Testing Orr’s document delivery test on biomedical journals in South Africa

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This paper describes the use of a document delivery test (DDT) to measure the availability of biomedical research journals in South African health sciences libraries. The methodology employed was developed twenty years ago by a team of researchers from the Institute for the Advancement of Medical Communication under the direction of R. H. Orr. The testing of the methodology was in itself an objective of the present research. A citation pool consisting of 307 items was constructed from references to journal articles in papers published in 1989 by South African biomedical researchers. The availability of each article was determined at each of seven medical library sites; the performance was measured and presented as an arithmetical value or document delivery capability index (CI). The results of the tests show a high level of availability, ranging from CI = 81.68 to CI = 92.97 for the journals sampled. The DDT methodology was found to be practical, applicable to such studies, and flexible. Its use is recommended for similar studies.

INTRODUCTION

In academic libraries, the financial commitment to periodical subscriptions demands that particular attention be focused on journal collections and their use. Library managers are under pressure to justify the rather large expenditures. Evaluation of library collections and services to ensure that the needs of users are met is a good way of convincing budgetary authorities that their money is well spent. A sound methodology has been developed that provides generalized representative results in evaluation of document delivery and availability [1]. The methodology employs one of the most successful performance measures available to assess the capability of a library service to deliver the goods, the so-called document delivery test (DDT).

Document delivery test

The most extensive investigation ever of the document delivery capability of libraries was undertaken by the American Institute for the Advancement of Medical Communication (IAMC) for the National Library of Medicine (NLM). The researchers, working under the direction of R. H. Orr, used the DDT to survey ninety-two U.S. health sciences libraries and proved the test to be a simple, effective method of measuring the capability of a library to supply documents [2]. The investigation was described fully in three articles in the Bulletin of the Medical Library Association [3-5]. The quality and thoroughness of the research set high methodological standards for subsequent availability studies [6].

In 1990, some twenty years after the work of Orr’s project team, its methodology still was considered the
most appropriate for assessing the availability of journals to biomedical researchers in South Africa. This paper emphasizes practical aspects of the application of the DDT and examines its value and appropriateness as a tool for this type of investigation. The actual results of the South African availability study were reported in detail in a doctoral dissertation [7], and the implications of the findings were described in the national medical journal [8].

**METHOD**

Application of the classic DDT requires the availability of a large enough collection of recent publications by members of the target group that a valid sample of citations can be drawn. Each item in this pool of citations then is scored individually against a checklist representing the library collection, to ascertain availability of that journal. The collective availability of all items is the performance of the library or information system. The basic method can be applied to the literature of any discipline.

The South African study had another feature in common with the IAMC project—the objective of evaluating several separate libraries within a national system. Most South African biomedical researchers use a medical faculty library to obtain the literature required for their work. Therefore, the test was conducted at each of the seven academic medical libraries in South Africa. The libraries are attached to the following universities, in alphabetical order: Medunsa (Medical University of Southern Africa, situated outside Pretoria); University of Cape Town; University of Natal (Durban campus); University of Pretoria; University of Stellenbosch (Tygerberg campus); University of the Orange Free State (Bloemfontein); and University of the Witwatersrand (Johannesburg).

The objective of the project was to assess the national collection of biomedical journals and its availability to researchers. Each library was seen as a component of the national system. The many variations among these libraries would invalidate any direct comparison of their relative performance. For that reason, this report does not identify specific libraries but rather refers to "library A," "B," and so on, focusing on the practical application of the methodology rather than on the specific scores. (The director of each library was given a full set of the results obtained at his or her site.) Data obtained at library A will be used to illustrate the application of the method and the calculation and interpretation of the results.

South Africa has a well-established albeit decentralized interlibrary lending system. An efficient national interlending, or document delivery, system is made possible through a union catalog of journals, *Periodicals in Southern African Libraries* (*Pisal*), which is available in microfiche format as well as on the computerized South African Bibliographic Network (Sabinet). The catalog provides bibliographic information as well as holdings and location data for each title, making the resources accessible nationally.

**Citation pool**

A citation pool should contain items that are representative of the literature of the target group. The pool also should be large enough to give credence to any conclusions based on the study results. Items can be identified in several different ways. The most obvious and direct would seem to be through contact with users by means of personal interviews, questionnaires, or even the scientist's diary method. Alternatively, a list of items can be derived by collecting examples of citations used in the subject literature. This approach is really a simulation of user requests.

The success of the DDT method depends on the selection or availability of a large enough body of suitable literature to draw a representative proof of citations. South Africa has a comparatively small population of publishing scientists, but the considerable contribution from the medical sector of that group made it possible to establish an adequate citation pool. Biomedical professionals are the most prolific of publishing scientists in South Africa [9–10].

Thus, construction of a citation pool based on publications recently cited by representatives of the target group was found to be practicable. The primary publications came from a database of medical literature compiled and maintained by the South African Medical Research Council (MRC). The South African Medical Database (SAMED) was developed to provide information about health sciences literature published in or of relevance to South Africa. Journal articles are included in the database if there is some South African connection through an author, laboratory, or topic; papers published by non–South African scientists in local journals are included. The same criteria are applied to monographs, theses, letters, and book chapters.

The SAMED database was an ideal resource for this study, because it provided access to recent research papers written by South African biomedical scientists—enough bibliographic references from which the requisite sample of some 300 citations could be drawn. Orr et al. asserted that with a sample of 300 citations, researchers can be 95% confident that the results from repeated testing of comparable pools would not vary by more than plus or minus 5% [11].

When the citation pool was constructed during July 1990, the database contained 450 items indexed from 1989 publications. In addition to the standard bibliographic details for each publication, entries also contain an abstract, subject terms, the specialty discipline of the first author, the number of pages, and
the number of references cited in the bibliography. The BRS/Search software was used to index and search the database, enabling effective access to all fields. A simple search strategy combining the publication date “1989” with the document type “journal” and the MRC support variable produced a data set of research journal articles linked to MRC-funded projects. This approach excluded other forms of publication, such as monographs, chapters in monographs, theses, conference papers, and contributions to peripheral publications. The list was restricted to items linked to MRC funding, because such support implies a qualitative judgment or approval of the research involved.

The list contained 320 articles published during 1989 in local and international research journals. Most of the papers contained references to other publications, either in a bibliography or in footnotes, providing a substantial pool of citations representative of the group without bias toward a specific institution or geographic area. The pool contained 7,158 items, of which 6,298 (87.99%) were journal articles.

In accordance with the Orr methodology, the target size of the citation pool was at least 300 journal articles. Through sequential sampling (using a factor of 19), a provisional set of 376 items was selected from the 7,158 cited items. This number was reduced to 332 through the discarding of references to publications other than journal articles. The bibliographic correctness of each reference subsequently was verified; where possible, items were located in the regional academic libraries and examined to check the bibliographic details as well as the nature of the paper (e.g., to make sure it was not merely a letter to an editor). Items that could not be traced physically were verified through the use of manual or online searches of bibliographic databases such as BIOSIS, CASLINE, MEDLINE, and SCISEARCH.

Eventually, 307 items were included in the citation pool, which was considered acceptable for application of the test conducted by Orr and his associates. Each reference was treated as a separate document, even when different authors cited the same article; duplicate references were treated as two albeit identical citations.

Checklist for recording availability data

The second essential element required for a DDT is a workable checklist or report card for scoring the outcome or success rate for each item searched. Examples of score sheets used in other availability studies such as those of Orr, Kantor, and Wilson [12-14] were examined and considered for use in this project. Useful elements of each were incorporated in the design of a provisional form, which then was tested in a search for twenty randomly selected items. After some modifications, the improved form was tested again and found to be acceptable.

In examining the document delivery capability of a single library, a very detailed analysis is possible. Factors such as time delays can be calculated precisely, and an accurate assessment can be made of interlibrary lending performance. In this study, the test collections were located at seven individual institutions, a situation that increased the number of variables to include such factors as physical layout and organization of journals, lending policies, and service standards. The need to accommodate diverse characteristics led to development of a simple checklist with four accessibility categories, to reflect the status of each item on the day of the test. The researchers recognized that the eventual analysis of the results also would be comparatively crude.

The final checklist designed for the project is shown in Figure 1. Where an item was owned by a library and found on the shelf, the “yes” square was ticked and a score of “1” entered in the “time code” space on the right side of the form. When an item owned by the library was not found on the shelf, the “no” square was ticked and the form set aside for further investigation. The eventual outcome or result then was recorded in one of the categories under “accessibility.”

“C I” was used for any item that probably could be supplied within one week; “C II” was for items that would have to be obtained through the national interlibrary lending scheme, a process that takes approximately two to three weeks; “C III” was used for items not traced in the standard South African union catalogues, meaning they would have to be obtained from overseas, requiring three to six weeks for delivery; and “C IV” was used for totally unverified or untraceable citations.

The national bibliographic network, Sabinet, was used to access the Pical database and determine library holdings. All searches that yielded no results were checked against the 1985 microfiche edition of Pical (plus its supplements).

Pilot study

A pilot study to ascertain the functionality of the measuring instruments is obligatory before a research team embarks on an extensive field trip. The time schedule therefore was adapted to allow several days between the DDT at the first library and the tests at other institutions. This first library served as an in vitro pilot study. Any unforeseen problems with the checklist, for instance, still could have been corrected at this stage. Sufficient time was allowed to change the methodology and repeat the DDT at the first library.

It also was important to ascertain the approximate

Steynberg and Rossouw
duration of the test. The literature on the subject suggests an exercise of this nature can be done in four hours. But it is not clear how many participants can be accommodated within this time limit; this variable was important, because the present project had only one field worker. It was therefore reassuring that the pilot study required approximately the same amount of uninterrupted time—four hours—as suggested in the literature. Fortunately, the procedures worked as planned, and the full-scale pilot project affirmed the functionality of the test procedures.

Field trip
The field trip took place from August 22 to 31, 1990. The project was timed to take place during an active period of the academic cycle. All seven health sciences libraries were visited and the test administered in this period. A full day was set aside for conducting the DDT at each location, to allow for unforeseen complications or delays.

Several decisions were required in interpretation of the different categories on the checklist. The “elsewhere on campus” was interpreted to include not only items held by the main university library or other branch libraries of the same institution but, also, where a well-organized daily delivery service existed between two institutions, items included in the partner’s collection. This seemed reasonable, because the objective was not to evaluate the comparative strengths of individual collections but to gauge the availability of sources.

Very few items, only seventeen total, were unaccounted for in the DDT. At two libraries, each item owned by the institution either was found on the shelf or its whereabouts were known. At the other centers, a photocopy of the checklist form of each item not found was left with a member of the staff. A date some five work days later was established as the time for the follow-up search. These forms were to be returned with a simple “found on [date] yes/no” notation. Each of the seventeen forms was returned; nine items had been found, while eight had not. If found, the item received a code “2” rating; if not and available elsewhere in the Republic of South Africa, it was marked “3.”

In general, the duration of the test was influenced by several factors:
- the arrangement of the journals (alphabetically filing by title makes journals easier to find than do sets shelved in classification order);
- the physical layout (shelving height, lighting, the tightness of the shelving, the general order and accuracy of shelving);
- the availability and accuracy of journal catalogs and records (including circulation records, visible file or other accession records, and binding records); and

- the accessibility of separate stacks that contain older runs of journals.

This exercise demonstrated the importance of good housekeeping in academic libraries: a mis-shelved item is a missing item, as unavailable to the user as if the item never had been acquired by the library. The ideal test site contained all holdings in one sequence, arranged alphabetically by journal title on well-lit shelves of normal human dimensions. Up-to-date binding is necessary, because many biomedical journals are physically large, and one volume may run into tens of thousands of pages in up to twenty-four separate parts; when long runs of unbound sets are packed tightly on the shelf, finding specific page references can be arduous.

Recording the data
At all sites, the checklist for each item was filled out manually, with annotations where a second search had to be performed later by a member of the library’s own staff. Afterwards, all the information gathered for each of the 307 items at each site was recorded in

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**Figure 1**

<table>
<thead>
<tr>
<th>Checklist</th>
<th>Time code</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A.</strong> Owned by Medical Library</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Shelf no.</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>B.</strong> Availability</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>On shelf</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>C.</strong> Accessibility</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>C.I</strong> Circulation</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Found in library</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>(Tables, sorting shelves, etc)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Elsewhere on campus</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>In process, available</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>Found during second search</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>C.II</strong> National ILL (In Pinal/Sabinet)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>(includes items not owned or missing, unexplained)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>C.III</strong> International ILL (BIDOC/ELM)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td>(includes items not owned or missing, unexplained)</td>
<td>☐ Yes ☐ No</td>
</tr>
<tr>
<td><strong>C.IV</strong> Item not located in above</td>
<td>☐ Yes ☐ No</td>
</tr>
</tbody>
</table>
spreadsheet format, using VPPlanner Plus. The different parameters were presented in columns, coded numerically; for instance, the “yes/no” option, indicating whether a library owned an item, was noted as “1” or “2.”

The spreadsheet file was imported into a mainframe computer using the Statistical Analysis System (SAS) for all calculations and analyses of the data.

RESULTS

The results of the DDT are expressed arithmetically as the capability index (CI), where

$$CI = \frac{5 - \text{mean speed}}{4} \times 100$$

Orr’s formula is a simple percentage, where the highest possible score, or CI, is 100. The mean speed is calculated by dividing the sum of the time code scores for all documents by the number of items in the citation pool. The results of the DDT obtained at library A are summarized in Table 1 to illustrate the calculation of the mean speed and the CI.

The CI for each of the other six libraries (B through G) was calculated in the same way. In addition, a hypothetical national collection CI was calculated based on the mean of the combined holdings of the seven medical centers (Figure 2).

All the libraries were relatively self-sufficient in providing a basic journal collection. An analysis of the document supply resources of library A, for instance, reveals that 248 items (79.48%) of the test sample of references came from the library’s own stock; 31 items (10.10%) from other collections on the campus or the neighboring medical library; 23 items (7.49%) came through national interlibrary lending; while only 9 items (2.93%) were not known to be in South Africa and would have to be obtained from external sources, such as the British Library Document Supply Centre or NLM in the United States.

Table 1

<table>
<thead>
<tr>
<th>DDT results obtained at library A</th>
<th>Number of items</th>
<th>Time code</th>
<th>Sum of time codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>On shelf</td>
<td>232</td>
<td>1</td>
<td>232</td>
</tr>
<tr>
<td>Accessible CI</td>
<td>43</td>
<td>2</td>
<td>86</td>
</tr>
<tr>
<td>Accessible CII</td>
<td>23</td>
<td>3</td>
<td>69</td>
</tr>
<tr>
<td>Accessible CIII</td>
<td>9</td>
<td>4</td>
<td>36</td>
</tr>
<tr>
<td>Totals</td>
<td>307</td>
<td></td>
<td>423</td>
</tr>
</tbody>
</table>

Mean speed = 423/307 = 1.37785

Capability Index = $\frac{5 - 1.37785}{4} \times 100 = 90.55$

DISCUSSION

The availability of material is very high when the results are compared to data obtained in similar studies in academic libraries [15–16]. All the South African libraries had a CI of more than 80, with the highest score an exceptional 92.97. Direct comparisons between studies cannot be made, because, in most cases, the items checked are monographs, not journals.

The following factors enhanced the measured delivery capability of the test libraries:

- verification of references enhanced the success rate or retrievability of journals,
- the study excluded user performance error stemming from unfamiliarity with library systems,
- calculation of time delays was optimistic,
- generous delivery times were allowed,
- accountability of stock in test sites was excellent, and
- the DDT tests the potential of the collections rather than the actual performance of the individual library.

Some 31.6% of the items in the test sample (97 papers that appeared in 47 different journals) were found to be in stock at each of the seven libraries. Only nine references were not found at any of the test sites or the holdings traced in Pisal. In other words, only 2.93% of the citation pool would have to be obtained from international document suppliers.

With regard to items found to be “not available in the country,” it is acknowledged that there are many informal databases, personal files, and so on that are not consulted or indeed consultable by mainstream libraries and librarians; the fact that these references

![Figure 2](image-url)
were provided in the bibliographies of South African researchers presupposes some availability, at least to those individuals. However, there are many indications that not all items cited by publishing scientists had in fact been seen first-hand and that references were cited from another bibliography without the obligatory “cited by” acknowledgment. The SCI-SEARCH database has revealed repetition of incorrect bibliographical detail, indicating the copying of citations without consultation of the original.

The accuracy of the constructed or simulated citation pool is one of the factors that distinguishes it from a citation pool consisting of unverified bibliographic items obtained from actual library users. All the verification techniques employed are available to patrons of any South African medical library; whether these services are utilized fully is an open question. Publications that are cited incorrectly cannot be traced; proper verification of references is probably the best way to improve the success rate or availability of items.

CONCLUSION

This was the first attempt in South Africa to examine the availability of the literature of a scientific discipline. The study determined the level of availability of the national biomedical journal collection at the end of 1990. Future studies will be able to use these data as a benchmark in monitoring the national information capability.

The project had two distinct objectives: the assessment of journal availability in South African health sciences libraries and the reevaluation of Orr’s document delivery test.

The results of the DDT indicate a satisfactory level of availability of important journals in South Africa, as well as a good distribution among the seven test libraries. Document delivery to the end user is supported by a functional national union catalog of journals and their locations, facilitating interlibrary lending. Access to the services of the British Library Document Supply Centre as well as NLM ensures that any identified item can be obtained at a price. Economic factors undoubtedly inhibit full access to information, but investigation of this issue was outside the scope of this project.

The DDT methodology proved to be elegant, simple, and timeless in its applicability. Development of the two main elements, the citation pool and the checklist, required a fair amount of deliberation and meticulous preparation. The execution of the test and subsequent analysis of the results proved straightforward. One of the advantages of the DDT is that a project can be undertaken by a single researcher, but, if there were greater resources, a team could expand the scope of the research or reduce the overall time required. The flexibility of the method allows for application at a single site, where great detail can be incorporated in the checklist, or, as in this case, investigation of multiple sites with the use of a generic checklist.

Finally, the value of results would be increased significantly if the study were longitudinal; that is, repeated regularly with an updated citation pool but the same checklist. The monitoring of trends or changes in availability would provide important information for the management of collection development policies. The methodology developed by Orr et al. is undoubtedly still an effective approach to a problem that is likely to become more acute in an era of dwindling journal budgets.

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11. Lancaster, op. cit.
12. Ibid.


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