	21	29
1984	56	22	23	11
1985	32	35	27	13
1986	52	19	27	22
1987	65	31	29	24
1988	62	32	37	41
1989	75	29	34	30
1990	78	33	51	31
1991	36	35	41	34
1992	16	51	57	44
1993		83	72	67
1994		90	69	65
1995		70	86	54
1996		70	93	74
1997			51	70
1998				49
	965	1024	1031	1031

APPENDIX v

Ranked distribution (a) and Data Analysis (b) of books circulating in the Linear Library in relation to their ages for the samples derived during 1996, 1997, 1998, and in relation to 1992.

Appendix v (a): Ranked distribution of ages of books in circulation				
Age of books in circulation (years)	Number of items circulating in 1996	number of items circulating in 1997	Number of items circulating in 1998	Number of items circulating in 1992
1	70	51	49	16
2	70	93	70	36
3	90	86	74	78
4	83	69	54	75
5	51	72	65	62
6	35	57	67	65
7	33	41	44	52
8	29	51	34	32
9	32	34	31	56
10	31	37	30	35
11	19	29	41	32
12	35	27	24	38
13	22	27	22	28
14	24	23	13	29
15	22	21	11	22
16	34	27	29	27
17	31	21	25	21
18	21	24	22	14
19	19	18	31	23
20	25	22	27	23
21	19	21	20	26
22	19	13	19	13
23	24	23	18	25
24	16	13	17	16
25	18	18	26	15
26	20	12	21	11
27	13	9	19	18
28	13	9	18	11
29	7	11	11	16
30	13	8	12	3
31	6	6	13	7
32	12	4	16	2
33	7	4	7	7
34	6	7	6	8
35	3	3	6	3
36	9	4	5	2
37	4	5	2	5
38	1	2	3	4
39	6	9	2	1
40	4	2	4	2
41	4	2	0	3
42	5	4	1	2
43	1	2	3	1
44	1	0	0	
45	1	2	3	
46	4	2	4	
47	2	0	1	
48	2	1	1	
49	2	1	0	
50	2	3	2	
51	3	1	6	
52			2	
	1023	1031	1031	965

Data description

1996		1997		1998		1992	
Mean	20.05882353	Mean	20.21568627	Mean	19.82692308	Mean	22.44186047
Standard Error	2.939042363	Standard Error	3.196237215	Standard Error	2.726569062	Standard Error	3.138074391
Median	16	Median	12	Median	16.5	Median	16
Mode	2	Mode	2	Mode	2	Mode	2
Standard Deviation	20.98896068	Standard Deviation	22.82569931	Standard Deviation	19.66156912	Standard Deviation	20.5777299
Sample Variance	440.5364706	Sample Variance	521.012549	Sample Variance	386.5773002	Sample Variance	423.4429679
Kurtosis	3.184238468	Kurtosis	2.265639415	Kurtosis	1.03729171	Kurtosis	0.91361273
Skewness	1.778761396	Skewness	1.633442484	Skewness	1.274180783	Skewness	1.221517007
Range	89	Range	93	Range	74	Range	77
Minimum	1	Minimum	0	Minimum	0	Minimum	1
Maximum	90	Maximum	93	Maximum	74	Maximum	78
Sum	1023	Sum	1031	Sum	1031	Sum	965
Count	51	Count	51	Count	52	Count	43
Largest(1)	90	Largest(1)	93	Largest(1)	74	Largest(1)	78
Smallest(1)	1	Smallest(1)	0	Smallest(1)	0	Smallest(1)	1
Confidence Level(95.0%)	5.903242728	Confidence Level(95.0%)	6.419834002	Confidence Level(95.0%)	5.473811584	Confidence Level(95.0%)	6.332892513

APPENDIX vi

Distribution of books and Descriptive Data in the subjects Philosophy and Psychology, including Religion, Social Sciences, Natural Sciences and Mathematics, Technology and Applied Sciences and Literature and Rhetoric, in relation to the number of items circulating in the Main library during each year for the period 1996 – 1998.

Philosophy and Psychology, including Religion			
Age of books in circulation (years)	Number of items circulating in 1996	Number of items circulating in 1997	Number of items circulating in 1998
1	7	8	4
2	10	9	7
3	9	16	2
4	11	13	9
5	4	7	5
6	6	11	5
7	4	11	3
8	2	4	2
9	1	7	4
10	2	4	2
11	1	7	4
12	2	3	5
13	1	4	5
14	1	3	4
15	4	3	2
16	4	2	1
17	4	3	3
18	4	3	2
19	2	2	3
20	2	3	1
21	4	3	2
22	0	2	1
23	1	7	3
24	2	0	1
25	3	4	2
26	2	1	2
27	1	0	1
28	2	3	1
29	1	2	0
30	1	1	3
31	1	0	0
32	1	0	3
33	1	0	0
34	0	1	1
35	0	0	1
36	0	0	1
37	0	0	0
38	1	0	0
39	1	1	0
40		0	0
41		0	0
42		0	0
43		1	0
Totals	103	149	95

	Descriptive data: Philosophy and Psychology, including Religion				
1996		*1997*		*1998*	
Mean	2.395349	Mean	3.465116	Mean	2.209302326
Standard Error	0.411813	Standard Error	0.599325	Standard Error	0.314926101
Median	1	Median	3	Median	2
Mode	1	Mode	0	Mode	0
Standard Deviation	2.700437	Standard Deviation	3.930036	Standard Deviation	2.065108547
Sample Variance	7.292359	Sample Variance	15.44518	Sample Variance	4.264673311
Kurtosis	2.837103	Kurtosis	1.761162	Kurtosis	1.601211171
Skewness	1.748732	Skewness	1.458151	Skewness	1.168553641
Range	11	Range	16	Range	9
Minimum	0	Minimum	0	Minimum	0
Maximum	11	Maximum	16	Maximum	9
Sum	103	Sum	149	Sum	95
Count	43	Count	43	Count	43
Largest(1)	11	Largest(1)	16	Largest(1)	9
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	0.831072	Confidence Level(95.0%)	1.209487	Confidence Level(95.0%)	0.635546803

Social Science			
Age of books in circulation (years)	number of items circulating in 1996	number of items circulating in 1997	number of items circulating in 1998
1	20	26	19
2	20	37	23
3	24	24	32
4	25	19	23
5	17	24	24
6	11	10	27
7	10	16	18
8	5	17	12
9	9	7	13
10	10	8	11
11	4	8	15
12	13	6	7
13	5	4	4
14	6	4	5
15	6	6	3
16	7	5	8
17	8	6	2
18	4	6	7
19	3	5	12
20	6	5	11
21	4	0	10
22	4	6	3
23	4	6	3
24	2	3	3
25	4	4	11
26	4	3	4
27	1	3	7
28	1	1	5
29	0	1	4
30	1	2	1
31	0	1	2
32	0	1	3
33	0	0	1
34	0	0	1
35	0	1	0
36	0	0	0
37	0	0	0
38	0	0	0
39	1	1	0
40	0	1	0
41	0	0	0
42	0	0	0
43	0	0	1
44	0	0	0
45	0	0	1
46	0	0	1
47	0	0	1
48	1	0	0
49	0	0	0
50	0	0	1
51	1	0	0
Totals	241	277	339

	Data description: Social Sciences				
1996		*1997*		*1998*	
Mean	4.725490196	Mean	5.431373	Mean	6.647059
Standard Error	0.912689811	Standard Error	1.129378	Standard Error	1.143378
Median	2	Median	3	Median	3
Mode	0	Mode	0	Mode	0
Standard Deviation	6.517908963	Standard Deviation	8.06537	Standard Deviation	8.16535
Sample Variance	42.48313725	Sample Variance	65.0502	Sample Variance	66.67294
Kurtosis	2.527850568	Kurtosis	4.76509	Kurtosis	1.383227
Skewness	1.756589555	Skewness	2.178339	Skewness	1.453298
Range	25	Range	37	Range	32
Minimum	0	Minimum	0	Minimum	0
Maximum	25	Maximum	37	Maximum	32
Sum	241	Sum	277	Sum	339
Count	51	Count	51	Count	51
Largest(1)	25	Largest(1)	37	Largest(1)	32
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	1.833192185	Confidence Level(95.0%)	2.268423	Confidence Level(95.0%)	2.296543

Natural Sciences and Mathematics			
Age of books in circulation (years)	number of items circulating in 1996	number of items circulating in 1997	number of items circulating in 1998
1	9	5	5
2	8	5	7
3	13	16	5
4	12	16	5
5	9	15	9
6	5	9	9
7	6	5	7
8	8	11	6
9	6	6	7
10	7	5	4
11	3	5	6
12	5	5	3
13	4	7	4
14	5	4	2
15	2	1	1
16	7	4	5
17	3	3	6
18	2	1	2
19	4	0	4
20	4	0	6
21	3	3	2
22	3	2	3
23	5	1	2
24	4	2	3
25	1	0	2
26	4	1	1
27	3	2	2
28	2	2	3
29	3	1	5
30	4	0	1
31	1	3	3
32	6	2	1
33	3	1	0
34	1	1	0
35	1	0	2
36	1	0	1
37	1	2	1
38	0	0	1
39	1	1	0
40	0	0	2
41	1	0	0
42	0	0	0
43	0	0	0
44	0	0	0
45	0	1	0
46	1	0	0
47	0	0	0
48	1	0	0
49	0	0	0
50	0	0	0
51	0	0	1
Totals	172	148	139

	Descriptive data: Natural Sciences and Mathematics				
1996		*1997*		*1998*	
Mean	3.372549	Mean	2.90196	Mean	2.72549
Standard Error	0.4471792	Standard Error	0.57275	Standard Error	0.360912
Median	3	Median	1	Median	2
Mode	1	Mode	0	Mode	0
Standard Deviation	3.1934983	Standard Deviation	4.09026	Standard Deviation	2.577428
Sample Variance	10.198431	Sample Variance	16.7302	Sample Variance	6.643137
Kurtosis	0.9728005	Kurtosis	3.89009	Kurtosis	-0.381575
Skewness	1.1072989	Skewness	2.02992	Skewness	0.761784
Range	13	Range	16	Range	9
Minimum	0	Minimum	0	Minimum	0
Maximum	13	Maximum	16	Maximum	9
Sum	172	Sum	148	Sum	139
Count	51	Count	51	Count	51
Largest(1)	13	Largest(1)	16	Largest(1)	9
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	0.8981862	Confidence Level(95.0%)	1.1504	Confidence Level(95.0%)	0.724914

Technology and Applied Sciences			
Age of books in circulation (years)	Number of items circulating in 1996	Number of items circulating in 1997	Number of items circulating in 1998
1	11	4	9
2	15	19	17
3	28	11	12
4	15	12	6
5	4	7	20
6	5	10	9
7	5	2	6
8	2	8	10
9	8	9	4
10	7	5	4
11	5	6	4
12	7	7	5
13	5	7	6
14	7	6	2
15	5	8	1
16	4	11	10
17	12	6	6
18	6	10	8
19	3	5	7
20	6	8	5
21	2	9	2
22	6	1	8
23	4	4	0
24	5	6	4
25	6	6	1
26	5	4	4
27	1	1	7
28	2	1	7
29	1	1	1
30	1	2	1
31	2	0	3
32	2	1	2
33	0	1	3
34	1	1	3
35	1	0	1
36	2	1	2
37	0	0	0
38	0	1	0
39	1	4	1
40	1	0	2
41	2	1	0
42	3	1	1
43	0	1	1
44	0	0	0
45	0	1	2
46	1	0	3
47	2	0	0
48	0	0	1
49	0	0	0
50	0	0	0
51	0	1	0
52	0	0	1
Totals	200	206	212

	Technology and Applied Sciences				
1996		1997		1998	
Mean	4.057692	Mean	4.038462	Mean	4.076923
Standard Error	0.694415	Standard Error	0.587682	Standard Error	0.598418
Median	2	Median	2	Median	3
Mode	0	Mode	1	Mode	1
Standard Deviation	5.007498	Standard Deviation	4.237839	Standard Deviation	4.315254
Sample Variance	25.07504	Sample Variance	17.95928	Sample Variance	18.62142
Kurtosis	9.722016	Kurtosis	1.448926	Kurtosis	3.430521
Skewness	2.650077	Skewness	1.16989	Skewness	1.678149
Range	28	Range	19	Range	20
Minimum	0	Minimum	0	Minimum	0
Maximum	28	Maximum	19	Maximum	20
Sum	211	Sum	210	Sum	212
Count	52	Count	52	Count	52
Largest(1)	28	Largest(1)	19	Largest(1)	20
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	1.394095	Confidence Level(95.0%)	1.179821	Confidence Level(95.0%)	1.201373

Literature and Rhetoric			
Age of books in circulation (years)	number of items circulating in 1996	number of items circulating in 1997	number of items circulating in 1998
1	5	3	2
2	5	8	11
3	7	7	6
4	7	5	7
5	9	9	5
6	9	5	6
7	6	4	3
8	4	1	2
9	2	3	1
10	2	8	2
11	4	2	5
12	4	3	1
13	5	2	2
14	2	3	0
15	2	0	4
16	9	2	4
17	2	2	7
18	5	2	2
19	3	4	2
20	6	2	3
21	2	2	2
22	3	1	1
23	8	2	9
24	2	2	4
25	3	3	8
26	4	3	5
27	5	1	2
28	5	0	1
29	1	1	0
30	6	1	4
31	2	2	2
32	2	0	6
33	2	1	2
34	3	3	0
35	1	1	2
36	4	3	1
37	3	2	1
38	0	0	2
39	2	1	1
40	2	0	0
41	1	0	0
42	1	3	0
43	1	0	1
44	1	0	0
45	1	0	0
46	1	2	0
47	0	0	0
48	0	1	0
49	0	1	0
50	2	2	0
51	2	0	4
Totals	163	113	133

	Data description: Literature and Rhetoric				
1996		*1997*		*1998*	
Mean	3.294118	Mean	2.215686	Mean	2.607843
Standard Error	0.342189	Standard Error	0.302037	Standard Error	0.372673
Median	2	Median	2	Median	2
Mode	2	Mode	2	Mode	0
Standard Deviation	2.443719	Standard Deviation	2.156977	Standard Deviation	2.661416
Sample Variance	5.971765	Sample Variance	4.652549	Sample Variance	7.083137
Kurtosis	-0.03187	Kurtosis	2.345457	Kurtosis	1.031875
Skewness	0.83338	Skewness	1.514152	Skewness	1.196705
Range	9	Range	9	Range	11
Minimum	0	Minimum	0	Minimum	0
Maximum	9	Maximum	9	Maximum	11
Sum	168	Sum	113	Sum	133
Count	51	Count	51	Count	51
Largest(1)	9	Largest(1)	9	Largest(1)	11
Smallest(1)	0	Smallest(1)	0	Smallest(1)	0
Confidence Level(95.0%)	0.687307	Confidence Level(95.0%)	0.60666	Confidence Level(95.0%)	0.748536

APPENDIX vii

New acquisitions in the Main library, 1996-1998.

VOLUMES ADDED TO LINEAR LIBRARY			
BY CESM CATEGORY			
	1996-1998		
CESM	VOLUMES 1996	VOLUMES 1997	VOLUMES 1998
01	-	-	-
02	-	-	-
03	-	-	1
04	170	127	532
05	-	-	-
06	113	113	92
07	-	-	-
08	410	409	515
09	-	-	-
10	-	-	-
11	-	-	-
12	1,393	1,710	1,433
13	-	-	-
14	-	-	-
15	666	409	439
16	195	114	80
17	-	-	-
18	573	976	1,297
19	-	-	-
20	466	211	196
21	190	397	221
22	2,838	1,671	1,920
23	35	31	19
TOTAL	7,049	6,168	6,745