

Performance Measurement of Interlibrary Loan for University Libraries in Taiwan in the Digital Age

Mei-Ling, Wang

Professor, Graduate Institute of Library, Information and Archival Studies,
National Cheng-chi University
E-mail : meilingw@nccu.edu.tw

Yang, Chieh

Graduate Student, Graduate Institute of Library, Information and Archival Studies,
National Cheng-chi University
Email:lovejessica44@hotmail.com

Abstract

The study mainly discusses performance measurements of interlibrary loan for university libraries in Taiwan. The purposes of the study are: 1) to explore the status of interlibrary loan services for university libraries in Taiwan; 2) to investigate the effect of electronic resources on interlibrary loan services; 3) to collect and analyze current data on the performance of ILL services of university libraries; 4) to identify and describe characteristics of low-cost, high-performing ILL operations. The study used questionnaire surveys and performance evaluation method with four performance measures to evaluate borrowing and lending services: cost, fill rate, turnaround time, and collection sufficiency. In 2014, the researcher sent questionnaires to 169 university libraries to collect the interlibrary loan operations and performance data in 2013. The study found electronic resources had influenced ILL services, and that 29 participants (27.1%) provided database ILL services, 28 participants provided e-journals ILL (26.2%), 5 participants (4.7%) provided e-book ILL services. With the implementation the NDDS ILL information system in 2013, the ILL service performance of 107 participants were assessed, the average ILL transaction per library was 993, the average ILL borrowing transaction per library was 484, and the average ILL lending transaction per library was 509. The borrowing unit cost was NT\$165, and the lending unit cost was NT\$129. The borrowing fill rate was 79%, and the lending fill rate was 82%. The borrowing turnaround time was 1.98 days, and the lending turnaround time was 1.54 days. As the ratio of requests received to requests sent out in interlibrary lending was 1.1, it showed that the collection of university libraries was sufficient and adequate. This study carried out a performance measurement of ILL service, constructed four performance measures and described the performance of ILL service for university

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libraries in Taiwan as costing less with a faster turnaround time, higher fill rate and a sufficient and adequate collection. The study is valuable because it proposed new performance measures and significant findings of effects of e-resources in interlibrary loan services.

Keywords : Interlibrary Loan, Performance Evaluation, University Libraries

1. Introduction

As academic libraries designed to promote the growth of knowledge and information sharing, provide information resources to faculty, researchers and students to engage in research, teaching, and learning activities, Interlibrary Loan (ILL) has become the most common resource sharing activity within academic libraries. ILL is the sharing of materials among libraries, be they across town or across the globe, and a service that provides access primarily conducted library-to-library, on behalf of the patron. Although Interlibrary Loan is evolving and changing, it provides access to materials not held in or otherwise unavailable from a library's collection (Hilyer,2002). Levine-Clark and Carter(2013) defines interlibrary loan as being a transaction in which, upon request, one library lends an item from its collection or furnishes a copy of the item to another library.

Interlibrary loan services for academic libraries in the U.S. continued to grow. Interlibrary Loan among the Association of Research Libraries (ARL) had grown from 362,931 requests in 1974 to 3,562,401 in 2008. Mak (2011) explores the factors that have led the USA to be one of the few countries in the world that has seen interlending continue to increase. As a result, interlibrary loan is both a highly visible and a highly valued service. That visibility drives libraries to continually invest in systems that expand discovery and integrate the request process. The national resource-sharing infrastructure includes a national union catalog that aggregates the collections of thousands of academic libraries and libraries utilize a relatively small number of systems to provide access to those collections. That interlibrary loan automation needs can be well met by those systems is evidence of high-volume and production oriented workflows as well as a shared understanding of the process across libraries. Those same forces drive down the incremental costs of increased activity, and interlibrary loan services continue to grow in the US.

As the library interlibrary loan service had begun in Taiwan since 1970s, at present, the Interlibrary Cooperation Association, ROC of more than 420 members is the main interlibrary cooperation organization facilitating interlibrary cooperation in Taiwan. As interlibrary loan is the process by which a library requests material from, or supplies material to, another library, it consists of two parts, borrowing and lending, and two parties: the borrowing library and the lending library. Interlibrary loan services provide borrowing and lending returnables and nonreturnables materials. Returnables are books and other items the lending library expects to be get back; Nonreturnables are

photocopies and other items the lending library does not expect to get back and all requests are processed under the Copyright Law. For assessing interlibrary loan services, the Interlibrary Cooperation Association, ROC develops the information system of National Document Delivery Service (NDDS) to carry out interlibrary loan operations, which provides periodicals union catalog, service management, account management, interlibrary loan request management, and statistics report. University libraries use the services the most.

As interlibrary loan services help users get materials not held by the library, from other libraries, it is important to meet the research needs of faculty members and students. However, interlibrary loan operations require a lot of manpower and financial support. Therefore, it is necessary that librarians run ILL operations effectively and managers make an assessment of how well the interlibrary loan department is performing. Stein (2001) reviewed some literature for the years 1987 through 1997, and found there was general agreement that fill rate, turnaround time, cost and user satisfaction were four primary criteria for evaluating ILL. Subsequently, the Association of Research Libraries in 1995-1996, 2004 respectively undertook two interlibrary loan performance evaluation (Jackson, 1998; Jackson, 2004), and Northern Europe (Vattulanien, 2003), Australia, and Japan were engaged in related research.

In 1928, the first university library, Taipei Imperial University Library, was established in Taiwan. Now there are more than 160 university libraries, which are vibrant and provide interlibrary loan services charged by ILL department and librarians. As interlibrary loan service costs a lot of money and human resources, it is important to carry out a performance evaluation study. Performance evaluation will help to understand the current situation and the effectiveness of ILL services. However, there are seldom interlibrary loan surveys and evaluation research in Taiwan, so cost-effective performance management to improve service should be pursued. In the digital age, as university libraries acquire a lot of electronic resources, the question of whether these resources influence interlibrary loan service is worth studying. To improve the cost effectiveness of interlibrary loan services, the study mainly assesses performance of ILL services for university libraries in Taiwan and explores the effect of electronic resources on ILL services.

2. Literature Review

This article reviewed important literature on interlibrary loan and performance evaluation. Measuring performance means collecting statistical and other data that describe the performance of the library and analyzing these data in order to evaluate the performance (Poll & Boekhorst, 2007). Measuring performance of interlibrary loans was comparing what interlibrary loan was doing with what it was meant to do and what it wanted to achieve. Performance indicators were numerical, symbolic or verbal expression, derived from library statistics and data used to characterize the performance of a library. Performance indicators

were keys of interlibrary loan service performance evaluation which can provide quantitative description on ILL status to meet its stated objectives. Performance evaluation indicator system including performance indicators and performance evaluation of the description, the indicator system operability and practical applications, was critical to performance evaluation.

The Association of Research Libraries undertook the interlibrary loan and Document Delivery (ILL/DD) performance measures study, a two-year effort to measure 1995/96 performance of ILL departments in 119 North American research and college libraries. The study examined four performance measures: cost, fill rate, turnaround time, and user satisfaction. On average, the unit cost of research libraries to borrow an item on interlibrary loan was \$18.35, and the cost to lend an item was \$9.48. Average borrowing turnaround time was 16 calendar days, the borrowing fill rate was 85%, and the lending fill rate was 58%. The Study also examined the differences among libraries and identified characteristics of low-cost, high performing ILL operations to suggest strategies for other research and college libraries to improve local performance (Jackson, 1998).

Assessing Interlibrary Loan (ILL) and Document Delivery (DD) Services was the third study undertaken by the Association of Research Libraries (ARL) to examine the performance and economics of interlibrary loan operations in libraries. The data-gathering phase of this study, which ran from June 2002 to October 2003, collected 2002 baseline data on mediated ILL/DD services and seven user-initiated services. The study examined indicators of mediated and user initiated operations through the analysis of three performance measures: direct costs, fill rate, and turnaround time. The study presented its key findings and compared the performance of mediated services as following: borrowing unit cost US\$17.5, borrowing fill rate 86%, borrowing turnaround time 7.6 calendar days; lending unit cost US\$9.27, lending fill rate 58%, lending turnaround time 1.5 calendar days. The study examined the five libraries with the highest weighted fill rates, lowest weighted unit costs, and fastest weighted turnaround times. This new study updated and expanded the 1996 study and, importantly, added a component measuring user-initiated interlibrary loan and document delivery (Jackson, 2004).

In 2001, the Interlibrary Loan and Document Delivery (ILL/DD) Benchmarking Study was undertaken by the National Resource Sharing Working Group with the assistance of the National Library of Australia. The key aims of the study were: to identify the characteristics of high performing ILL/DD operations, to be an instrument for raising awareness and changing ILL/DD practices, and to assist any library to benchmark its operations against a standard set of data. Turnaround time, fill rate and unit cost were used as the main performance measures for requesting activities, and fill rate and unit cost were used for supply. Ninety-seven libraries from all states and territories and sectors were

surveyed. Data from ninety were included in the main part of the analysis. The average performance overall and for each sector against the key measures of the study was as following: borrowing turnaround time 11.5 days, lending turnaround time 6.2 days; borrowing fill rate 89%, lending fill rate 83%; borrowing total unit cost AUD\$32.1, lending total unit cost AUD\$17.03; borrowing patron satisfaction timeliness 97%, quality 97%. The results proved the interlibrary loan borrowing and lending services of Australia with high operating performance (National Resource Sharing Working Group, 2001).

In 2001, Nordic academic libraries studied performance of interlending, it aimed to measure some features of interlibrary loan activities in Nordic research libraries. The members of the steering group choose the participating libraries in their countries, which should be university libraries or research libraries. Participating institutions that provided the information without cost to the research project included 49 libraries (Denmark 10, Finland 7, Iceland 4, Norway 19, and Sweden 9). The study examined four items: cost fill rate, time and user satisfaction. The key findings of the study are as follows: unit costs €44; turnaround time 49; borrowing fill rate 38%; lending fill rate 36% (Vattulainen, 2003).

Tutiya (2006) studied basic facts about the interuniversity cooperative library service by way of an ILL request message sending system of NACSIS-ILL. The study based on the data recorded by the system from 1994 to 2005. Among major findings were that the "Interlibrary Loan (ILL)" in the Japanese university context was very peculiar in that requests for photocopies of "foreign journal" articles were significantly predominant in 1990s; that an increase of requests for "domestic journal" articles, including those in nursing science in particular, was becoming conspicuous, as if to match the decrease of requests for "foreign journal" articles; that requests for book loans, which had only accounted for a small portion of requests, apparently increased as the union catalog database called NACSIS-CAT grew; and that the system was remarkably efficient with the fill rates in lending/supplying constantly high and the average turnaround time generally less than a week. Regarding performance of ILL services for university libraries, 85,251 lending transaction, 975,850 borrowing transaction, 117 returnables and 1,344 nonreturnable were managed by each university library. While the original intention was construction of a mutually beneficiary collaborative system, there were some libraries that mainly only request and others that mainly only supply.

The International Federation of Library Associations (IFLA) proposed three performance indicators of interlibrary loan services: interlibrary loan borrowing speed, interlibrary lending speed, and the ratio of requests received to requests sent out in interlibrary lending. The ratio of requests received to requests sent out in interlibrary lending was defined as the number of requests received in interlibrary lending divided by the number of requests sent out and assessed

whether the library's collection was adequate and sufficient for the needs of the library's population. A large number of titles requested from other libraries were a clear indication that either the acquisitions budget was insufficient or the collection policy was not based on the needs of the local users. On the other side, the number of requests received showed the importance of the library's collection for the scientific community and the library's role in resource sharing. Comparison between libraries of similar size, structure and mission would be possible, if the request allocation procedures of cooperative systems were taken into account. The calculation method of the ratio was establishing the number of requests received and requests sent out in interlibrary lending during a year. The number of requests received was divided by the number of requests sent out to obtain the ratio for the indicator. It might be useful to count requests for books and articles separately to get more detailed information about possible shortcomings in the collection. Regarding interpretation and use of results, a higher score would generally be considered as good, as it showed the relevance and comprehensiveness of the library's collection. The results of the indicator can also be used for promoting the library's importance and role (Poll & Boekhorst, 2007).

Referring to the above literature, this study will use four performance measures -- cost, fill rate, turnaround time, and ratio of requests received to requests sent out in interlibrary lending -- for assessing interlibrary loan services in university libraries in Taiwan.

3. Research Method

Interlibrary loan services were common for university libraries but cost a lot of money and human resources. In order to help libraries handle their operations in cost-effective and timely manner, it was important to carry out a performance evaluation study. The study mainly discusses performance measurements of interlibrary loan for university libraries in Taiwan. The purposes of the study were: 1) to explore the status of interlibrary loan services for university libraries in Taiwan; 2) to investigate the effect of electronic resources on interlibrary loan; 3) to collect and analyze current data on the performance of ILL services of university libraries; 4) to identify and describe characteristics of low-cost, high-performing ILL operations; 5) to compare the ILL service performance measurement with the 2004 study conducted by the Association of Research Libraries in the United States.

This study used the performance evaluation method and collected data by questionnaires with quantitative approach, not including user's satisfaction and service quality. The main study target was the interlibrary loan operations of university libraries in Taiwan implementing the NDDS information system. For the limitations of the study, the research scope included borrowing and lending in domestic interlibrary loan services, excluding foreign interlibrary loan and user-initiated RapidILL service.

The study used questionnaires to collect data and evaluated borrowing and lending operations with four performance measures: direct costs, fill rate, turnaround time, and ratio of lending to borrowing ILL, as shown in Figure 1. Aimed at university libraries in Taiwan, the study conducted ILL performance evaluation surveys. First, two focus group interviews were undertaken for consultation from ILL librarians to construct interlibrary loan performance evaluation indicators and evaluation methods. Second, questionnaires were designed to collect data on university library interlibrary loan service status and performance information. Seven performance indicators were constructed according to suggestions from a focus group interview as follows: borrowing unit cost, lending unit cost, borrowing fill rate, lending fill rate, borrowing turnaround time, lending turnaround time, and ratio of lending to borrowing in interlibrary lending. The questionnaires were designed based on these seven indicators to collect the interlibrary loan service operations and performance data on the previous year, including organization and administration, interlibrary loan operations statistics, and cost of materials. After filled questionnaires were sent back, the researcher analyzed, measured the effectiveness and performance of ILL operation, and described characteristics of low-cost and high performing libraries.

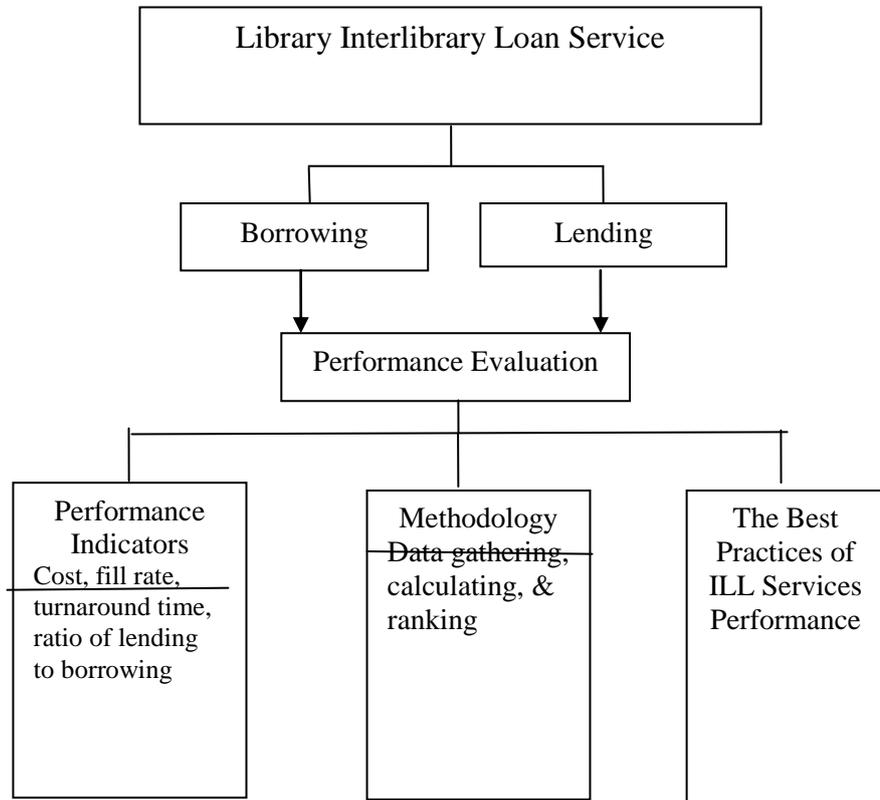


Figure 1 Research Framework of University Libraries Interlibrary Loan Performance Measurement

The study used four performance measures to evaluate borrowing and lending services: direct costs, fill rate, turnaround time, and ratio of lending to borrowing in interlibrary lending with seven indicators. Calculating methods were described as follows:

1. Unit costs: Costs a library incurred to fill a borrowing or lending request. Direct costs included seven categories: staff, network /communication, delivery, photocopy, supplies, equipment, and ILL fees (Jackson, 2004). Unit cost was derived from the total cost identified in participating libraries cost worksheets, divided by their total filled transactions for the year for requesting and for supplying.
2. Fill rate: Percentage of borrowing or lending requests successfully filled in a

fiscal year. It was calculated using transaction data from the questionnaire. Totals represented the percentage of requests successfully filled.

3. Turnaround time: Number of calendar days to complete a borrowing request or fill and ship a lending request. This measured the number of calendar days between the patron's initiation of an ILL/DD request and the library's notification to the patron of the final outcome of the request. It was calculated using data from the questionnaires.
4. Ratio of lending to borrowing in interlibrary lending: Number of requests received in interlibrary lending divided by the number of requests sent out. It was calculated establishing the number of requests received and requests sent out in interlibrary lending during a year. Requests made by users directly to other libraries should be included if the cooperative automated system for the interlending procedures can deliver these data. The number of requests received was divided by the number of requests sent out to obtain the ratio for the indicator.

In April 2014, the researcher sent two questionnaires to 169 university libraries to collect 2013 baseline data on interlibrary loan service operations and performance data; Questionnaire A collected university library interlibrary loan services operations and statistics, Questionnaire B collected cost data of interlibrary loan services. Items of questionnaire included: basic information, interlibrary loan organization and staff, equipment and services, borrowing operations, and lending operations. Questionnaire B collected cost data of interlibrary loan operations, including staff, network /communication, delivery, photocopy, supplies, equipment, and ILL fees. After receiving filled questionnaires, the researcher analyzed and measured the effectiveness and performance of ILL operations. After receiving filled questionnaires, researchers registered data and calculated performance based on the seven indicators, using SPSS statistical software and Excel for calculations. Finally, based on performance measures, interlibrary loan services were evaluated and low-cost and high performing interlibrary loan operations and characteristics were listed and compared to the performance of interlibrary loan service for university libraries in Taiwan with the 2004 ARL study. As a result, the performance evaluation and recommendations were made to improve the interlibrary loan services.

4. Results

4.1 Background

The researcher sent questionnaires A and B to 169 university libraries to collect 2013 baseline data on interlibrary loan service operations and performance data, and received 107 valid filled questionnaires with return rate of 63%, which included 63 comprehensive university libraries (59%), 26 science & technology

university libraries (24%), and 18 college libraries (17%). The collection of 59 participants (55.1%) was between 210,000-500,000 volumes. All participants provided domestic interlibrary loan services; and 45 libraries (42.1%) provided foreign interlibrary loan service. All participants implemented a variety of interlibrary loan systems, including NDDS system, RapidILL system; OCLC ILL as shown in Table 1.

The names of interlibrary loan departments were diverse, such as reference/promotion services for 39 participants (36.4%); circulation department for 28 libraries (26.2%), and technical services. ILL operations of 77 participants (72%) were run by professional librarians; 17 libraries (15.9%) by professional and non-professional; 13 libraries (12.1%) by non-professional librarians. Types of staff deployed in ILL unit were different, the majority of librarians, 93 participants (86.9%); part-time students, 50 participants (46.7%). The mean number of staff was 1.3 per each library, 1.1 staff per comprehensive university library, and 2.1 staff per science & technology university library, 1.1 staff per college library.

Table 1 Interlibrary Loan Organization and Services (N=107)

Library Type	Comprehensive University	63(59%)
	Science & Technology University	26(25%)
	College	18(17%)
Department	Reference and Promotion Services	39(36.4%)
	Other	33(30.8%)
	Circulation	28(26.2%)
	Technical Services	5(4.7%)
	Administration	2(1.9%)
Interlibrary Loan Staff Number	Mean	1.3(100%)
	Comprehensive University	1.1(47.4%)
	Science & Technology University	2.1(39%)
	College	1.1(13.5%)
ILL Fee	ILL Returnables Fee	93(86.9%)
	ILL Nonreturnables Fee	92(86%)
	ILL Returnables for Free	15(14%)
	ILL Returnables for Free	14(13.1%)
ILL Delivery	Mail	106(99.1%)
	E-mail	76(71%)
	Ariel/DD	41(38.3%)
	Fax	33(30.8%)
	Express delivery	13(12.1%)
	Other	1(0.9%)

Regarding ILL fee charging, 92 participants (86%) charged interlibrary loan returnables fee, 93 participants (86.9 percent) charged interlibrary loan nonreturnables fee, 15 participants (14%) free of charge. Participant libraries used various ILL delivery methods, such as mail, 106 (99.1%); e-mail 6 (71%); Ariel 41 (38.3%). As the impact of electronic resource's on ILL, 29 participants

(27.1%) made a database available for interlibrary loan services, 28 participants offered electronic journals ILL (26.2%), 5 participants (4.7%) provided e-Book interlibrary loan. It indicated electronic resources began to influence interlibrary loan service, so that the library should pay attention to this new trend and develop electronic resources interlibrary loan services.

4.2 General Overview

The study evaluated borrowing and lending services for university libraries in Taiwan, covering borrowing returnables, borrowing nonreturnables, lending returnables, lending nonreturnables, with seven indicators including borrowing direct costs, lending direct costs, borrowing fill rate, lending borrowing fill rate, borrowing turnaround time, lending turnaround time, and ratio of lending to borrowing in interlibrary lending.

Table 2 summarized the key finding of performance of ILL operations in the 107 university libraries. In 2013, 107 participants processed 106,261 totally interlibrary loan transactions, 51,753 borrowing, 54,508 lending. On average, a university library needed to manage 993 ILL transactions, 484 borrowing, and 509 lending. On average, the unit cost to university libraries to borrow an item on interlibrary loan was NT\$165, and the cost of lend an item was NT\$109. Average borrowing turnaround time was 1.98 days, and lending turnaround time was 1.54 days. The borrowing fill rate is 80%, and the lending fill rate was 82%. The ratio of lending to borrowing in interlibrary lending was 1.1.

Table 2 Key Findings of Measuring University Libraries ILL Services: Mean Performance

N=107

	Mean	Median
1. Number of Transactions		
1.1 Total Number of Transactions	993	295
1.2 Borrowing		
Returnables	484	207
Nonreturnables	202	75
282	108	
1.3 Lending		
Returnables	509	88
Nonreturnables	210	13
299	56	
2. Unit Cost		
2.1 Borrowing	NT\$165	
2.2 Lending	NT\$109	
3. Fill Rate		
3.1 Borrowing		
Returnables	80%	85%
Nonreturnables	81%	75%
78%	83%	
3.2 Lending		
Returnables	82%	76%
Nonreturnables	82%	77%
81%	66%	
4. Turnaround Time		
4.1 Borrowing		
Returnables	1.98 day	1.92 day
Nonreturnables	2.09 day	2 day
1.87 day	1.84 day	
4.2 Lending		
Returnables	1.54 day	1 day
Nonreturnables	1.58 day	1 day
1.49 day	1 day	
5. Ratio of Lending to Borrowing		
Ratio of Lending to Borrowing	1.1	0.4

4.3 Interlibrary Loan Transactions

In 2013, the 107 participants managed 106,261 totally interlibrary loan transactions, 51,753 of borrowing, and 54,508 of lending as shown in Table 3. On average, a university library needed to manage 993 ILL transactions, 484 of borrowing, and 509 of lending. Comprehensive university libraries managed the most ILL requests among three types libraries, 97,278 (91.5%) transactions -- 46,169 borrowed and 51,109 lent. On average, a comprehensive university library needed to manage 993 ILL transactions, 484 of borrowing and 509 of lending. Both comprehensive university libraries and science & technology

university libraries managed borrowing requests more than lending requests; however, college libraries lending requests more than borrowing requests. It indicated that science & technology university libraries were the most needed ILL services among libraries.

Table 3 Interlibrary Loan Total Transactions (N=107)

	Com. Universities (63)	Sci & Tech Universities (26)	Colleges (18)	Total	Mean	Median
Borrowing	46,169	4,834	750	51,753	484	207
Lending	51,109	2,628	771	54,508	509	88
Total	97,278 (91.5%)	7,462 (7%)	1,521 (1.5%)	106,261 (100%)	993 (100%)	242 (100%)

In 2013, the 107 university libraries generated 51,753 borrows, 30,177 nonreturnables borrows, and 21,576 returnables borrows; on average, an university library managed 484 borrowing transactions, 202 nonreturnables borrows, 282 returnables borrows. Among university libraries, comprehensive university libraries managed 46,169 borrowing requests, accounting for 89.2 percent of all universities; of the borrowing requesting, 42 percent for returnables and 58 percent for nonreturnables. Both comprehensive university libraries and science & technology university libraries borrowed nonreturnables than returnables ; however, college libraries more needed returnables borrowing, as shown in Table 4.

Table 4 Interlibrary Loan Borrowing Transactions (N=107)

	Com. University (63)	Sci& Tech. Universities (26)	Colleges (18)	Total	Mean	Median
Returnables	19,662 (43%)	1,510 (31%)	404 (54%)	21,576 (42%)	202 (42%)	75 (36%)
Nonreturnables	26,507 (57%)	3,324 (69%)	346 (46%)	30,177 (58%)	282 (58%)	130 (64%)
Total	46,169 (89.2%)	4,834 (9.3%)	750 (1.5%)	51,753 (100%)	484 (100%)	207 (100%)

Table 5 shows that the 107 participants managed to lend 54,508 items, 22,501 returnables items, and 31,997 nonreturnable items. On average, a university library managed 509 lending transactions, 299 nonreturnables transactions, and 210 returnables transactions. Comprehensive university libraries managed 51,109 lending requests, accounting for 93.8 percent of all universities, 41 percent for returnables and 59 percent for nonreturnables. Both comprehensive university libraries and science & technology university libraries lent nonreturnables more than returnables; however, college libraries needed returnables lending more.

Table 5 Interlibrary Loan Lending Transactions (N=107)

	Com.University (63)	Universities of Sci & Tech. (26)	Colleges of Tech. (18)	Total	Mean	Median
Returnables	20,801 (41%)	983 (37%)	717 (93%)	22,501	210 (41%)	13 (15%)
Nonreturnables	30,298 (59%)	1,645 (63%)	54 (7%)	31,997	299 (59%)	56 (85%)
Total	51,109 (93.8%)	2,628 (4.8%)	771 (1.4%)	54,508 (100%)	509 (100%)	88 (100%)

4.4 Unit Cost for Interlibrary Loan

The 107 participants generated 51,753 borrowing transactions and 54,508 lending transactions. Using mean unit costs for borrowing and lending (NT\$165 and NT\$ 109 respectively), the study estimated that in 2013 the 107 participants incurred total ILL direct costs of NT\$ 14,417,068; NT\$8,560,322 (41%) in borrowing expenses; and NT\$ 5,943,657(59%) in lending expenses. Unit cost of college libraries was the highest, and unit cost of comprehensive university libraries was the lowest, as shown in Table 6.

Table 6 Unit Cost for Interlibrary Loan (N=107)

	Com. University (63)	Sci& Tech Universities (26)	Colleges (18)	Unit Cost (NT\$)	Transacti ons	Total Cost (NT\$)
Borrowing	130	352	1,133	165	51,753	8,560,322(59%)
Lending	96	321	281	109	54,508	5,943,657(41%)
Total	226	673	1,413	274	106,261	14,417,068(100%)

The study collected borrowing and lending direct costs including seven categories: staff, network /communication, delivery, photocopy, supplies, equipment, and ILL fees. The study estimated that in 2013 the 107 participants incurred NT\$8,560,322 in borrowing expenses; and staff cost NT\$ 7,513,106 (88%) was the largest expense, as shown in Table 7. The study estimated that the 107 participants incurred NT\$5,943,657 (41%) in lending expenses, and staff cost NT\$5,096,177 (86%) still was the most expensive, as shown in Table 8.

Table 7 Borrowing Unit Cost by Cost Category (N=107)

Cost category	Fee(NT\$)	Unit Cost(NT\$)
Staff	7,513,106(88%)	145
Application Fee	577,114(6.7%)	11
Delivery	332,501(3.9%)	6.4
Supplies & stationery	96,063(1.1%)	2
Internet & communication	41,538(0.5%)	0.8
Photocopying	0(0%)	0
Equipment / software / maintenance	0(0%)	0
Total	8,560,322(100%)	165

Table 8 Lending Unit Cost by Cost Category (N=107)

Cost category	Fee(NT\$)	Unit Cost(NT\$)
Staff	5,096,177(86%)	94
Fee	348,727(5.9%)	6.4
Delivery	327,876(5.5%)	6
Supplies & stationery	135,972(2.3%)	2
Internet & communication	34,905(0.6%)	0.6
Photocopying	0(0%)	0
Equipment / software / maintenance	0(0%)	0
Total	5,943,657(100%)	109

4.5 Fill Rates for Interlibrary Loan

Table 9 presented that fill rate was the percentage of all borrowing or lending requests that were successfully filled. The borrowing fill rate for 107 participants was 79%, returnables borrowing fill rate was 81%, nonreturnables borrowing fill rate was 78%. The fill rates of college libraries and science & technology university libraries were higher than comprehensive university libraries as shown in Table 9.

Table 9 Borrowing Fill Rates (N=107)

	Com.University (63)	Sci &Tech Universities (26)	Colleges (18)	Total	Mean
Returnables	81%	86%	83%	81%	81%
Nonreturnables	77%	83%	86%	78%	78%
Total	79%	84%	84%	79%	79%

The lending fill rate was 82%, returnables lending fill rate was 82%, nonreturnables lending fill rate was 81%. The fill rate of science and technology university libraries at 84% was the highest, as shown in Table 10.

Table 10 Lending Fill Rates (N=107)

	Com.University (63)	Sci& Tech. Universities (26)	Colleges of (18)	Total	Mean
Returnables	82%	82%	83%	82%	82%
Nonreturnables	81%	86%	72%	81%	81%
Total	81%	84%	82%	82%	82%

4.6 Turnaround Time for Interlibrary Loan

Table 11 indicated that average borrowing turnaround time for 107 participants was 1.98 days, returnables borrowing turnaround time 2.09 days, nonreturnables borrowing turnaround time 1.87 days. The borrowing turnaround time of college libraries, 1.81days was the fastest and the 2.11 days of science and technology university libraries was the slowest.

Table 11 Borrowing Turnaround Time (N=107)

	Com.University (63)	Sci& Tech Universities (26)	Colleges (18)	Mean (day)	Median (day)
Returnables	2.08	2.27	1.87	2.09	2
Nonreturnables	1.86	1.96	1.76	1.87	1.84
Total	1.97	2.11	1.81	1.98	1.92

Table 12 indicated that average lending turnaround time for 107 participants was 1.54 days, returnables lending turnaround time 1.58 days, nonreturnables lending turnaround time 1.49 days. The lending turnaround time of comprehensive university libraries 1.39 days was the fastest, and the 1.81 days of science and technology university libraries was the slowest.

Table 12 Lending Turnaround Time (N=107)

	Comp. University (63)	Sci& Tech Universities (26)	Colleges (18)	Mean (day)	Median (day)
Returnables	1.41	1.89	1.72	1.58	1
Nonreturnables	1.38	1.73	1.57	1.49	1
Lending	1.39	1.81	1.64	1.54	1

4.7 Ratio of lending to borrowing in Interlibrary Lending

The ratio of requests lending to borrowing in interlibrary lending was defined as the number of requests received in interlibrary lending divided by the number of requests sent out. The indicator assessed whether the library’s collection was adequate and sufficient for the needs of the library’s population. Average ratio of lending to borrowing in interlibrary lending for 107 participants was 1.1, which meant the university libraries’ collection in Taiwan was adequate and sufficient for the needs of users. The ratio of comprehensive university libraries

was the highest; however, the ratio 0.5 of the science and technology university libraries was the least. It showed that collection of science and technology university libraries was not sufficient and needed to be improved. Science and technology university libraries borrowing requests account for 65 percent of all transactions was higher than lending request, which means that the collection of science and technology university libraries needed to be improved, especially the serials collection, as shown in Table 13.

Table 13 Ratio of Lending to Borrowing in Interlibrary Loan (N=107)

	Com.University (63)	Sci& Tech Universities (26)	Colleges (18)	Total	Mean
Borrowing	46,169(47%)	4,834(65%)	750(49%)	51,753(49%)	484(49%)
Lending	51,109(53%)	2,628(35%)	771(51%)	54,508(51%)	509(51%)
Total	97,278	7,462	1,521	106,261	993
Ratio	1.1	0.5	1	1.1	

4.8 High-performing ILL Operations

One objective of this study was to describe the characteristics of low cost, high-performing borrowing and lending operations. High-performing operations were defined as the ten libraries with the most borrowing requests, most lending requests, lowest unit costs, the fastest turnaround time for returnables and the fastest turnaround time for nonreturnables. More than 20 libraries got a 100% borrowing fill rate, so fill rate measure was excluded. The high-performing borrowing operations were the ten libraries with most returnables ILL requests, most nonreturnables ILL requests, fastest turnaround time, lowest unit cost. The top ten libraries ranked by five borrowing measures were as follows: NTHU, NCTU, NYMU, NTU, PU, CCU, TMU, NTNU, OUC, NSY SU. High-performing borrowers processed and filled a mean of 1,040.2 borrowing transactions for returnables more than the mean of 202 transactions for all participants, a mean of 1,216.5 nonreturnables borrowing transactions more than the mean of 282 transactions for all participants. The mean unit cost of the ten libraries with the lowest unit cost was NT\$41 lower than the mean of NT\$165 for all participants. The mean borrowing turnaround time for returnables for the ten libraries with the fastest turnaround time was 0.19 days more than the mean of 1.87 days for all participants. The mean borrowing turnaround time for nonreturnables for the ten libraries with the fastest turnaround time was 0.18 days more than the mean of 2.09 days for all participants.

High-performing lending operations were the ten libraries with most returnables ILL requests, most nonreturnables ILL requests, fastest returnables turnaround time, fastest nonreturnables turnaround time, lowest unit cost. The top ten ranked libraries for five lending measures were as follows: NTU, NCTU, NCKU, NTNU, NSYSU, CCU, PU, NCYU, CSMU, F JU. High-performing lenders processed and filled a mean of 1,399 lending

transactions for returnables for the ten libraries more than the mean of 213 lending transactions for all participants, a mean of 1,895 lending transactions for nonreturnables more than the mean of 299 lending transactions for all participants. The mean unit cost of the ten libraries with the lowest unit cost was NT\$28 lower than the mean of NT\$108 for all participants. The mean lending turnaround time for returnables for the ten libraries with the fastest turnaround time was 0.28 days more than the mean turnaround time of 1.87 days for all participants. The mean lending turnaround time for nonreturnables for the ten libraries with fastest turnaround time was 0.25 days more than the mean turnaround time of 1.49 days for all participants.

5. Discussion and Conclusion

5.1 Discussion

1. Interlibrary loan service is valuable to university libraries in Taiwan

Interlibrary loan service is valuable to university libraries in Taiwan, most charged by reference / extension departments with librarians assisting; the average number of staff was 1.1. In 2013, the 107 participants managed 54,508 lending transactions, 22,501 returnables lending transactions, and 31,997 nonreturnable lending transactions; 51,753 borrowing transactions, 30,177 nonreturnables borrowing transactions, and 21,576 returnables borrowing transactions. Among university libraries, comprehensive university libraries are the main borrower and lenders of interlibrary loan services. The science and technology university libraries are the most needed borrowing services, especially nonreturnables borrowing.

2. Performance evaluation of interlibrary loan for university library in Taiwan is presented

Measuring the performance of interlibrary loan in university libraries in Taiwan, on average, the unit cost of university libraries to borrow an item on interlibrary loan is NT\$165, and the cost to lend an item is NT\$109. Average borrowing turnaround time is 1.98 days, and lending turnaround time is 1.54 days. The borrowing fill rate is 79%, lending fill rate is 82%. The ratio of lending to borrowing in interlibrary lending of ILL service for university libraries in Taiwan is 1.1, which means that collection of university libraries is sufficient and adequate; but collection of science and technology university libraries is inadequate, especially for serials collection.

3. Performance of ILL operations of university libraries in Taiwan is smaller in requests but better than research libraries of the 2004 ARL study

Comparing the performance of interlibrary loan operations of 107 university libraries in Taiwan to the performance of 59 research libraries of the 2004 ARL study, ILL transactions of Taiwanese university libraries are smaller than the U.S. research libraries, as shown in Table 14. Borrowing unit cost

NT\$165 is for Taiwan, NT\$525 for ARL study; lending unit cost NT\$109 for Taiwan, NT\$278 for ARL study. Fill rate of interlibrary loan service of university libraries in Taiwan is higher than research libraries of ARL study. The ratio of lending to borrowing of the ARL study 2.5 is larger than the ratio of university libraries in Taiwan. The interlibrary loan operation of university libraries in Taiwan still needs to improve. The ILL transactions of universities libraries in Taiwan are smaller than the U.S. research libraries, but faster and with a lower unit cost, which showed that the performance of ILL services of the university libraries in Taiwan was good.

4. High-performing university libraries make lot contributions to resource sharing

The study presented high-performing operations as the ten libraries with the most borrowing requests, most lending requests, lowest unit costs, and the fastest turnaround times. These high-performing university libraries make a lot of contributions to interlibrary loan.

Table14 Library ILL Performance Comparison between Taiwan and the US

	Taiwan(2013) N=107	US (ARL2004) N=59
Participants	University Libraries	Research Libraries
1.1Borrowing Unit Cost	165	525
1.2Lending Unit Cost	109	278
1.3Total Unit Cost	274	803
2.1 Borrowing Fill Rate	79%	86%
2.2 Lending Fill Rate	82%	58%
3.1 Borrowing Turnaround Time	1.98 day	7.6 day
3.2 Lending Turnaround Time	1.54 day	1.5 day
4.1Mean of Borrowing	484	16,698
4.2 Percentage of Borrowing Returnables	42%	44%
4.3 Percentage of Borrowing Nonreturnables	58%	56%
5.1Mean of Lending	509	41,088
5.2 Percentage of Lending Returnables	41%	45%
5.3 Percentage of Lending Nonreturnables	59%	55%
6 Mean of ILL requests	993	58,703
7 Ratio of Lending to Borrowing	1.1	2.41

5. The electronic resources begin to influence interlibrary loan service

The survey shows that there are electronic resources available in ILL services from 29 university library (26.2%), 28 university libraries provide electronic journals ILL, 5 libraries provide e-Book interlibrary loan. ILL librarians also note that they have some problems on following copyright law and getting agreement on license contracts.

5.2 Conclusion and Suggestions

This study carries out a performance measurement of ILL services for university libraries in Taiwan in accordance with four performance measures and described the performance of ILL service for university libraries as lower cost, faster turnaround time, higher fill rate and with sufficient and adequate collection. Based on the above discussions, some suggestions are made as follows:

1. As the performance evaluation of ILL services is important, it is recommended that libraries in Taiwan gather interlibrary loan service statistics referring to the seven performance evaluation indicators proposed by the study, including borrowing unit cost, lending unit cost, borrowing fill rate, lending fill rate, borrowing turnaround time, lending turnaround time, and ratio of lending to borrowing in interlibrary lending. Based on the calculation of interlibrary loan service statistics, according to the seven indicators, the result reports of performance evaluation will assist ILL managers to understand and improve their own operations.
2. It is recommended that the Association of Library Cooperation, Republic of China actively carry out interlibrary loan service performance evaluation for various libraries in order to achieve to cost-effective interlibrary cooperation and keep up with new development trends in interlibrary loan services.
3. It is suggested that science and technology university library collections be enhanced; the ratio of lending to borrowing in interlibrary lending is only 0.5, showing a serious shortage of collections. It is recommended the Ministry of Education pay attention to these problems and help science and technology university libraries improve their collections to fulfill their missions of supporting teaching and research.
4. As databases are available in interlibrary loan services of university libraries in Taiwan, including electronic journals and e-books, it is recommended that databases interlibrary loan service models should be developed and more discussions made regarding copyright issues.
5. As the study of quantitative research does not discuss user satisfaction, it is recommended that further study be done on user satisfaction and service quality evaluation for ILL in order to understand user needs and behaviors. Meanwhile, more studies can be conducted to investigate use of the NDDS information systems and assessing user-initiated RapidILL service.

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