

# Ex Libris Limited

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## *COMPANY BACKGROUND*

Ex Libris Limited markets ALEPH, an integrated library system that is an outgrowth of library automation and networking activities in Israel, particularly at the Hebrew University of Jerusalem where the system was initially developed. ALEPH is an acronym for Automated Library Expandable Program Hebrew (University of Jerusalem). The system's history and characteristics are described by Lazinger (1991), Lazinger and Levi (1996), Lefkovitz (1988), Lev et al. (1983), Levi (1984), and Simon (1993, 1995).

ALEPH's initial implementation at Hebrew University in the early 1980s followed a decade of planning and proposals for library automation in Israel. Seeking a comprehensive library automation system, Hebrew University examined commercially available products, including the DOBIS/LIBIS system then offered by IBM. It ultimately decided that customized development would best satisfy its special requirements, which included Hebrew language support. For ALEPH's initial implementation, Hebrew University employed a Control Data Corporation mainframe. The development team included librarians who specified system characteristics. The resulting product was widely accepted by University users, and a variety of enhancements were proposed.

During the early 1980s, as part of an initiative to implement a national network of university libraries, the Israeli government subsidized the participation of other university libraries in ALEPH. From its inception, ALEPH was intended to support a network of Israeli libraries. In the mid-1980s, the Hebrew University decided to redevelop ALEPH for VAX minicomputers. The VAX implementation became available in 1987. Termed the ALEPH 200, it permitted a distributed network of multiple processors installed in individual libraries as an alternative to a centralized system serving all participants from a single mainframe. (The original Control Data implementation is now described as the ALEPH 100.) The ALEPH 300, an implementation for Unix-based computers, was introduced in 1991. The ALEPH 500, a Unix-based client/server product that features a relational data base management system and graphical user interfaces, was introduced in 1996.

Ex Libris Limited is a private company owned by the Hebrew University of Jerusalem and by individual shareholders, most of whom are company employees. Ex Libris Limited, which is based in Tel Aviv, markets and supports the ALEPH system internationally. The company's development center is located at Hebrew University. Ex Libris Incorporated, the marketing and support operation for the United States, is located at 509 Bradford Parkway, Syracuse, New York 13224 (telephone: (315) 449-2132; fax: (315) 449-1860; e-mail: rbaum@sprynet.com). Other Ex Libris sales and support offices are located in Luxembourg, Prague, and Buenos Aires. The company has authorized dealers and agents in Denmark, Hungary, Italy, Mexico, Norway, Peru, Poland, Portugal, South Africa, and Sweden.

## *COMPUTING ENVIRONMENT*

The ALEPH system is available for Digital Equipment Corporation's Alpha and VAX minicomputers running under the OpenVMS operating system and for the various Unix-based computers. The OpenVMS version can operate on any processor in the Alpha or VAX product lines, although selection of an appropriate model for a given installation will depend on data base size, the number of simultaneous users, and other application characteristics. Ex Libris emphasizes its Unix implementation for new

ALEPH installations. The Unix version is available for Digital Equipment Corporation's Alpha processors running under OSF/1 (Digital Unix), Hewlett-Packard HP-9000 Series computers running under HP-UX, IBM RS/6000 computers running under AIX, and Sun SPARC processors running under Solaris. The ALEPH 500, a client/server product, currently employs Unix servers, but an implementation for Windows NT is in development. Ex Libris can supply complete turnkey solutions consisting of hardware and software. ALEPH is also available as software for implementation and operation on customer-supplied computer configurations.

As described below, the ALEPH system supports a variety of national character sets. The ability to display a particular character set depends on the type of terminals employed in a given installation. A Latin character set, which includes the ALA character set and Digital Equipment Corporation's multinational character set, is supported by all VT-compatible terminals as well as by microcomputers equipped with VT-100 emulation capabilities. VT-320 and VT-420 terminals, and microcomputers equipped with compatible emulation software, can display Hebrew, Arabic, and Cyrillic scripts as software-based fonts that are resident in the ALEPH host computer. Each font is defined in a file that includes instructions for drawing individual characters. As an alternative to soft fonts, VT-320 and VT-420 terminals can be equipped with an Israeli Hebrew chip. Substitution provisions are made for the display of special characters on terminals, such as the VT-100 and VT-220, that cannot accommodate them. The ALEPH system supports many printers, including Postscript-compatible laser printers.

#### *SYSTEM DESCRIPTION*

ALEPH is a fully integrated system with application modules for cataloging, authority control, online catalog access, circulation control, acquisitions, serials, and interlibrary loan. An optional component can accommodate full-text documents, digitized images, and audio information linked to bibliographic records. ALEPH also supports a selective dissemination of information (SDI) component based on library-defined user profiles.

ALEPH is compatible with single-computer or networked implementations. Single-computer installations may involve a single library or multiple libraries. In multi-library implementations, participants may maintain separate or shared data files. In either case, each participant defines its own policies for bibliographic information, circulation control, and other aspects of system operation. ALEPH installations in two or more libraries can be networked using a variety of communication protocols, including TCP/IP, DECNET, and IEEE 802.3 (Ethernet).

The ALEPH system was designed to accommodate a broad range of library requirements and to be adaptable to a variety of library-related documents, including patents, engineering drawings, manuscripts, and audio-visual materials as well as conventional monographic and serial publications. Significant application characteristics, such as data base structures and circulation policies, are defined in parameter tables. Bibliographic records can be accommodated in MARC or non-MARC formats. The ALEPH system can import MARC records, which it converts to a proprietary format for storage and processing. A document record table defines field names and codes, which may be MARC tags or simple mnemonic codes. Libraries can combine MARC tags for standard bibliographic materials with special codes for other items. ALEPH supports national MARC variants, including USMARC, UKMARC, DANMARC, IBERMARC, and UNIMARC. It supports the ALA character set, Digital Equipment Corporation's multinational character set, and the ISO Latin 2 character set, which encompasses Arabic, Cyrillic, Greek, Hebrew, Latin, and Eastern European characters. Different character sets can be combined within a bibliographic record. Any field can be indexed within data base records. Any field can be a repeating field with an unlimited number of occurrences.

Cataloging records can be key-entered or imported in machine-readable formats from external sources. ALEPH supports several convenient key-entry methodologies, including structured data entry based on predesigned workforms and free-format data entry. Up to 99 different workforms can be defined for various types of library materials. An operator can switch between workforms and free-format data entry during cataloging of a given record. Data entry and editing privileges are regulated by passwords. Full-screen editing is supported. Field values can be transferred from a previously entered record, such as an earlier edition of a given work. ALEPH does not require entries in specific data fields; to maintain maximum flexibility in application design, the particular field values entered into cataloging records are entirely determined by application requirements. As an alternative to online data entry and immediate updating of a library's bibliographic data base and its associated indexes, cataloging records can be entered into a file for batch input. Records can be copied from external files in either the ALEPH format or a MARC exchange format. In its standard configuration, the ALEPH system can load records in the USMARC or other MARC formats from magnetic tapes produced by national libraries, bibliographic utilities, retrospective conversion companies, or other organizations. Online interfaces are available for OCLC and RLIN. At the time of this writing, Ex Libris was reportedly enhancing those online interfaces.

The ALEPH system supports authority control as a standard capability of the cataloging module. An ALEPH installation can have multiple authority files, and the system can link headings in multiple character sets. As cataloging records are added to a library's data base, the ALEPH system automatically extracts field values for inclusion in authority files. Authority records can also be entered separately, using the system's authority maintenance functions. To facilitate key entry of cataloging information, authority files can be searched at any point in the cataloging process, and authorized headings can be copied into bibliographic records. Entries in authority files can include cross-references and scope notes. The system automatically checks for blind or conflicting references. Preferred terms are automatically substituted for "see" references. Libraries can create multiple authority files in different languages. Such files can be linked to permit searching of authority-controlled fields in any of the defined languages.

During cataloging, operators are warned when entries in authority-controlled fields do not match headings in authority files. The system permits global editing of authority files. Changes in an authority record automatically modify the corresponding field values in cataloging records. Authority control is provided for library-defined fields at the individual installation level only. There is no provision for centralized authority control in multicomputer networks. In such situations, access points for a given bibliographic record may differ from one library to another.

The ALEPH online public access catalog module supports novice-and expert-mode searching. In either mode, users can retrieve a bibliographic record or set of records based on specified criteria, request additional information about retrieved records, and determine the circulation status of specific items. The novice search mode is menu-driven and employs guided search concepts. A series of screens present preconfigured search options. The content of each screen can be customized to address special application requirements. The user interface -- including menu titles, operator prompts, explanatory messages, and help screens -- can be implemented in different languages or character sets. Users can change languages during an OPAC session. Designed for library staff members and experienced users, the command-driven expert mode is based on the ISO 8777 standard, Common Command Language (CCL). As noted above, ALEPH also supports an SDI capability through which a series of commands can be stored as a query profile to be executed at predefined intervals.

OPAC searches can be limited to a defined collection segment, such as the holdings of one library in a consortium installation. In networked implementations involving installations at multiple libraries, ALEPH can maintain a union catalog of holdings at all participating sites. The union catalog's interface and search procedures are identical to the local library interface. Any networked computer and library

catalog can be accessed from any site during an online search session. In such networked implementations, information about participants' holdings is consolidated. ALEPH displays a list of libraries that have copies of a given title. The user can request a detailed display of holdings information for any library's copy. A utility program identifies duplicate cataloging records and adds only holdings information if a record is a duplicate.

Retrieval operations can be based on index browsing or explicit requests. In the browse mode, the system displays a scrollable, alphabetized list of names, subject headings, or other field values. Cross-references can be displayed where applicable. The operator selects a desired heading to invoke the display of bibliographic and holdings information. The command mode supports complex retrieval capabilities, including command stacking, right and left truncation of search terms, Boolean operators, relational expressions, proximity operators, and ranking of search results by frequency of occurrence of search terms. Searches can be limited by publication date, language, or other library-defined parameters.

Search results can be displayed, printed, or saved in a file for editing or other processing. A library can define up to 98 different display formats for retrieved bibliographic and holdings information. A library-specified default format can be changed by the user during a search. Registered borrowers can place loan, hold, and photocopy requests for items retrieved by OPAC searches. Parallel requests can be placed on all items in a designated set. The request is satisfied by the first item in the set to become available. The ALEPH photocopy request module prompts users to enter a pickup location or a delivery address. An order slip is printed for each available item requested for photocopying. Holds are automatically placed on unavailable items. Borrowers can also request lists of their outstanding loans, holds, and photocopy requests.

As an optional component, the ALEPH system provides utility programs for creating union catalogs. Such catalogs can reside on a single computer or at multiple ALEPH installations. The union catalog can serve as a central data base in which the records of all participating libraries are cataloged. Following data entry, the records are downloaded automatically from the union catalog to individual libraries. Alternatively, catalog records can be entered initially into individual library data bases. Bibliographic records are then uploaded automatically to the union catalog. The uploading procedure checks for duplicate records. The union catalog's user interface is identical to the local library's user interface. When bibliographic records are retrieved from the union catalog, a pop-up window displays a list of libraries with copies for perusal and selection. Users are automatically transferred to specified library locations for holdings information.

Ex Libris offers Z39.50 compatibility as an optional system component. The ALEPH Z39.50 server provides access to ALEPH data bases through Z39.50 clients. The ALEPH Z39.50 gateway provides connectivity to remote servers that support the Z39.50 protocol. In the novice and expert modes described above, the ALEPH online public access catalog has a text-based user interface. The ALEPH 500 Search Client provides a Windows-based interface for searching ALEPH catalogs as well as remote data bases that reside on Z39.50 servers. The ALEPH 500 Search Client relies on icons, pulldown menus, dialog boxes, and other graphical interface components to simplify the entry of search terms and display of retrieved records. It supports multiple languages and character sets, image displays with automatic activation of resident image viewers, and audio output. Among its special features, the ALEPH 500 Search Client can search multiple data bases with a single command and consistent user interface.

The ALEPH 500 Web Server provides Internet-connectivity for access to ALEPH data bases via Netscape Navigator or other Web browsers. It supports the same retrieval functionality as the ALEPH catalog, including a choice of interface languages, powerful search capabilities, brief and full display formats for retrieved records, and online requests for loans, holds, and photocopies.

The ALEPH circulation control module automates check-out, check-in, holds management, borrower registration, and other circulation activities. As previously noted, circulation policies are governed by parameter tables with defined loan periods and fine rates for particular item and borrower categories. Due dates can be computed (by adding a specified number of days to the current date) or fixed (such as the last day of the semester in an academic library). When computing a due date, the ALEPH system automatically compensates for holidays or other days when the library is closed. Circulation transactions are performed in real time. Transactions are automatically blocked when exceptional item or borrower conditions are encountered. Completed loan transactions can be transferred to a history file. An offline loan facility can record circulation transactions when the ALEPH system is unavailable.

Displayed workforms facilitate borrower registration. Borrower records include personal information, expiration dates, circulation privileges, and permission indicators for photocopy requests or other special capabilities. Borrower records can be retrieved by name, identification number, or barcode number. The circulation control and online catalog access modules are integrated. Holdings displays contain circulation status information, including due dates. As an option, the ALEPH system supports self-service circulation workstations. Using the OPAC module, registered borrowers can renew items on loan. A voice response system is available for renewals and hold requests. The circulation control module can generate various notices and reports, including overdue notices, hold notices, borrower rosters, lists of items on hold, lists of overdue items, lists of items returned late, and statistics about loan and hold activity for specific time periods.

The ALEPH interlibrary loan module is designed to manage interlibrary loan requests to libraries within or outside of an ALEPH network installation. It supports the creation of data base records for requests, printing of requests on IFLA forms, electronic transmission of requests, maintenance of supplier rosters and deposit accounts, check-in of requested items on receipt, and tracking and return of loaned items. When an interlibrary loan request is initiated, the system prompts the user to enter the type of request (loan or photocopy), as well as bibliographic, supplier, and borrower information. Records for interlibrary loan requests are maintained in ALEPH's data record format. They can be retrieved by bibliographic fields, supplier codes, expected date of arrival, borrower identifier, or other parameters. The interlibrary loan module can print lists of orders for follow-up, summaries of items received, and cost reports.

The ALEPH acquisitions module supports order creation, fund accounting, full or partial receipt of items, claiming, cancellation, fund accounting, and related recordkeeping activities associated with the procurement of library materials. It can accommodate regular or standing orders for monographs and subscriptions. ALEPH supports several acquisitions arrangements, including purchases, gifts, exchanges, depository arrangements, and approval plans. If desired, a designated library in an ALEPH network can handle all acquisitions-related activities for network participants. This arrangement is suitable for a large public or academic library with multiple branches or departmental libraries. Alternatively, orders can be initiated by individual libraries and executed by a central library. In still another method, libraries that share an ALEPH data base can handle acquisitions separately.

The acquisitions process begins with the entry of order information via the cataloging function. To minimize key-entry, information can be transferred from other bibliographic or order records. The system automatically generates an order number. Short and detailed workforms are provided for order entry. The subscription order form includes the renewal date and a field to designate automatic renewal. Existing order records can be copied and modified to create new orders. If an ISBN or ISSN was entered into the cataloging record, it is automatically transferred to the order form. Order records can be retrieved by bibliographic indexes, order number, fund, vendor, invoice number, or other parameters.

The acquisitions module maintains fund and vendor files. Up to three funds can be assigned to a given order. Estimated prices are automatically deducted from the indicated funds. Currency exchange rates can be defined and modified as required. Different rates can be assigned to various phases of the procurement cycle, including encumbering, invoicing, and payment. Purchase orders and claims can be printed in library-defined languages on demand or in batches. The ALEPH system can accommodate multiple order formats and claim letters. The acquisition module can generate a variety of management reports, including order requisition lists, lists of orders for claiming, lists of subscriptions due for renewal, lists of deleted orders, fund reports, and vendor rosters. The ALEPH system can generate orders in the BISAC format for electronic transmission via e-mail or file transfer protocol.

As described above, the ALEPH acquisitions module can order, cancel, and renew subscriptions to magazines, professional journals, newspapers, and other serial publications. The ALEPH cataloging function is used to create bibliographic records for serials. The ALEPH serials management module automates the check-in of individual issues and related serials control activities. It can predict the receipt of specific issues, claim unreceived issues, generate routing slips, and create holdings statements for inclusion in a library's catalog. Enumeration information for individual issues is automatically generated from library-defined publication patterns. Claiming of missing issues can be performed online or through a batch utility program. Bindery orders can be prepared for completed volumes. Routing slips can be prepared for received issues. Names on routing lists can be prioritized, added, or deleted. Printed reports include union lists, lists of newly received issues, bindery lists, and lists of inactive serials.

As an optional capability, an ALEPH system can link bibliographic records to full-text documents, audio information, or digitized images produced by document scanners or imported from machine-readable sources. The text, images, or audio information is linked to bibliographic records by entering a file name into a designated field. During OPAC searches, text or images are displayed in pop-up windows.

### *INSTALLATIONS*

The ALEPH system is installed at more than 210 processor sites in 29 countries. Approximately 20 percent of the installations are in Israel. Libraries in Denmark and Italy account for 17 and 18 percent of the installed base, respectively. Other Western European installations are located in Belgium, France, Germany, Greece, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and Switzerland. Approximately 28 percent of ALEPH installations are in Eastern European libraries. Hungary has 29 installations, followed by the Czech Republic with eight installations and the Republic of Slovakia and Poland with six installations each. Ex Libris has four installations in the Ukraine and one installation in Bulgaria, Romania, Russia, and Turkey. Its African installations are in Egypt and South Africa. Latin American installations, which account for about 5 percent of ALEPH customers, are located in Argentina, Brazil, Mexico, and Peru. Ex Libris has four installations in the United States.

Approximately 57 percent of ALEPH installations are in academic institutions, including colleges, universities, theological institutes, and technical schools. Approximately 25 percent of ALEPH installations are in special libraries, including national libraries, government agency libraries, parliamentary information centers, corporate libraries, museums, and specialized research organizations. The remaining 18 percent of the installed base consists of public libraries. Almost two-thirds of those are located in Denmark, where Ex Libris has over 20 installations in municipal libraries.

ALEPH installations range in size from small libraries with fewer than 10,000 volumes to very large collections in universities, national libraries, and research institutes. Because some ALEPH implementations involve networked consortia that serve multiple libraries, the total of 210 processor sites given above understates the number of organizations served by Ex Libris. When consortium arrangements

are considered, over 280 libraries utilize ALEPH as their integrated system. Svobod (1993) describes the CASLIN network, which links major libraries in the Czech and Slovakian Republics. Other published discussions of ALEPH installations include Aczel (1988), Adler (1983, 1986), Arosy (1995), Ben-Chaim (1987), Bergami and Musek (1992), Bernardis and Bezzi (1994), Cassidy (1991), Domotor (1995), Farkas and Lajcher (1988), Hansen (1992), Huppert (1988), Kokas (1992), Lazinger and Peritz (1991), Lazinger et al. (1993), Lehozki (1996), Nadvornikova (1994), Remzsoe (1991, 1992), Roitberg (1987, 1990), Sandfaer (1991), Starkova (1992), Svoboda (1994), Steinberger (1994), Tolnai (1992), Vasarhelyi (1994), Wohnert (1993, 1993a), and Yachun (1990).

Dozens of ALEPH installations are accessible via the Internet. Examples, with telnet addresses, include Aalborg University (auboline.bib. dk), CASLIN, the Czech and Slovak Library Information Network (alpha.nkp. cz), Consejo Superior de Investigaciones Cientificas (olivo.csic.es), Hebrew University of Jerusalem (aleph.huji.ac.il), Jewish Theological Seminary of America (jtsa.edu), National Library of Turkey (kitap.mkutup. gov.tr), Ohio State University Jewish and Middle Eastern Studies (aleph. lib.ohio-state.edu), University of Tel Aviv (taulib.tau.ac.il), and Weizmann Institute of Science (wislib.weizmann.ac.il). A number of ALEPH installations provide access to their online catalogs through the World Wide Web. They can be accessed from the Ex Libris Web site.

### *COMPETITIVE ANALYSIS*

Like the NOTIS and VTLS systems, ALEPH had its origins in a university library's automation project, but ALEPH has not been constrained by its developmental history. In its promotional literature, Ex Libris emphasizes the system's flexibility and adaptability in addressing a broad spectrum of library automation requirements. To serve various types of libraries in an international market, ALEPH supports multinational character sets and permits combinations of different character sets within bibliographic records. ALEPH's application modules are highly parameterized to give individual installations maximum control over the system's operating characteristics. ALEPH provides default characteristics that libraries can accept or alter, without programming expertise, to suit local needs.

Full MARC records are accommodated but not required. ALEPH installations can employ customized record formats for library materials and related items, such as office documents and engineering drawings. Libraries can define field names, tags, and sequences. Libraries can create workforms for key-entry of bibliographic records. Any field can be indexed within data base records. Any field can be a repeating field. No minimum information is required in cataloging records. Authority control can be applied to any field. Installations can have multiple authority files. The online catalog's user interface can be implemented in different languages. Menu titles, operator prompts, help screens, and other catalog components can be customized for specific installations. Libraries can define many different display formats for bibliographic and holdings information.

As previously discussed, the ALEPH system was designed from its inception to support multi-library implementations, and its redevelopment for VAX processors in the late 1980s encouraged distributed networking arrangements. ALEPH continues to provide superior capabilities for consortia and multibranch installations. Multiple libraries can have timeshared access to a single processor; alternatively, multiple ALEPH systems operated by different libraries can be interlinked in networking arrangements. In the latter case, each networked processor may serve a single library or multiple libraries. At any ALEPH site, individual libraries can have their own data bases or participate in a union catalog; in Israel, for example, various library collections are individually identified in OPAC menus, but the data bases maintained at interconnected ALEPH sites comprise a national union catalog. In keeping with the ALEPH system's emphasis on flexibility and adaptability, individual participants in networked

implementations can define their own authority control practices, circulation policies, acquisitions procedures, and other operating characteristics.

From the outset, ALEPH was conceptualized as a fully integrated system that would support multiple library operations. Like competing products, ALEPH is modular in design. Among its excellent core components, the online catalog access module is particularly noteworthy for its powerful and versatile retrieval capabilities. It incorporates a menu-driven search mode for novices and a command-mode for experienced searchers. Special features include index browsing, fully integrated cross-references, keyword searching of library defined fields, right truncation of search terms, Boolean operators, proximity operators, and command stacking. In networked installations, library catalogs at any connected site can be accessed during an online search session. Unusual features include SDI capabilities and the ability to receive data base queries from remote users via electronic mail. The ALEPH catalog access module also allows users to place photocopy requests for retrieved items.

The ALEPH system has an impressive installed base in Europe and the Middle East. Its customer list includes large national libraries and library networks, as well as smaller corporate libraries and specialized research centers. Despite its excellent installation record, the ALEPH system has limited visibility in North America where it has four installations, all of them in the United States. Ex Libris faces formidable obstacles to success in the U.S. market. None of its U.S. sites are high profile installations. The VAX implementation of ALEPH has limited appeal for U.S. libraries. To win Unix installations, Ex Libris must compete with Ameritech, Geac, Innovative Interfaces, SIRSI, and other vendors who are better known and have large U.S. customer lists that serve as reference sites. The newly developed ALEPH 500 may appeal to U.S. libraries interested in client/server technology, but similar products have been announced by other vendors.

To strengthen its competitive position, Ex Libris has added certain features, such as cataloging interfaces to OCLC and RLIN, that are commonly specified in requests for proposals issued by North American academic and public libraries. It also offers Z39.50 capability, a Web browser interface, and graphical user interfaces for all modules except acquisitions and serials, which remain character-based. (Graphical user interfaces for those modules are scheduled for release in late 1997.) External data bases that are compatible with the Z39.50 standard can be accessed through ALEPH'S standard OPAC screens. A special interface screen must be provided for other information resources. In cooperation with Ghent University, Ex Libris is currently developing an interface to CD-ROM information products produced by SilverPlatter. The interface will allow OPAC users to determine the availability with the library of articles cited in a CD-ROM data base and place hold or photocopy requests for such items.

The ALEPH system's application modules, as described above, provide excellent functionality and superior adaptability. ALEPH should appeal most strongly to large academic and research libraries that want maximum flexibility in system implementation to accommodate complex or distinctive information management requirements and preferences. In particular, the NOTIS customer list, which is dominated by large academic libraries, should be attracted to ALEPH's support for multiple character sets and record formats.

As previously described, ALEPH systems offer distinctive flexibility for distributed networking implementations involving multiple libraries. In the United States, there has been considerable discussion of networked implementations involving libraries in a particular geographic region, such as a municipality, state, or province. While ALEPH's capabilities might facilitate such networking initiatives, their application for North American libraries is limited by market considerations. The medium-size and larger academic and public libraries that might serve as the foundation for such network implementations already own and operate integrated library systems of other vendors. ALEPH'S most successful



networking implementations have been in relatively small countries such as Israel and Denmark, where cooperation is facilitated by government subsidies and where libraries were largely unautomated prior to the installation of ALEPH. As an additional complicating factor, market share in a given U.S. locality is typically fragmented among multiple vendors. Single-vendor networked installations are a rarity; more often, an academic and public library in the same city or town will have different integrated systems. Recognizing this, networking initiatives among North American libraries have emphasized Z39.50 compatibility to interconnect different systems rather than the implementation of networks in which multiple libraries each purchase the integrated system of a single vendor.

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