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Measuring the Effectiveness of Queen Elizabeth II Library Document Delivery Operations Before and After the Implementation of Relais International's Enterprise Document Delivery Software

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Abstract

Objective - To compare the performance of the Queen Elizabeth II Document Delivery operation before and after the implementation of Relais International's Enterprise document delivery software.

Methods - This paper employs methodology established in the Association of Research Libraries' 1998 publication, "Measuring the Performance of Interlibrary Loan Operations" and repeated in ARL's "Assessing ILL/DD Services: New Cost- Effective Alternatives," published in 2004. In both studies, three measures were used to evaluate the efficiency of document delivery operations: fill rate, turnaround time and direct costs. Both studies offer ARL benchmark or mean scores for each efficiency measure. This paper compares Queen Elizabeth II Document Delivery (QEII/DD) scores for each efficiency measure with those reported in both ARL studies.

Results - Data for the two periods under review, 1999-2000 and 2004-2005, indicate that borrowing fill rates remained relatively stable, showing only a 3% drop in the latter year, while lending fill rates showed a significant increase (11%). Turnaround times for filled QEII/DD borrowing returnable requests were faster on average by 4.2 days or 24%. Turnaround times for QEII/DD non-returnable borrowing requests also show improvement: a filled non-returnable request was faster on average by 1 day or 12%. The average cost of a

QEII/DD borrowing request has remained stable: \$22.82 in 1999-2000 and \$22.61 in 2004-2005. In contrast, the average cost of a QEII/DD lending request has increased slightly: from \$11.08 in 1999-2000 to \$13.12 in 2004-2005. .

Conclusion - Both the implementation of Relais document delivery software and the delivery of returnables (loans) by courier between consortium members have allowed the QEII/DD unit to post modest gains in both fill rates and per unit costs and more substantive gains in turnaround time.

Introduction

Document Delivery Services at Memorial University of Newfoundland comprises interlibrary loan, intercampus loan and document supply to distance users. This paper will focus on the part of Document Delivery Services known traditionally as interlibrary loan. Interlibrary loan has both a borrowing and a lending component. Borrowing refers to the practice of locating and obtaining documents from other institutions on behalf of students, faculty and staff of Memorial University. Lending refers to the practice of supplying documents from Memorial University Libraries to other institutions.

This paper describes a two-part study conducted at Memorial University of Newfoundland's Queen Elizabeth II Library Document Delivery (QEII/DD) unit which measured the efficiency of the operation before and after the implementation of Relais Enterprise document delivery software. The ultimate aim of this study was to test the hypothesis that the implementation of Relais Enterprise software would result in greater efficiency in local document delivery operations. A secondary aim of this study was to compare the performance of the QEII/DD operation with the performance of Association of Research Libraries in North America (ARL). In order to achieve these aims, an efficiency study of the QEII/DD operation carried out in 2001 was repeated in 2005 and the scores compared to benchmarks reported for the

ARL group. The study, reported in this paper, adds to a growing body of literature on performance measurement in interlibrary loans and document delivery operations.

Relais Enterprise software was implemented at Memorial University as part of a growing consortium of Atlantic Canadian University libraries known as the East Coast Relais Consortium (ECRC). Both the consortium and the adoption of new software arose in response to a demand for greater efficiency both in resource sharing and in document delivery following a decade of cuts to journal subscriptions. Also contributing to the demand was an increased availability of both electronic discovery tools and electronic journals which fuelled user expectations of rapid access to a wide variety of literature. Relais software was implemented at Memorial in two phases: Relais lending (version 2.3) was introduced in the fall of 2000, and Relais borrowing (version 4.1) was introduced in the fall of 2004. Though the software has been fully operational since fall 2004, there are frequent upgrades and enhancements. The most recent upgrade, to Relais Enterprise V. 2006, took place in December of 2006.

Relais Enterprise document delivery management software employs a variety of technologies and protocols to semi-automate the document delivery process. Relais Enterprise uses control number, author, title, and phrase searching to automatically generate a Z.39.50 (an information search and retrieval protocol)

query to one or more library catalogues. The system communicates with other document delivery management systems through the ISO 10160/1 communication protocol, through 'generic script format' (a CGI script that allows data to be processed through a form), as well through other non-standard means, such as e-mail. The system allows for the automatic creation of routing lists for each request. Staff use free text e-mail or a series of 'canned' messages to communicate with external libraries and local patrons. Patrons can monitor the status of requests via Relais Access web forms. A key component of the system is the integration of scanning software with the document delivery management software which allows for the seamless retrieval and completion of requests. Relais Enterprise also facilitates the delivery of documents in a variety of formats, including Ariel, fax, electronic mail and post-to-web.

Literature Review

In 2001, Thomas Nisonger published a review of literature evaluating interlibrary loan and document delivery services in which he stated, "the most frequently evaluated issues are 'speed,' fill rate and cost, yet a host of other questions have been addressed: the cost effectiveness of access versus ownership, user satisfaction, concentration and scatter in the requested materials, and the percentage of items already held in the collection" (Nisonger 1). Nisonger concludes that while a "voluminous amount has been written" only a "fraction of the published literature reports the results of evaluative studies" (Nisonger 1). Those interested in a comprehensive review of publication around performance measurement between the years 1986 and 1998 should see Stein who points out that research in this area had been "hindered by the lack of standardisation of measurement devices and definitions of terms" (Stein 11).

For the purposes of this paper, the author conducted a literature survey of articles published between 2000-2006 on the subject of performance measurement and efficiency and found a similar pattern to that outlined by Nisonger: a high number of articles focussing on issues related to interlibrary loan and document delivery services, but relatively few articles reporting on evaluative studies of those services (Nisonger 2). Literature reviews published by Connolly (2000, 2001), Gould (2000, 2001, 2002) and McGrath (2002-2007), in the journal *Interlending and Document Supply*, highlight continued interest both in the access versus ownership debate and in resource sharing. These reviews also highlight a growing body of literature on automation, unmediated document delivery, copyright, electronic resources, consortia, as well as licensing and pricing as it relates to the so-called 'big deals'. In recent years, many articles have been published on the subjects of open access, e-books, digitization and Google.

Mary Jackson's studies of interlibrary loan and document delivery operations in North America continue to generate evaluative literature (Jackson, 1998; and Jackson, et al. 2004). A number of other authors around the world have recently performed benchmarking studies. These include Fisher in New Zealand (2000), Vattulainen in Norway (2000), Søndergaard in Denmark (2001), Stabler in the USA (2002), and Bailey-Hainer in the USA (2001 and 2004). The National Resource Sharing Working Group reports on an Australian benchmarking study based on Jackson's ILL/DD study (2001). Papers emanating from the Australian study include Ruthven (2001) and Ruthven and Magnay (2002).

Between 2000 and 2006, both *Interlending and Document Supply* and the *Journal of Interlibrary Loan, Document Delivery and Electronic Reserves* published articles on user

satisfaction related to the automation of interlibrary loan and document delivery operations. Porat (2001) reflects on user satisfaction and ILL/DD automation at the University of Haifa. Sutherland and Wanat (2000) discuss how automated statistics can be used to monitor and improve ILL/DD customer service. Burke (2001) reports on turnaround times for the commercial document delivery service, Dissertations Express.

Elsewhere, efficiencies related to the implementation of specific document delivery technologies are discussed: Weible and Robben (2002) report on the benefits of ILL/DD automation using Prospero; Tonn (2003) investigates patron satisfaction related to the implementation of ILLiad at Ellender Memorial Library; and Connell (2006) offers a comparison of turnaround times between ILLiad's Odyssey and Ariel Delivery methods. Among recent papers that discuss the implementation of specific commercial document delivery software and technologies, only two focus on Relais Enterprise: Cornish (2000) and Guadagno (2005). Both papers are descriptive rather than evaluative, and the latter (Guadagno) was produced on behalf of the vendor. This paper is the first to offer a quantitative analysis of operational efficiencies resulting from the implementation Relais Enterprise software.

Methods

This study uses methodology employed in the Association of Research Libraries' (ARL) 1998 publication, "Measuring the Performance of Interlibrary Loan Operations" and repeated in ARL's "Assessing ILL/DD Services: New Cost-Effective Alternatives," published in 2004. In both studies, three measures were used to evaluate the efficiency of document delivery operations: fill rate, turnaround time and direct costs. Both studies offer benchmark or

mean scores for each efficiency measure based on scores for ARL libraries. This paper will compare 1999-2000 QEII/DD mediated borrowing and lending scores for each measure with the mean scores reported for mediated ILL/DD in the 1998 ARL study. A further comparison will be made between 2004-2005 QEII/DD mediated borrowing and lending scores for each measure with the mean scores reported for mediated ILL/DD in the 2004 ARL study. Finally, this paper will compare 2004-2005 QEII/DD scores with the mean scores reported in the 2004 study for ARL high-performing mediated ILL/DD. Comparing 1999-2000 QEII/DD scores for all three measures with those for 2004-2005 will show whether the implementation of Relais Enterprise software resulted in operational efficiencies. Comparing QEII/DD scores for both years with the benchmarks for ARL libraries will show how the QEII/DD service compares, in terms of the three efficiency measures, with document delivery services in North American research libraries.

Fill rate

Fill rate "represents the percentage of requests successfully filled" (Jackson 5). For document delivery lending, fill rate means the total number of returnables (loans) and non-returnables (photocopies) supplied to external libraries. The lending fill rate is expressed as a percentage of the total number of items requested by external libraries. For document delivery borrowing, fill rate means the total number of returnables and non-returnables supplied to the QEII/DD unit by external libraries or document suppliers. The borrowing fill rate is expressed as a percentage of the total number of document delivery requests submitted by patrons. In calculating the number of requests submitted by patrons, QEII/DD staff members exclude those requests that are found to be available in our local collection, a number which amounts to

between 15% and 20% of the total number of requests submitted each year.

Turnaround time

Turnaround time is calculated as “the number of calendar days from the date the user submitted the request to the date the library notified the user that the item was ready to be picked up or the date that the ILL unit sent the item to the user” (Jackson 51). This includes the initial processing time, the time it took to obtain the item and any post-receipt processing. Following ARL’s reasoning that filled document delivery requests are the “product” of ILL/DD units, this study calculates the turnaround time of filled request only, i.e. it does not include in its calculations requests that could not be filled or requests that users submitted which were subsequently found to be held in the local collection (Jackson 32). Furthermore, this study focuses on the turnaround time for borrowing requests only. QEII/DD turnaround time statistics were calculated on requests received during two periods: February 2000 and February 2005. Statistics for February 2000 were manually generated. Statistics for February 2005 were generated from the Relais database using Crystal Reports reporting software.

Direct costs

Direct costs are calculated using the following categories: general operations (material and supplies, printing, courier charges, interlibrary loan charges, student assistant salaries, reimbursements, external contracts and operating leases), staff salaries, software, hardware and equipment. The cost of hardware and equipment is calculated at

25% of the replacement cost and is based on a four year upgrade cycle. General library functions such as collections development, serials and acquisitions are excluded from cost calculations. Jackson makes the case for excluding these costs as follows: “Collection development, acquisitions, and circulation are necessary preconditions for an ILL service and would be a cost to the library whether or not the library provided ILL services (Jackson 5). Wherever possible, direct costs are assigned to either borrowing or lending. This is easily done with some costs, e.g. staff costs, courier charges, and not so easily done with others. Costs shared between units—supplies, some equipment, some software charges—were divided proportionately between borrowing and lending, based on the percentage of the total number QEII document delivery requests filled by each unit. That works out to be 59% for lending and 41% for borrowing. All costs are reported in Canadian funds.

Results

Fill Rate

Tables 1 and 2 show that QEII/DD borrowing fill rates remained relatively stable between 1999-2000 and 2004-2005, showing only a 3% drop in the latter year. Borrowing fill rates also remain very close to the mean fill rates reported by ARL in 1998 and again in 2004.

QEII/DD lending fill rates, on the other hand, show a significant increase (11%) between 1999-2000 and 2004-2005. QEII/DD lending fill rates are also considerably higher than ARL’s reported mean rates: 13% higher in

	ARL (Mean)	QEII/DD
Borrowing requests (filled)	85%	87%
Lending requests (filled)	55%	68%

Table 1. Fill Rate: QEII/DD fill rate in 1999/2000 compared to ARL libraries (1998 study)

	ARL(mean)	QEII/DD
Borrowing requests (filled)	86%	84%
Lending requests (filled)	58%	79%

Table 2. Fill Rate: QEII/DD fill rate in 2004/2005 compared to ARL libraries (2004 study)

	ARL (Mean) # of days	QEII/DD # of days
Turnaround time for returnables	16.9	18.0
Turnaround time for non-returnables	14.9	8.1

Table 3. Borrowing Turnaround Time: QEII/DD turnaround in 1999 compared to ARL libraries (1998)

	ARL (Mean) # of days	QEII/DD # of days
Turnaround time for returnables	9.3	13.8
Turnaround time for non-returnables	6.1	7.1

Table 4. Borrowing Turnaround Time: QEII/DD turnaround in 2004-2005 compared to ARL libraries (2004)

	ARL (Mean)	QEII/DD
Cost of a Borrowing request	\$22.69*	\$22.82
Cost of a Lending request	\$12.78	\$11.08

Table 5. Direct Costs: QEII/DD direct costs in 1999/2000 compared to ARL libraries (1998)

*A conversion rate of 1.3613 was used to convert USD to CDN (ARL 1988)

	ARL (Mean)	QEII/DD
Cost of a Borrowing request	\$27.44*	\$22.61
Cost of a Lending request	\$14.53	\$13.12

Table 6. Direct Costs: QEII/DD direct costs in 2004-2005 compared to ARL libraries (2004)

*A conversion rate of 1.5687 was used to convert USD to CDN (ARL 2004)

1999-2000 and 21% higher in 2004-2005. It is notable that ARL mean fill rates for lending show only a 3% increase between the 1998 study and the 2004 study.

Turnaround Time

Tables 3 and 4 show improved turnaround times for filled QEII/DD borrowing *returnable* requests during the two periods under review, 1990-2000 and 2004-2005. A filled request for a returnable was faster on average by 4.2 days or 24%. Turnaround times for QEII/DD non-returnable borrowing requests also show improvement:

a filled non-returnable request was faster on average by 1 day or 12%.

Direct Costs

Tables 5 and 6 show that the average cost of a QEII/DD borrowing request has remained stable: \$22.82 in 1999-2000 and \$22.61 in 2004-2005. In contrast, the average cost of a QEII/DD lending request has increased slightly: from \$11.08 in 1999-2000 to \$13.12 in 2004-2005. When compared to the mean for ARL libraries, the unit cost for a QEII/DD lending request in 2004-2005 was \$1.83 or 10% cheaper.

	Unit Cost	Fill Rate	Turnaround (#days) returnables	Turnaround (#days) non-returnables
Mean for ARL (14)	\$24.39*	90%	5.4	7.6**
QEII/DD (04/05)	\$22.61	84%	13.8	7.1

Table 7. QEII/DD (2004-2005) compared to ARL Best Borrowers (2004): All Measures

*A conversion rate of 1.5687 was used to convert USD to CDN (ARL 2004)

**Notably the mean turnaround time for non-returnables for the 14 high-performing borrowers was 22% slower than the mean for all 58 ARL units studied.

Comparison with High Performance Borrowing

Table 7 shows that QEII/DD borrowing per unit request costs and fill rates compare favourably with high-performing ARL borrowing operations. Turnaround times compare less favourably. The following tables offer a comparison between the QEII/DD scores for each efficiency measure and the scores of the 14 high-performing ARL borrowing units.

Discussion

The results show that the implementation of Realis Enterprises document delivery software has allowed the QEII/DD operation to post modest gains in both fill rates and per unit costs and more substantive gains in turnaround times. The results also show that QEII/DD scores for all three efficiency measures compare favourably with the mean scores reported for ARL libraries.

Fill Rates: Lending statistics for the QEII/DD are not consistent with ARL statistics in all areas. The QEII/DD lending unit posts much higher fill rates when both the total number of lending requests is lower than the mean for ARL libraries (11,927 as compared to 41,088 in 2004-2005), and the ratio of returnables to non-returnables is higher (in both years under review, the QEII/DD unit filled slightly higher number of requests (7%) for returnables than did ARL libraries).

One factor that might explain the difference in lending fill rates is that 75% of ARL libraries involved in the study place requests through WorldCat, OCLC's union catalogue (Jackson 45). Jackson goes on to say that many libraries do not regularly update holdings on OCLC and that borrowing staff do not always check OCLC union lists before placing requests (Jackson 45-46). In contrast, the QEII/DD lending unit fill rates may benefit from a library policy which dictates regular updating of the library's holdings in AMICUS, the National Library of Canada's union catalogue, resulting in more accurate holdings statements and fewer cancelled lending requests. As well, ECRC members search each member's catalogue before placing a request.

A second factor that might explain the difference in lending fill rates is staffing levels. In its 2004 study, ARL reports the mean number of filled lending requests per lending FTE staff as 10,297. For the QEII/DD, the number of lending requests per lending FTE staff is 7,016. In this regard, the performance of QEII/DD lending corroborates another statistically significant relationship reported by Jackson: "as total lending staff increases, the lending fill rate increases (Jackson 40).

Turnaround Times: Courier delivery is the single most important factor contributing to improved turnaround time of returnables

between consortium members.

Approximately 18% of returnable requests are supplied to the QEII Library by ECRC members, and turnaround times are generally fast, e.g. requests supplied from within the consortium are usually filled within 48 hours. The mean turnaround time for all returnables (13.8 days) is still slow, however, when compared with the mean for ARL libraries (9.3 days). The most significant factor contributing to slow turnaround for returnables is the time a mailed item spends in transit. Based on this study, it is recommended that QEII/DD unit move to courier delivery of all borrowing requests for returnables.

Given the possibility of increased automation of workflow, including the functionality to create routing lists and automatically route requests to suppliers, a greater improvement in turnaround time for non-returnables was expected. In reality, however, the majority of borrowing requests are still mediated. While most requests are submitted using Relais Access web forms, users still submit incomplete or abbreviated bibliographic citations, i.e. requests which require staff editing. Also, because Relais software is configured to search at the ISSN level and not the volume/issue level, staff members will, whenever possible, check holding statements in AMICUS before submitting a request.

One development that may have a positive effect on turnaround time is the implementation of a virtual union catalogue through the Atlantic Scholarly Information Network (ASIN) Portal. Document delivery requests from the ASIN Portal will send a full bibliographic citation from the relevant catalogue or index to the Relais database. This will have a significant impact on the amount of editing staff are required to do on any one request and will facilitate automatic routing of requests.

It is notable that in the most recent period under review, February 2005, the Relais Borrowing module was still a relatively new implementation. A more recent in-house review of turnaround time for QEII/DD borrowing requests, comparing the periods October 1, 2004 to March 1, 2005 and October 1, 2005 to March 1, 2006, shows significant improvement in turnaround time for non-returnables: from 7.1 days to 4.7 days per request, an improvement of approximately 30%. Interestingly, there were no major changes to workflow rules or to the policies during this period. It is likely that staff familiarity and confidence in the system were contributing factors.

Direct Costs: staff salaries remain the single biggest factor on cost per unit transaction for both borrowing and lending requests. In the 2004 ARL study, Jackson reports that staff costs account for 58% of the cost of a borrowing transaction and 75% of the cost of a lending transaction (Jackson 33). By comparison, a cost analysis of QEII/DD lending and borrowing transactions for the year 2004-2005 shows 81% of the cost of a borrowing transaction and 66% of the cost of a lending transaction are attributable to staff salaries.

Both borrowing and lending units each had one less FTE position in 2004-2005 than they did in the academic year 1999-2000.

Additional staff costs were incurred with the hiring of two full-time Relais system administrators, a portion of whose salaries is charged to the QEII/DD budget. Because software charges and the salary costs for system administrators are attributed proportionate to the total number of filled lending and borrowing requests, it is possible that the unit cost for a lending request is slightly inflated and the unit cost for a borrowing request slightly underestimated.

High performance Borrowing Operations

While the QEII/DD scores for the three efficiency measures compare favourably with the mean for ARL borrowing units, it is worth comparing QEII/DD scores with those of low cost, high-performing borrowing operations reported in the 2004 ARL study. As stated earlier in the results section, QEII/DD borrowing per unit request costs and fill rates compare favourably with high-performing ARL borrowing operations, though turnaround times compare less favourably. As noted above, a more recent in-house review of turnaround time for non-returnables shows a major improvement. The local operation posted a significantly better turnaround time than the mean turnaround time reported for ARL borrowers. Further improvements are possible with increased automation and a more streamlined workflow. A significant improvement in turnaround time for returnables is to be expected if the recommendation of this study to implement courier delivery of all returnables meets with approval.

In ARL's 2004 study, Jackson points to a number of areas that may be exploited to improve the efficiency of document delivery operations. These include monitoring the performance of lenders, posting articles on secure web sites for users to access, and increasing the use of user-initiated services (Jackson 100). The QEII/DD unit is currently working with other consortium members to develop reports which will monitor the performance of lenders. The East Coast Relais Consortium has also committed to print-to-web article delivery by fall 2007. Print-to web is new technology which allows for a scanned document to be posted to a web server. Once notified by e-mail that the requested item is available, the user will view the cover page online and then print a single copy of the document. The user is prevented from keeping an electronic copy. Since 2002, the QEII/DD has used CISTI

Source, the Canadian Institute for Scientific and Technical Information's document delivery service, to provide user-initiated document delivery services to selected faculty and graduate students. CISTI Source is fast, cost-efficient and popular with users (Warner 217). In addition, Memorial University Libraries are currently taking a leading role in the development of the Atlantic Scholarly Information Network, which will see all Atlantic Canadian University libraries using a single virtual union catalogue and a single document delivery system. This development will lead to more user-initiated document delivery services of the kind Jackson describes as "direct consortial borrowing" (Jackson 100).

Conclusion

This paper confirms that the implementation of Relais Enterprise software resulted in greater efficiency in local document delivery operations. This paper also offers evidence based on three key measures: fill rate, cost and turnaround time— that QEII/DD performance compares favourably with the performance of Association of Research Libraries in North America (ARL).

Over the past six years, the Queen Elizabeth II Document Delivery unit has moved from being a paper-based, stand-alone document delivery operation to a semi-automated document delivery unit operating in a consortial environment. The academic year 2004-2005 was a transition year, i.e. the first full year of operation using both Relais borrowing and lending modules. That 2004-2005 was a transition year is corroborated by the fact that there was a significant improvement in turnaround times in 2005-2006, an improvement which shows the QEII/DD borrowing unit out-performing the ARL borrowing operations documented in Jackson's 2004 study.

Further improvements in turnaround time are to be expected in the next few years as the degree of mediation in request processing decreases and courier delivery of all returnables is implemented. Per unit costs should also decrease when the East Coast Relais consortium moves to a hosted option with Relais International for systems and system's services. Once these technological enhancements and policy changes are in place, it is likely that subsequent efficiencies will be achieved only by implementing unmediated document delivery services.

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