1998

An Interlibrary Loan System on the World Wide Web

Schubert Shou Boon FOO

Ee Peng LIM
Singapore Management University, eplim@smu.edu.sg

Citation

An Interlibrary Loan System on the World-Wide-Web

Schubert Foo[†] & Ee Peng Lim[•]
School of Applied Science
Nanyang Technological University, Nanyang Avenue, Singapore 639798

Abstract

Inter-Library Loan (ILL) service is one of the services provided by libraries that offers users a way to access library resources beyond their affiliated libraries. Additionally, it allows participating libraries to share and maximize their resources. This work examines the ILL process used by libraries in Singapore and proposes that the existing paper-based manual system be replaced by a Web-based ILL system. Such a Web-based system has been successfully designed and implemented at the Nanyang Technological University. The paper presents on overview of the system requirements and architecture, implementation details and demonstrates the feasibility and advantages of the new system.

INTRODUCTION

The Interlibrary Loan (ILL) service provides an avenue for users of the library to borrow books, periodicals or other library resources from other participating libraries when these cannot be found in their own library. The provision of such a service potentially widens the range of library materials offered by the library and optimizes resource usage among participating libraries.

However, existing ILL systems are largely manual systems that require substantial user intervention in the ILL process. Apart from a few ILL systems in universities, such as the University of Stirling (Stirling, 1997) and University of Arkansas (Arkansas, 1995) that support World-Wide-Web based ILL systems, the remainder are likely to be manual systems or commercial ILL modules such as Softlink's Library Automation Software (Softlink, 1997). Nonetheless, the number of manual ones far exceeds

---

[†] Schubert Foo (PhD, MBA, BSc, CEng, MIMechE, MBCS) Email: assfoo@ntu.edu.sg

[•] Ee Peng Lim (PhD, BSc, MACM) Email: aseplim@ntu.edu.sg

computerized ones due to a number of reasons. There is the need for each participating library to use the same system or software in order to carry out the ILL process. The difference in library policies among participating libraries makes it difficult to realize a generic system that would be acceptable to all. Different systems, even if they exist, suffer from interoperability problems due to the absence of standards. Thus, two different ILL systems will not be able to exchange information or data.   As the number of ILL requests are traditionally low compared to normal borrowing, little resources have been placed to administer the ILL service.

CURRENT ILL PROCESS

In developing the present Web-based ILL system, Nanyang Technological University's (NTU) Library (Nanyang, 1997) has been used as a basis for study and derivation of system requirements. NTU Library is one of a number of nationwide participating libraries of the Library Association of Singapore (LAS) ILL service. Participating libraries have ILL reciprocity and adopt a similar process for processing outgoing and incoming ILL requests. There are basically no charges for ILL transactions of books or periodicals although some libraries charge a flat-rate for photocopies of periodicals.

Figure 1 shows the process for an outgoing ILL request. When an ILL request is received, the librarian has to verify the validity and contents of the request by checking the requester's particulars, 'correctness' of request from a union catalogue such as the Singapore Integrated Library Automated Service (SILAS); ensure non-availability of request in the library's own holding; decide on the lending library, complete and submit the LAS-ILL loan form; and coordinate the collection of material when approved and made available by the lending library. As indicated by NTU librarians in an interview, the process up to this point takes an average of 6 man-hours. The collection, tracking and controlling of the loaned material, collecting overdue fines, returning the loaned material, and confirming the successful end of the ILL process incurs further man-hours. The majority of the time is being spent on searching, documentation and updating of loans' statuses that requires minimal decision making.

Figure 2 shows the process for an incoming ILL request. When an incoming request is received, the librarian has to verify the loaned material against its catalogue (e.g. OPAC) and holding information. If the material is available for loan, then it is first physically retrieved from the shelf and put on charge and placed aside to await collection. Arrangements are made to inform and arrange for collection by the borrowing library. The process of tracking loan item collection and their return are similar to normal items from the library except that is it carried out with a borrowing library instead of a normal library user. The process ends with the confirmation with the borrowing library of the safe and sound return of the loaned item.
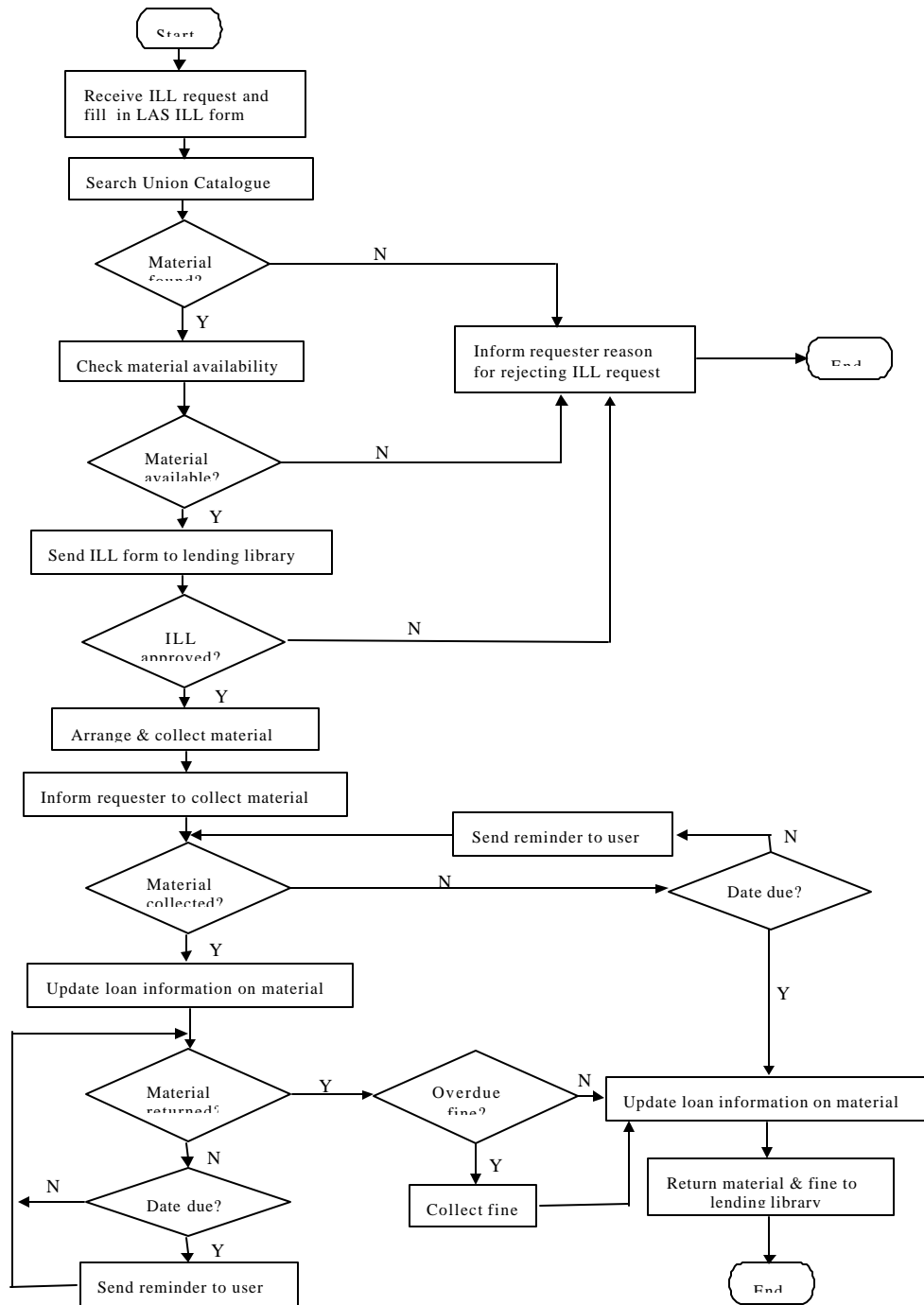
Figure 1. Outgoing ILL Process
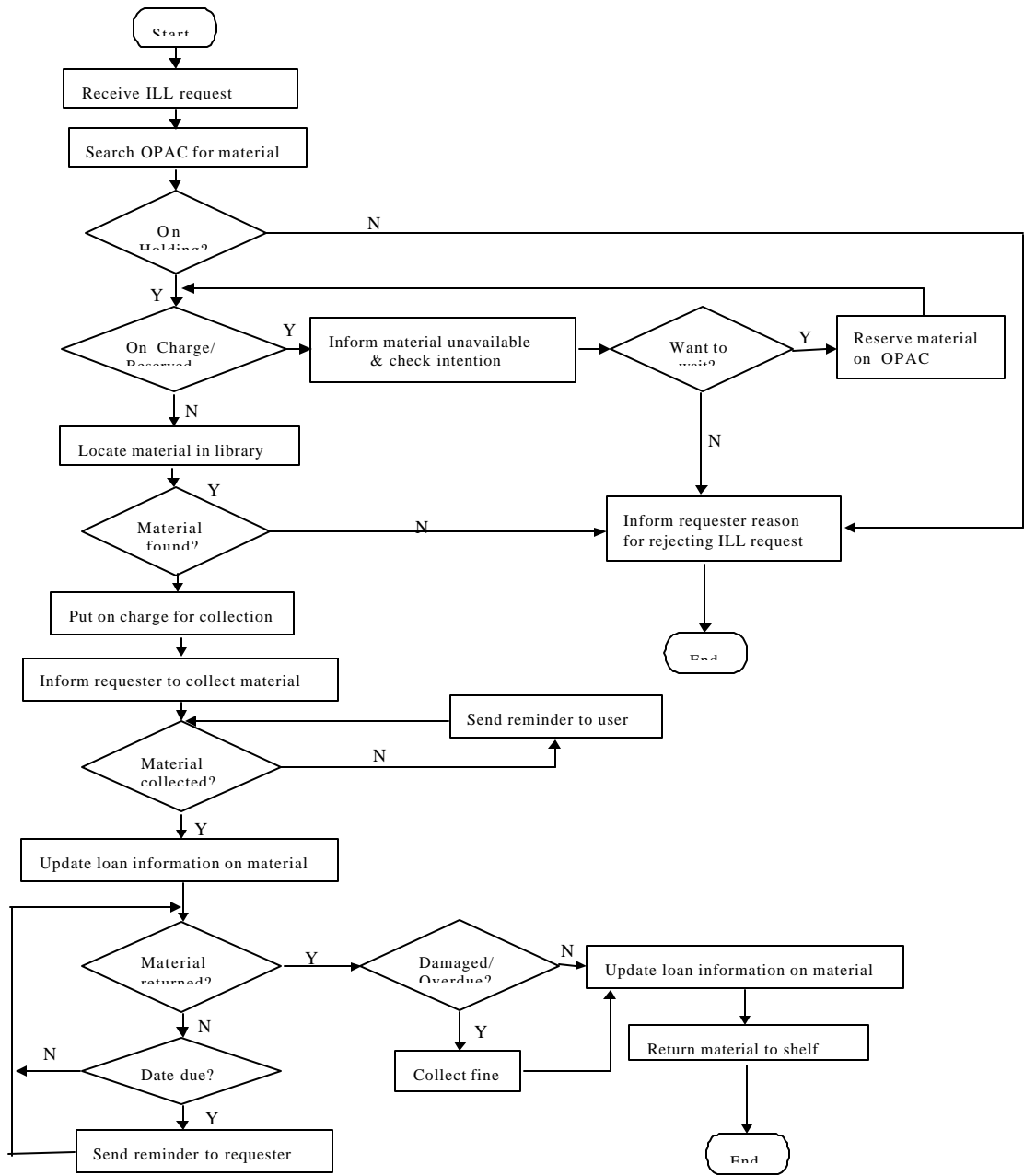
Figure 2. Incoming ILL Process

Needless to say, the manual system is both time-consuming and inefficient. Duplication of effort is required to complete the LAS ILL loan form since the user fills in a separate form when requesting for an ILL. Access to SILAS is confined to certain access points in the library. Miscommunication with the lending library may delay the approval process. Time is spent in contacting users when urgent requests are not fulfilled, filing ILL forms, carrying out manual periodic checking of overdue items and collating ILL

4

statistics. The manual system is manageable if the requests are few but is likely to lead to proportionate increase of administrative problems and overloads when ILL demand increases.

The availability of on-line library systems, OPAC and information technology know-how provides further impetus to deliver a computerized ILL system to replace and enhance the highly labour-intensive and time-consuming manual system.

SYSTEM ARCHITECTURE & DESIGN
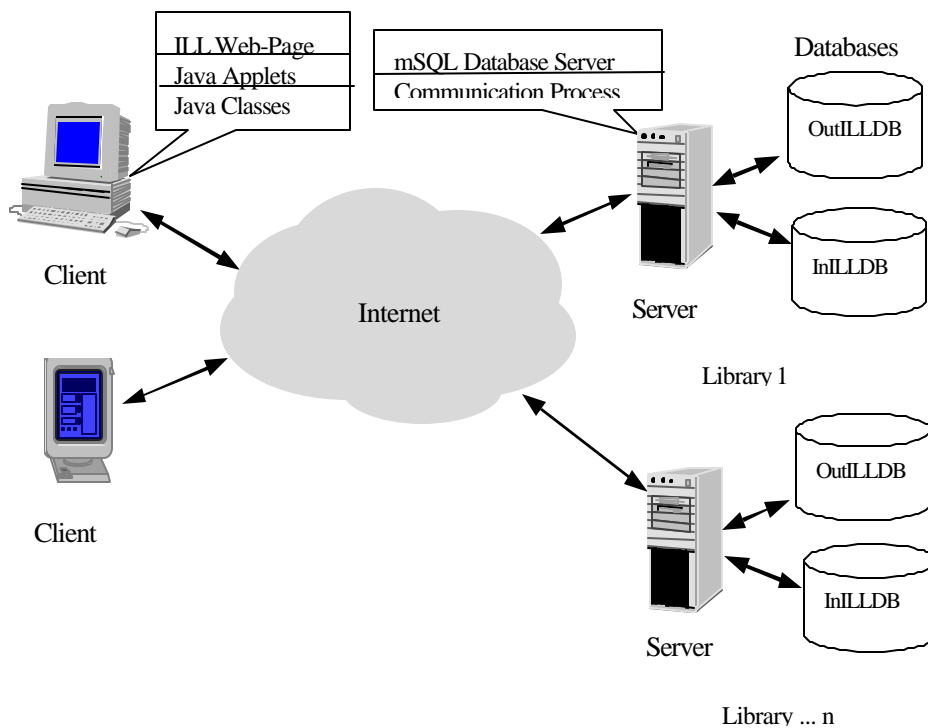
Figure 3. ILL System Architecture

The Web-based ILL system adopts a client-server architecture as shown in Figure 3. It allows the system to be integrated with the library's existing functions on the Web to enable widespread access by anyone on the Internet. This implies that both users and librarians are no longer confined to using special access points to submit or process ILL requests.

The client can be a personal computer, Macintosh or workstation with a suitable Web browser such as Netscape Navigator 2x/Gold (Netscape, 1997) or Microsoft Internet Explorer 3.0 (Microsoft, 1997), or higher equivalent versions of them. Residing on the Web server is a database server that supports two separate databases for maintaining

incoming and outgoing ILL requests respectively. The use of separate databases distinguishes the two different roles of borrowing and lending clearly, and provides a neat solution that improves speed, efficiency and maintainability. These stand-alone databases are used solely to support the ILL functionality and at such, are not the same library databases used for catalog or holding information. This architecture is replicated at each participating library. A communication process exists to allow direct communication and updating of each other library's databases. Users interact with the system using the normal Web access techniques of browsing and filling in forms.

A number of system requirements are fulfilled in the ILL system design:

- The ILL system is integrated with the library's Web page to provide the added ILL functionality.
- An authentication process is maintained to provide legitimate access by registered library users, librarians and participating libraries.
- ILL requests are electronically completed by users and verified by the system prior to being stored in the database by processing by librarians.
- New requests are automatically presented for approval. Approved requests are automatically forwarded to the lending libraries by updating their databases directly. Rejected requests can be accompanied by reasons provided by the library.
- Incoming ILL requests from other libraries are automatically presented for approval. Likewise, the outcomes of these requests are automatically forwarded to the borrowing libraries by updating their databases directly.
- Progress tracking exists to enable users to be kept up-to-date of the current status of the ILL requests.
- Transaction updating exists to allow both libraries to keep track and monitor the loan status after collection from the lending library.
- Overdue items are automatically flagged and made known to the librarians by the system.
- Completed ILL transactions are kept in the databases for a period of time (e.g. two years) prior to being archived. Statistical information of the data on the active databases can be generated for viewing and analysis.
- The system maintains participating libraries' information allowing libraries to join or leave the ILL system.

SYSTEM IMPLEMENTATION

A Web-based ILL system has been developed in the School of Applied Science, NTU. It employs the architecture of Figure 3 and satisfies the associated system requirements. The client is implemented as a set of Java applets (Walsh, 1996) that are downloaded and invoked when the Web page is browsed. The client-server concept of the architecture is only apparent when these applets are downloaded to the client since there is no prior installation of applets at the client machine.

Java has been selected as the development platform due to its superior features, being platform-independent, and its emerging role as being the *de-facto* language for Web-based applications.   A publicly available relational database management system (RDBMS), Mini-SQL (Hughes, 1995) that supports standard subset of ANSI SQL, is used as the database engine. This is sufficient in most instances, as the number of ILL transactions is still relatively small. Data associated with incoming and outgoing ILL requests are stored in the separate InLLDB and OutLLDB database respectively.

The client uses a set of object classes to communicate with the host and remote library databases. The object classes are built using Java and Java-mSQL Application Programming Interfaces (APIs)(Collins, 1996). Each class consists functionality to support connection establishments, database queries, retrieval and presentation of results, and disconnection to remote hosts.   If necessary, the existing Mini-SQL database can be "unplugged" (removed) and replaced by a production based RDBMS to support higher ILL demands. This poses no problem as it requires only minor changes to existing codes due to the use of standard SQL APIs.
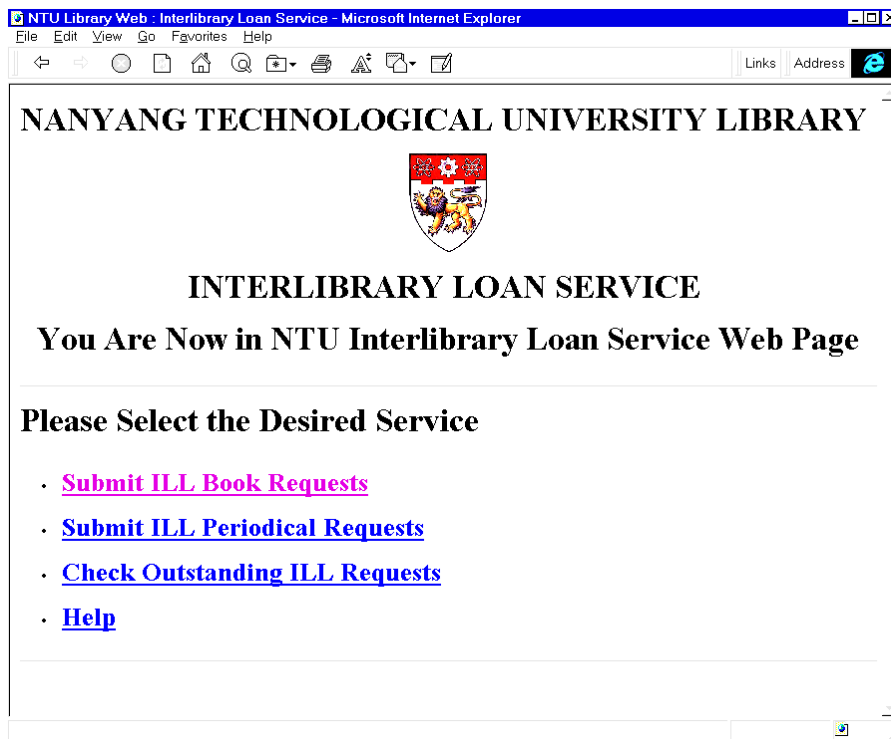

Figure 4. ILL Home Page for Registered Users

The ILL home page (not shown) comprises three options for new user registration, searching the library OPAC and request for ILL respectively. Registered users selecting the request ILL option will be shown the Web page of Figure 4. Separate options exist

for ILL of books and periodicals. This is to take into account the different information requirements for a book and periodical (such as periodical title/editor, article title/author, volume number, part number, range of page numbers, and so on). Users can also use the system to check on the status of their ILL request. The status corresponds to one of the eight states shown in Table 1. If an ILL application is rejected, a message pre-determined by the librarian is displayed to the user to inform the latter of the reason for rejection. This table also defines the library that is responsible at the various action stages and the databases that are updated in the process.

Table 1. Status in ILL Process

Status	ILL Process Stage	Action By	Database Update
A	New ILL request	Registered user (BL)	OutILLDB (BL)
B	ILL approved by Borrowing library	Librarian (BL)	OutILLDB (BL) InILLDB (LL)
C	ILL approved by Lending library	Librarian (LL)	OutILLDB (BL) InILLDB(LL)
D	Material collected, update collect date and due date	Librarian (BL) Librarian (LL)	OutILLDB (BL) InILLDB (LL)
E	Material collected by registered user	Librarian (BL)	OutILLDB (BL)
F	Material returned by registered user	Librarian (BL)	OutILLDB (BL)
G	Material returned to Lending library	Librarian (BL) Librarian (LL)	OutILLDB (BL) InILLDB (LL)
X	ILL request rejected	Librarian (BL) OR Librarian (LL)	OutILLDB (BL) OR both OutILLDB (BL) & InILLDB (LL)

BL: Borrowing library   LL: Lending library

The librarian's ILL Web page is shown in Figure 5. It mirrors the users' Web page by providing the functionality to handle new membership requests, process and update outgoing ILL transactions. New ILL requests are automatically displayed for processing by the librarian. Upon approval of the request, the librarian will identify and select a lending library to send the request. This is shown in Figure 6. Additionally, the librarian will define a number parameters such the type and subject area of request that are eventually used to generate different statistics of the ILL system such as frequency of approved and rejected requests, types of users using ILL service, and breakdown of subject areas of ILL service. The request is subsequently sent by the system by automatically updating the lending library's incoming database directly.
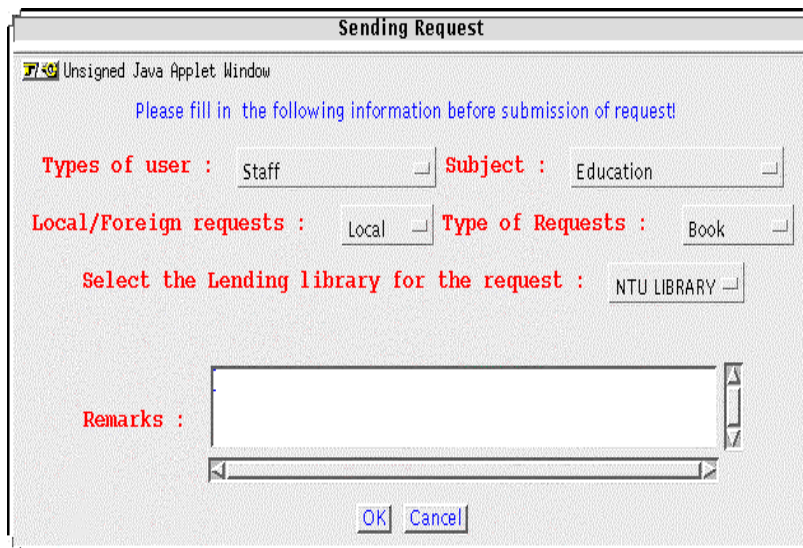
Figure 5. Librarian's Web Page

Figure 6. Interface to Send Approved User ILL Request

Thus, the second half of the librarian's ILL Web page of Figure 5 is used to process incoming requests as the library plays the reverse role as a lending library to process and update incoming ILL transactions from borrowing libraries. Finally, an administrative option exists to allow the system to admit new or delete existing participating libraries from the ILL system, and a statistical option allows the librarian to view incoming and outgoing various ILL statistics that are captured by the system.

CONCLUSION

A Web-based ILL system has been proposed, designed and implemented. The system has demonstrated the advantages associated of having a computerized system to replace the existing paper-based manual-intensive ILL system. The system is small, secure, robust, easily installed and maintained. It eliminates form-filling completely and minimizes human errors as information is electronically captured, updated and transmitted among participating libraries. The system simplifies status tracking and allows users to obtain the information directly and easily. Use and administration of the system is carried out through the Web and therefore made accessible Internet-wide and not just confined to limited access points in the library. Data in the system is handled efficiently and effectively with options for backup archival and statistics generation.

REFERENCES

Arkansas University. 1995. "University of Arkansas Libraries", <URL: http://cavern.uark.edu/libinfo/illdept>.

Collins, D. 1997. "Java-mSQL APIs", <URL:http://www.minmet.uq.oz.au/~darryl>

Hughes, D.J. 1995. "Mini SQL: A Lightweight Database Engine Version 1.0.6", <URL:http://Bond.edu.au/People/bambi.html>

Nanyang Technological University, 1997. "Nanyang Technological University Library", <URL: http://www.ntu.edu.sg/library/lib.htm>

Walsh, A.E. 1996. "Foundations of Java programming for the World Wide Web", IDG Books Worldwide, Inc.

Microsoft Corporation, 1997. "Internet Explorer 3.0". <URL: http://www.microsoft.com/ie/ie.html>.

Netscape Communications, Inc. 1997. "Netscape Navigator 2.02 WWW Browser" <URL: http://home.netscape.com/comprod/products/navigator/version_2.0/index.html>.

Stirling University. 1997. "Stirling University Library: Inter-Library Loan Document Requests", <URL: http://www.stir.ac.uk/services/swp/libraries/ill>.

Softlink International, 1997. "Softlink Library Automation Software", <URL: http://www.softlink.com.au/slkmill.htm.>