Chapter 2

COMPANY VIABILITY/VISION AND INDUSTRY TRENDS

A focus on the companies: Vendor viability and vision

This report gives considerable attention to discussing the companies that produce library automation software. Given the close competition in basic ILS functionality, the selection process of an ILS today often depends on the company's previous experience or track record. The library's resonance with the company's vision of information technology and in its confidence in the soundness of the company also matters.

The implementation of a library automation system is not a single event. It is just the beginning of an ongoing partnership with the company that produces and supports the product. Abrupt disruptions in this partnership can impede the library in fulfilling its strategic mission. An unplanned system migration will be a major setback for a library.

The ongoing viability of the company that produces the ILS should be a top concern for libraries as they select a system. One of the significant differentiating factors among ILS products involves the level of risk that the company will stay in business and will be able to continue aggressive development and high-quality support, and offer needed services in the future.

Business events such as mergers, acquisitions, and bankruptcy can disrupt all the libraries that use the ILS produced by the companies involved. Libraries must understand the financial health of a company before entering a long-term partnership, which occurs when a library purchases a company's software.

Accurately predicting which companies will survive into the future isn't possible, but know that one or more rounds of mergers and acquisitions will take place in the library automation industry in one to three years. Libraries must make educated decisions to choose a system from a company that will remain intact through the next decade.

Here are some factors to consider when evaluating the viability of a company:

- The company should have an adequate level of staff for product development.
- The company should have an adequate level of staff for product support.
- Look for companies with large and growing base of customer libraries.
- The company indicates some degree of profitability.
- The company should be relatively diversified. Most companies will have additional products and services that complement their flagship ILS.
- Choose companies with forward-looking vision and professional management.

Understanding the historical roots of the company also helps. Although past performance does not predict current and future capabilities, it can help to build confidence in the company and reinforce that the company will use its experience to develop its products.

The creation of new library automation products requires significant financial resources. Research and development and the exploration of new technologies incur costs at the front end of a product development cycle, which, if the product is successful, will be recovered later on.

To make rapid advances, a company may need to raise capital beyond what it is able to earn in operating revenue to fund a concerted R&D effort. Libraries must, then, understand the financial resources available to the company.

Library automation companies have followed three different strategies to fuel new product development:

- **A company can rely primarily on its operating revenues,** taken in through new sales and annual support fees, sufficient to fund its new development efforts. This approach requires the company to take in sufficient revenue both to meet expenses and to make significant re-investments in R&D. Although the level of resources in this model may be modest, it can be steady and avoids the loss of control associated with the alternatives.
- **A company may seek funding from external sources,** such as venture capital investments for the financial resources required to pursue aggressive development. Almost all venture capital firms require board-level representation in the company in return for significant investments. Depending on the level of investment and the number of board positions taken, this strategy gives the venture capital firm influence—even direct control—of the strategic direction of the company.
- **A company can tap resources from a company's larger parent organization.** This source may be either in the form of an existing organizational structure or in the form of a corporate acquisition. In allowing itself to be absorbed into an large corporation, a small library automation company can gain access to significant funding for new development and even gain access to existing technologies, business processes, and economies of scale.

Libraries should be aware of whether the company from which they plan to acquire a library automation system follows any one of the three above plans, or that the company has some other reliable approach toward funding its future innovations.

Given rapid changes in technology, having insufficient resources for R&D will cause a company to fall behind, leaving its library customers with a stagnant automation environment.

Given an adequate business development model, libraries also can consider the company's broad vision that guides its product development course. Libraries gain benefits from partnering with a company that understands the issues librarians face today and anticipate in the future.

Although a library can evaluate the company's current products, it must also judge whether the company's future products and development strategies will likely be allied with its needs anticipated down the road.

Libraries look for a company that understand their specific needs. A public library may not care that a company has the vision and products that support large academic libraries, and vice versa.

Some companies have a large customer base that spans many types of libraries and they strive to develop an automation system that serves them all well. Others focus on a specific library type. Knowing the degree of experience the company has with your type of library is important.

Library automation trends

Before looking at individual companies and systems, knowing the broad trends that characterize the library automation arena today is important.

Mature full-featured systems

The mainstream library automation systems available today can all be considered fully developed, at least regarding the core ILS functionality. Although each product has its strengths and weaknesses relative to its competitors, all the products include the major modules and sophisticated functionality within each module.

As Figure 1 illustrates, some systems on the market benefit from more than 20 years of product development and evolution. Although some systems have evolved significantly in their underlying components, the features available in the system have grown steadily. Even the newest of the current systems have been on the market for more than five years.

Having developed previous generations of automation software, some companies offer history and experience that exceeds the development history of their latest product.

Figure 1. Year of product introduction.

Product	Year introduced
Aleph	1980/1995*
Horizon	1991
Library.Solution	1996
Innopac/Millennium	1985
Polaris	1997
Unicorn	1982
Virtua	1995
Voyager	1992/1995**

*Aleph began as a mainframe-based system in about 1980. Aleph 500, the fourth generation of this product, began development in 1995.

**MARCorp, formerly Carlyle Systems, began development of a library automation system called Voyager Library Series in 1992. Endeavor Information Systems acquired that product when Endeavor became a company in November 1994. The original Voyager code base was replaced by programming developed by Endeavor starting with the version released in 1995.

The expected feature set of library automation systems has been evolving even longer. The basic methods and procedures associated with library automation were established in the precursors of these systems that have since become extinct.

Few multiuser library automation systems have entered the market in the last five years. The Destiny product released by Follett Software Co., which debuted at the National Educational Computing Conference in July 2003, remains as one of the few new systems introduced in recent years. Since this system was developed by the dominant company in the school library automation market, it is a system to watch.

Consolidation of companies and systems

One of the major trends in the library automation industry involves consolidation—both on the library and the vendor sides. Results of this trend are less diversity in the systems operated by libraries over time and for implementations of library automation systems to be larger, each supporting a large number of libraries.

A consolidation of library automation companies has transpired over the course of the last five years. A smaller number of library automation companies are offering fewer library automation systems.

Note, however, that the degree of consolidation among the library automation companies has not been as aggressive as that seen in other information services industries. Yet, the mergers and acquisitions that have taken place in the last 10 years have been the largest single factor in determining the systems available today.

The library automation industry has seen many consolidations take place through corporate acquisitions. The process initially involves one company acquiring one its competitors.

In the initial period following the acquisition, the acquiring company offers reassurance to the customers of the acquired company that its products will be supported and developed for a reasonable time. Whether stated or unstated, the years following the merger involve a steady process of coaching the libraries to adopt the company's flagship system.

All the mergers that have taken place in the industry have eventually resulted in a consolidation of systems—even if accomplished gradually. Ideally, each library automation company strives to develop and support a single library automation system.

Legacy systems and those gained though acquisitions ultimately will need to give way to a single flagship system on which the company can focus its resources. Ongoing development and maintenance of multiple systems cannot be sustained indefinitely.

Consolidation of libraries in consortia

Libraries are increasingly entering into a shared ILS rather than operating their own independent system. Any large organization, such as a publicly funded municipal or countywide system usually will operate a single system shared by all its libraries and branches. Multiple independent library systems may band together to form a shared system on an even larger scale.

An increasing number of large-scale collaborations are forming, spanning all the public or academic libraries in a state. This move toward collaborative implementations is driven by interests in providing greater opportunities for sharing

collections and by needs to reduce operating costs. The trend toward consortium-wide implementations is enabled by the ever-increasing capacities of library automation systems.

Participating in a consortium-based implementation of an ILS offers many advantages: reduced costs through economies of scale, increased sharing of resources, and library services provided to a broader base of users.

Consortia offer increased opportunities for resource sharing. A higher number of libraries sharing an ILS increases the number of items available to all library users. If an item is not available in a local library, it may be available from one of the other libraries within the consortium. Delivering requested items from another library within a shared system can be faster and done at lower cost than satisfying it through an interlibrary loan request.

An ILS shared by a consortium usually offers participating libraries a more sophisticated library automation environment at a lower cost than would be possible compared with the costs of operating an independent system locally. Many small libraries operating on their own would only be able to afford one of the PC-based library automation systems.

Through a shared environment, these libraries benefit from the features of one of the top-tier systems. As the numbers of libraries that participate in a shared ILS increase, the cost per library decreases.

Centralized shared systems require less storage and processing power per library than the alternative model where each library installs its own system. If the consortium shares a single bibliographic database, the storage needed per library is smaller than independent implementations, especially in libraries that have a significant amount of overlapping collections.

Adding a library's holdings to an existing bibliographic record takes less space than storing a separate bibliographic record for each library's copy. Having a single bibliographic record for each title and identifying holdings of each library is more efficient, compared with independent implementations that would entail many more bibliographic records.

The issue of scale isn't as problematic as it once was. The current slate of automation systems can easily scale to meet the demands of many libraries through a single implementation. The system must, however, be able to handle high transaction loads and databases of immense size and still deliver rapid performance levels. As shown later in this report, each of the systems has seen some large implementations, demonstrating that creating shared implementations that accommodate hundreds of libraries with combined collections of many millions of items is feasible.

A challenge of consortial implementations involves the balance of creating a shared system, yet offering each individual library sufficient local control. Many different configurations of a shared implementation of an ILS for a consortium are possible, each striking a different balance between local autonomy and consortial conformance. Some options include:

- Operating an ILS in each library and maintaining a union catalog with the consortium's combined holdings. This approach requires a mechanism for keeping the union catalog up-to-date as each local library adds to or modifies its holdings.
- Operating a single implementation of the ILS with a separate bibliographic database for each participating library organization.

- Operating a single implementation of the ILS with a single combined bibliographic database with holdings records indicating the owning library and location.

Other factors in a shared ILS implementation involve options for technical processing. Will each library continue to order, process, and catalog its own materials, or will this process be centralized? Again, the organization must make its choices that balance local control and centralized efficiencies.

To realize the benefits of a consortial ILS, the organization must also have mechanisms for processing requests among the participating libraries. A key feature for the ILS would involve direct consortial borrowing, where a patron of any given library can directly place a request for materials in any of the other participating libraries.

The automation component of this system can be provided by the ILS, or in some cases is provided through a third-party interlibrary loan or resource-sharing system. But the automation also needs to be supplemented by a system for physically shipping materials requested among the libraries. Some libraries choose to contract with a courier service to perform this function, or they may rely on regular mail or shipping services.

Transition from legacy systems

Much activity for procuring library automation systems relates to replacing legacy systems. Thousands of libraries implemented one of the systems deemed today as legacy systems, requiring the migration to a new system. Staying with an unsupported legacy system isn't a long-term option.

Until recently, many libraries running legacy systems found themselves in a holding pattern. They knew that eventual migration was inevitable, but wanted to hold off selecting a new system and migrating, hoping that the next-generation systems would mature. Although the legacy systems had reached a dead end technologically, the newer systems lacked many important features.

Each vendor that produced a legacy system will offer significant incentives to entice the libraries running that system to migrate to its flagship system. Companies want to retain those libraries. A significant amount of each company's revenues comes from ongoing annual maintenance fees.

Most companies with a legacy system offer an upgrade price to its legacy customers. The upgrade price will be significantly below the cost of the software to new customers. Some portion of libraries will accept the upgrade offer rather than enter a formal procurement process that equally considers the systems from all the major competitors.

Not all the companies that support a legacy system have a viable system that these libraries can migrate into. Even if the vendor has a system planned or in development, the system must be ready within an acceptable timeframe for its customer base running an aging legacy system.

The next two to five years are a critical period in the migration of legacy systems to the new fleet of flagship systems. Until recently, many libraries were following a wait-and-see approach, giving the new systems time to mature to the levels of functionality of their existing systems. By now, most libraries with legacy systems have a selection or implementation process underway.

Read the July-August 2003 issue of *Library Technology Reports*, "Model RFP for Integrated Library System Products," by Nicole Waller, for more information. ww.techsource.ala.org.

Extending the ILS

The traditional ILS focused on the library's print collections of monographs, serials, and physical media (videos, CDs, DVDs). The universe of the current library automation must be much broader if it is to serve the library successfully.

The core functionality of the library automation can be considered fairly well-defined, and the major library automaton systems all achieve almost complete compliance with that functionality. Yet, that core functionality focuses mostly on managing and providing access to the library's physical collection.

Although the part of library automation defined by the traditional ILS is mature, a whole new set of automation expectations is emerging. The solutions in these areas are in an early stage.

These new expectations center on the modern library's need to manage collections with ever higher proportions of electronic content and to provide services to library users through the Web, while still continuing to manage physical collections and provide traditional in-library services.

To serve a library well, a library automation environment must manage both physical and electronic resources. Earlier conceptions that libraries would evolve into mostly virtual organizations have not come to pass.

Although some areas—especially scholarly journals—have seen print resources diminish as electronic content expands, books continue to be a mainstay. E-books have made a relatively small impact on libraries, and the collection and circulation of physical books will be a permanent part of library operations.

The range of materials managed, though, must expand to include the library's collection of electronic journals, abstracting and indexing (A&I) databases, and collections of digital objects (images, video, and sound).

One of the largest challenges lies in managing collections of periodicals and journals that are partially electronic and partially print. Library users want electronic journals they can click through and read from the convenience of their Web browser—whether they are at home, in their office, or even in the library.

A basic issue addresses accessing article-level information. Library catalogs tend to work best at the title level for books and journals.

Beginning in the late-1980s many libraries experimented with loading article citation databases in their online catalogs. The NOTIS Multiple Database Access System was but one example of such a system that allowed libraries to load large sets of citations from A&I databases into their local catalogs as bibliographic records that could be searched along side the library's traditional database, using the same commands and interface.

These locally mounted article databases were valuable at the time since the alternatives in the form of mediated searching and printed indexes were inconvenient for library users.

Citation databases next became commonly distributed on CD-ROM, packaged with PC-based search-and-retrieval software. These CD-ROM based products expanded into local area networks, allowing multiuser access within the library—a significant advance at the time.

The main disadvantages of this system included having to physically visit the library to use the resources. An additional limit occurred with the number of

libraries that could use any given resource imposed by the physical number of PCs on which the software was made available or the number of simultaneous users allowed by the distribution license.

The next step in the evolution of citations involved Web-based resources. This approach takes advantage of the ubiquitous infrastructure of the Web, allowing library users to access many different citation databases to which the library may subscribe from outside the library.

The model of Web-accessible citation databases, while providing a level of convenience for its users, also presents some challenges. As a separate brand-name product, the library user may not even be aware that the product is made available by license fees paid for by the library, even if they link to it from the library's website.

Library users also have difficulty in knowing what kind of information is provided by each of the many different citation databases their library might make available to them.

Although all the Web-based citation databases follow the same general set of conventions for entering searches and viewing results, differences among them exist. Figuring out how to use each citation database can burden library users.

Using a citation database isn't an end in itself, but rather a tool for finding articles and other resources relating to the searcher's research topic. Linking from the citation to full text has become a standard expectation of the current information environment. Providing links that reliably take library users from a citation database to full text or from citations within one article to the full text of another article also is an expected capability.

Several technologies have emerged to address many of the issues that surround the library's involvement with article-level information and electronic content.

OpenURL-based link resolvers. Reference-linking applications address the various complications of taking users from a citation to the text to which it refers. A reference-linking framework has emerged that relies on links built using the OpenURL syntax rather than links hard-coded to a single destination.

A link built using OpenURL does nothing on its own—it relies on a link resolver to complete the process. A link resolver is a database-driven application that creates links to destinations based on the context of the link.

Using the metadata encoded in an OpenURL, the link resolver queries its database to find the most appropriate copy of the item referred to and attempts to link to it.

Creating a link that will work for all possible users from a citation alone is not possible. What makes sense to do from a citation relates to what is available to the researcher by virtue of the library's electronic subscriptions or print holdings.

Many different contexts could apply: multiple electronic copies of the full-text article may exist, the library may or may not subscribe to the journal or aggregated content resource that contains the electronic text, or the article may be available only in print, and the library may or may not subscribe to the print journal, and that copy may or may not be available.

One of the scenarios often mentioned is the "appropriate copy" question—which is the best, or most appropriate copy, of the item to link to? A system should not link users to a copy of an item that isn't available to them, or that they would have to pay for, when the library has licensed another copy that should be used instead.

A link resolver, by virtue of the data it contains regarding the library's current electronic and print holdings, is able to determine which of these contexts applies and provide the appropriate options: a link to the full text from a source to which the library subscribes, a holdings lookup in the library's online catalog when electronic full text is not available to see if it might be available in the library, or links to interlibrary loan or document delivery services.

The OpenURL-based reference linking application was created by Herbert van de Sompel at the University of Ghent as part of his doctoral research in an application he named SFX. The OpenURL syntax and its surrounding framework was described in a set of papers published in *D-Lib* magazine in 1998.

The reference-linking framework that has emerged and gained wide acceptance involves a large degree of cooperation among multiple entities:

- Publishers of electronic journals, citation databases, and other electronic resources willing to present an OpenURL button or link within a citation display within their interface (link sources)
- Publishers of full-text resources willing to follow a persistent deep-linking syntax to allow linking systems to access specific articles or other pieces of electronic content (link targets)
- Link resolvers capable of translating an OpenURL from a link source to the proper deep-linking syntax of the link target
- Libraries willing to implement a link resolver and populate it with data about its subscriptions and holdings

One of the key factors in the success of a library's OpenURL linking environment relates to the quality of the data that describes the library's electronic holdings.

The resolver's database must include information about each aggregated content resource (such as ProQuest, EbscoHost, Web of Science) the library licenses, each e-journal title contained within each aggregation, and the years of coverage provided for each title, as well as the specific dates or issues available for each title.

The aggregated content products constantly change—titles can be dropped or added, and the coverage dates may vary over time. An individual library may find keeping up with these changes difficult.

Services are available that provide libraries with regular updates of their holdings based on their profile of subscriptions. Such a service may be included with the link-resolving application as part of its ongoing maintenance, or the library may subscribe to a service from companies such as Serials Solutions or TDNet that specialize in providing libraries with serials holdings data.

www.serialssolutions.com

www.tdnet.com

Library automation companies have taken different approaches to the OpenURL reference-linking framework. Several questions might be asked of the company:

- Does the company offer its own OpenURL-based link resolver?
- Does the company offer a service for maintaining the database of subscription data and holdings necessary to operate the link server?
- Can the Web-based catalog of the company's ILS operate as an OpenURL link source?
- Can the Web-based catalog of the company's ILS operate as an OpenURL link target?

- Does the company offer other services or features that make use of OpenURL to enhance the library's information environment?

There need be no direct association between the OpenURL resolver and the library's ILS. Librarians should be able to acquire both from different vendors and expect them to work together. Financial incentives may exist to license linking products from the vendor that provides the library's ILS, but there should not be technical or functional problems with a mix-and-match approach.

Federated searching. As the number of electronic citation databases and other resources proliferate, library users may have difficulty finding the ones appropriate to a given topic and searching many different databases.

Google and other search engines, for better or worse, have set an expectation that a person can type a few words and see relevant results culled from billions of sources. An important part of the library information has become an interface where a researcher types words related to a topic of interest and receives results from the high-quality, scholarly resources to which the library subscribes.

Many products have emerged that are capable of searching multiple resources simultaneously through a common user interface and providing an organized set of results. This search process goes by several different terms: federated searching, metasearch, single search, or cross-searching.

The basis for federated searching lies in the behind-the-scenes communications between the application and each of the targets being searched. Although Z39.50 is supported for library catalogs and some other bibliographic databases, many of the information resources that libraries would like to search within a federated search environment do not support this protocol.

For these non-Z39.50 resources, other approaches can be used instead, varying from sending a search over HTTP and intercepting and parsing the raw HTML returned, to XML gateways, proprietary application programming interfaces (API), and other methods. In today's environment, a federated search application must be able to operate with many search and retrieval methods to include a wide range of target resources.

A federated search environment also controls the display of results returned from the target resources. Records from different resources are stored in a standard structure, usually in XML, organized, sorted, and presented to the user in a standard format. A federated search environment may interfile the results from all the search targets together or preserve the source groupings.

A federated search may be configured as a general-purpose environment that searches resources from many disciplines. Most federated search applications, however, allow the library to set up a variety of search configurations, associating the targets to be searched with subject categories.

A search process will likely return a more relevant set of results when the researcher first picks a general topic and then enters a search that is broadcast among a modest number of resources appropriate to that topic.

Federated searching of library reference resources has yet to achieve the same degree of acceptance as the reference-linking framework. The products and underlying technologies are not as mature, and opinions vary regarding the effectiveness or even desirability of providing this model of searching. Yet many libraries are willing to implement less-than-perfect products given the observation that many library users never discover the high-quality resources provided by the library, preferring to rely on Google and the free Web.

Like the OpenURL linking environments, a federated-searching application can be acquired à la carte relative the library's ILS vendor. ILS systems, given their inherent support for Z39.50, are the easiest and most flexible systems to integrate into a federated search environment.

Electronic resource management

Core ILS functionality includes detailed functionality related to print subscriptions. Serials modules with predictive check-in capabilities, the ability to load subscription invoices and produce claims for missing issues, renewals, routing list management, and the like are all standard fare.

The traditional ILS modules are ill-suited to managing the library's collection of electronic journals and databases. Many aspects of electronic resources, especially those related to the licensing agreements, do not fit well within functionality designed for managing print journals.

A typical license agreement will specify the number of simultaneous users allowed to access the system, the effective dates of the license, conditions under which the license can be terminated, whether remote access to the resources is allowed, whether the resource can be used to fill interlibrary loan requests, and many other details.

Also important to record are the telephone numbers and e-mail addresses for customer assistance or technical support. Having a scanned digital image of the signed contract available and the full text of the contract searchable may even be beneficial.

Many libraries have informal systems for managing the licenses associated with their electronic content. But in the same way that the most libraries outgrew manual or homegrown systems for managing their book budgets and implemented acquisitions modules specifically designed for the task, many libraries have far more licenses for electronic content than they can track without an automated system designed for the task.

Automated tools for managing electronic resources are just beginning to emerge. The Digital Library Federation launched the DLF Electronic Resource Management Initiative, which involves many projects and activities. Efforts undertaken so far include conducting a survey of the current library practices and some of the local systems that have been developed and exploring a conceptual model of the processes involved. It also has conducted a workshop in partnership with NISO and documented the data elements that need to be tracked.

www.library.cornell.edu/cts/elicensestudy/home.html

To date, only one ILS vendor offers an electronic resources module. Innovative Interfaces offers software called Electronic Resources Management that operates either as an extension of the Millennium serials and acquisitions modules or as a stand-alone application for libraries that use other automation systems.

Plug-ins for courseware systems

In the academic environment, universities and colleges are increasingly adopting course management systems. The two leading products include Blackboard and WebCT Vista. These course management systems provide a comprehensive framework for the resources related to the course: the

www.blackboard.com

www.webct.com

syllabus, daily assignments, required reading, course-related discussions, and relevant library resources.

The deployment of a course management system on a campus presents an opportunity for the library to work with instructors to provide access on their course pages to high-quality library resources. A courseware system may displace electronic reserves or other services the library provides, creating a role for the library in placing of electronic content in this environment.

Tools for integrating library-provided content into course management systems are beginning to emerge. Durable links to electronic resources through OpenURL and link resolvers and queries for course appropriate resources through federated search technologies are obvious components that lend themselves to the course management environment.

Integration beyond the library interface

As libraries implement an expanding arsenal of Web-based applications, they need to be concerned about how the applications work together. A library Web environment includes at a minimum HTML pages that provide descriptive information about the library and its services and the Web-based online catalog. But it also may offer an interlibrary loan system, electronic reserves, digital library collections, proxy services to allow remote access to restricted resources, link resolvers, and federated searching.

Libraries need to ask if a single information architecture underlies the components, or does each manage its part of the library's information resources independently? Do they share a common look and feel? Do they each require library users to login separately, or does the library's environment have a single login that carries the proper credentials through all the applications and services?

In this view, the ILS and its Web-based catalog are but a part of the overall library Web environment. In the selection and implementation of the ILS, consider what features it offers that foster integration with other library-provided applications and services.

The current model of library automation centers on a Web-based online catalog, however enhanced, that offers information about the library's offerings and delivers end-user services through a dedicated Web interface. Though that model will no doubt continue indefinitely, libraries will increasingly have an interest in participating in higher-level portals.

A university library may, for example, want to create a portal environment for its students that includes courseware, the library catalog, e-mail, and other Web-based services in a single interface. They can all be integrated in ways that not only share a common look and feel but that also work together to share a single log-in and allow the student to navigate easily among the functions available.

As this model of organizational portals takes hold, library automation systems will need to be less concerned with owning and controlling the landscape of the user interface directly but will need to ability to offer data and user functions as services provided through higher-level applications and interfaces.

XML and Web services

www.w3.org/XML

Over the last few years, XML (eXtensible Markup Language) has grown to be the preferred approach for encoding data, both as it is passed from one application to another, but also as it is used internally by information-oriented applications. XML has proven to be robust and flexible and has gained almost universal acceptance.

www.loc.gov/standards/marcxml

The library automation industry, however, long predates the emergence of XML and many of its basic building blocks rely on data structures. MARC 21, the core standard for library automation, is built on a non-XML binary data structure. Mechanisms do exist for expressing MARC records in XML, but this approach has yet to become widely implemented within library automation systems.

www.loc.gov/z3950/agency/zing/srw/background.html

Z39.50 uses ASN.1 (Abstract Syntax Notation 1) and BER (Basic Encoding Rules) rather than XML for lower-level data encoding. The Z39.50 International: Next Generation (ZING) has created a version of Z39.50 that operates as a Web service using XML called Search/Retrieve for the Web, or SRW.

www.w3.org/2002/ws

One of the key concepts that has emerged in the broader realm of information technology is called the Service-Oriented Architecture, or the Model of Web Services. Supported by the W3C (World Wide Web Consortium), Web Services provides the framework, protocols, and structure to allow distributed information-oriented applications to interoperate using the concepts of the Semantic Web. Web Services allows one application to request information, encoded in XML, from another, typically using Simple Object Access Protocol (SOAP) as the mechanism to exchange message transactions.

Although many of the supplementary products that have been produced by library automation companies in the last few years embrace XML, the core ILS products generally do not. Given its centrality to the current and future realm of information technologies, libraries should be aware of how library automation company makes use of XML in its current offerings and how it will be used in the future.

Digital library systems

Libraries are increasingly becoming involved in creating their own collections of digital content. Many libraries own specialized, unique, or local materials that are unlikely to be digitized by anyone else. Libraries need the tools to digitize, describe, and provide access to these locally built digital collections. Some of the components of such a digital library system would include:

- Tools for storing and managing digitized content
- An interface for describing the items using appropriate standards (Dublin Core, VRA, MPEG-7, etc) and thesauri and vocabularies (Art and Architecture Thesaurus, Library of Congress Subject Headings)
- A database for storing metadata records
- A search engine
- An interface for end-user searching

- Mechanisms to allow searching and metadata harvesting from external systems: Z39.50 or OAI-MPH (Open Archives Initiative Metadata Harvesting Protocol)

The connection between the library's ILS and any digital library systems it implements may be loose. The systems don't need to be provided by the same vendor, provided that each has enough flexibility to conform to a standard look and feel and that they support established interoperability protocols.

The advantages of acquiring the digital library system from the same vendor as the ILS might include financial discounts available when purchased as a total package, single point of contact for implementation and support issues, and consistency of design and architecture.

Application Service Provider (ASP)

Many library automation companies offer their software through an Application Service Provider (ASP) arrangement, where the vendor owns and houses the servers. In many cases, a vendor can provide a significantly more secure and reliable environment for servers than would be possible in the library's own facilities.

Many libraries, on the other hand, have less than optimal facilities for their servers. Libraries commonly have a server in unsecured facilities that lack even minimal power protection, environmental control, and network security protection.

Library companies that offer ASP will either provide their own hosting facility or will contract with a third party to provide an industrial-strength data center environment for the servers that support its customers. A professional hosting facility should offer many characteristics, including:

- Multiple layers of power protection, including both UPS equipment and backup generators
- Complete temperature and humidity control for the equipment
- 24/7 monitoring by people
- Automated fault detection systems
- Highly qualified systems administration and network engineering staff
- Multiple redundant high-capacity Internet links

The library should understand all the features of the hosting facility before entering an ASP arrangement for its library automation system.

Note, too, that multiple ASP customers might be aggregated on a small number of physical servers. Given the availability of highly scalable hardware, a single server may be able to support many instances of a library automation system.

Grouping multiple libraries' systems together can be done in such a way to be transparent. Each instance of the library automation system would be separately configurable—just as if it were installed on a discrete physical server.

In the right circumstances, ASP can be a good alternative for a library. A large percentage of libraries that have locally managed systems lack the resources to manage them well. When technical personnel command high salaries, libraries are hard pressed to recruit and retain people with the skills

necessary to administer and secure the library's servers. Implementing a library automation system through ASP appeals to libraries that may not have systems administration or technical support staff.

ASP offers a predictable budget model for library automation. The fees involved with the ASP arrangement are a fixed cost compared with the variable costs involved with a local system.

Some unpredictable costs of the local system include varying personnel costs, hardware upgrade and replacement issues, operating system software upgrades, and labor costs related to security prevention or recovery from security-related events.

A key issue with the ASP model involves connectivity issues. With a locally housed system, staff access to the system is usually takes place through the library's local area network (LAN). In-library workstations also access the system through the LAN. With ASP, however, all access to the system travels through the Internet. A major perquisite, therefore, of this approach involves having highly reliable Internet connectivity with an adequate level of bandwidth.

In many cases, even with locally housed servers, the majority of access to the system relies on the Internet or wide area network links. Library systems or consortia that span multiple buildings have almost the same level of reliance on connectivity issues as would be the case with an ASP model.

Another ASP concern regards the library's data—its physical security, ownership, and recoverability. Libraries make large investments in creating a database that reflects their physical and virtual collections. They need many layers of safeguards to ensure the safety of that data.

For a library to rely on a remotely hosted automation environment, it must have a high degree of trust in the vendor. On one level a library needs a high degree of confidence that the vendor is in no danger of going out of business. Ironclad agreements and procedures should be in place so the library can receive up-to-date copies of all its data should it terminate its ASP contract or if the vendor is unable to continue providing the service for any reason.

In many cases the library may want to receive copies of its databases periodically. It can keep them on site as a layer of insurance against any negative contingency.

Pricing

With these multiuser library automation systems, the cost of the software is fixed in a contract negotiated between the library and the vendor. Before receiving a response to a Request for Proposals or subsequent contract negotiations, knowing exactly what a system will cost a given library is difficult to determine.

The same software may be used by a small library or a large consortium, but in substantially different ways. The size and complexity of the library will have an enormous impact on the level of support needed to operate the system.

In the broader software arena, the cost of the license increases in proportion to the scale of its use. In the library automation arena, each library vendor also scales the cost of its software licenses according to the size and complexity of the library and its customer base.

Each module that the library licenses adds cost to the overall package. Beyond the base modules of circulation, cataloging, and Web OPAC that almost every library uses, the library optionally selects authority control, acquisitions, and serials. Z39.50 clients and servers, NCIP components, and ISO ILL support may also be à la carte additions to the base price of the package.

All the companies scale the cost of the system relative to the size and complexity of the library, though that measurement varies widely. Some relevant factors include:

- The number of bibliographic records held by the library
- The number of item records
- The number of order records
- The number of serials managed
- The number of physical or virtual libraries
- The size of the library's user base (For publics this size may be measured in population served or registered patrons; for academics, it may be measured by the FTE student enrollment.)
- The number of staff clients needed to access the system
- The number of simultaneous users

Many libraries, especially the larger ones, need to maintain a second copy of the software on a separate server for testing and training purposes. Most companies offer a license for such a test server at a greatly reduced fee relative to the library's production system.

Predicting the cost of a library automation system in advance of actual negotiations with a company is difficult. Library automation companies generally do not publish a formula for calculating the cost of their software. Although they may have a price list and scaling factors they use internally, each potential contract brings different competitive circumstances.

A company may quote a price higher or lower than what would be determined by a strict formula to increase its chances of winning a given contract. In some cases a higher price will be offered to a bid knowing that some libraries will request further discounts later in the negotiation process.

Given that over the lifetime of an extended contact period with a library, more revenues will be received in maintenance payments than from the initial license fees, companies are often willing to make compromises to win a library's business.

Figure 2 on page 22 illustrates a typical revenue stream between a library and its ILS vendor. In this example, assume an arbitrary initial license cost of $300,000, with an annual 15% maintenance and support fee, which also includes an inflationary increase of 4% each year. This scenario also makes the highly unlikely assumption that the library will not purchase additional products from the company during that period.

Figure 2 also illustrates that the fees charged for ongoing maintenance of the system also must be given careful consideration Acquiring a library automation system is not a one-time transaction.

Figure 2. Revenue stream between a library and its ILS vendor.

Year	Annual cost	Accumulated investment
1	$300,000	$300,000
2	$45,000	$345,000
3	$46,800	$391,800
4	$48,672	$440,472
5	$50,619	$491,091
6	$52,644	$543,735
7	$54,749	$598,484
8	$56,939	$655,423
9	$59,217	$714,640
10	$61,586	$776,226

Although all library automation companies require a one-time payment up front to license the software, they also require annual maintenance or software support payment. These annual support payments typically fall in the range of 10% to 20% of the initial software license. The library must have a permanent budget allocation for ongoing software maintenance.

Many of the recent slate of library portal products include not only the usual initial software license fees and ongoing software support fees but also include annual payments for delivery of regularly updated content items. An enhanced Web OPAC, for example, would likely include an additional subscription fee for ongoing access to the part of the service that provides the book cover images, tables of contents, summaries, and the like.