Smart Libraries Newsletter

News and Analysis in Library Technology Developments

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Smarter Libraries through Technology

Serving the Needs of Small Public Libraries

By Marshall Breeding

Small public libraries work hard to meet the needs of their communities, despite their limited collections and budgets. The characteristics of smaller libraries differ in many ways from their peers that serve larger populations. Libraries in small towns and rural areas may depend less on state-of-the-art technology and rely instead more on personal service with a human touch.

Public libraries in the United States receive the vast majority of their funding from their local government. According to IMLS statistics, in 2018 public library funding in the US totaled $13.9 billion, of which $11.9 billion, or 86 percent, came from local government. State governments contributed $936 million (7 percent) and $46 million, a fraction of a percent, came through federal funding. Public libraries received $981 million from grants and other sources. Table 1 presents the distribution of library funding in Tennessee, illustrating the high reliance on local funding with minimal contributions at the state and federal level.

Local funding of public libraries brings a sharp focus on the communities within their service areas. Public libraries' funding prospects are likewise closely connected to the economic conditions of their community. Small towns and rural areas generate limited taxes for local services such as libraries.

See IMLS Statistics for Public Libraries by state at Library Technology Guides: https://librarytechnology.org/libraries/imls/trends

This funding context means that the technologies offered by libraries are in broad terms proportional to the size of their service population. Libraries serving urban areas almost always have a top-of-the-line ILS and a well-designed responsive website delivering access to robust collections of print and digital content and plentiful programs. The smallest tier of public libraries in the US have a far less impressive digital presence. Out of 9,521 public library systems in the United States about 840 (9 percent) do not offer a public website and 896 (9 percent) do not have an ILS.[1] Though some may purposefully direct their budgets to areas other than technology, it seems likely that unconnected libraries would appreciate these basic technologies if funding were available. The patterns of funding and distribution of ILS and other technology systems differ in each state, providing interesting opportunities for analysis.

A look at the ILS products implemented in Vermont gives a good illustration of the impact of funding scenarios. Public libraries in Vermont are funded primarily from local taxes, and there are no major urban library systems. About 60 public libraries participate in the Vermont Organization of Koha Automated Libraries. Most of the others have implemented stand-alone ILS products, and 20 percent are not automated. Products from SirsiDynix (Symphony and Horizon) and Innovative (Sierra and Polaris), popular in the urban library arena, have almost no presence in Vermont. (See Table 2.)

Ohio provides an interesting contrast. Not only does Ohio have more urban areas, but its public libraries receive the highest percentage of state funding nationwide. In 2018, funding across public libraries in Ohio totaled $861 million. Funding from the state, at $394 million, exceeded the $390 million coming from

IN THIS ISSUE

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Table 1. Funding Source Trends for Public Libraries in Tennessee

Year	Total Income	Local Govt	State Govt	Federal Govt	Other
2018	$136,513,372	$128,408,911	$380,887	$273,023	$7,450,551
2017	$129,398,299	$121,490,509	$297,301	$294,238	$7,316,251
2016	$123,027,758	$115,611,541	$356,360	$250,578	$6,809,279
2015	$118,795,687	$111,525,763	$385,967	$304,647	$6,579,310
2014	$112,098,016	$104,956,581	$385,706	$201,212	$6,554,517

Table 2. Product Distribution, Vermont

Company	Product	Count	Percent
ByWater Solutions	Koha - ByWater Solutions	74	38%
NA	*Not Automated	39	20%
LibraryWorld	LibraryWorld	38	19%
SirsiDynix	Symphony	1	1%
Innovative Interfaces, Inc.	Polaris	1	1%

local governments. (See Table 3.) This funding scenario is unusual in the US. Only in Hawaii, where the public library system is operated by the state, is there a higher proportion of library funding provided at the state level.

Rather than each library automating independently, a large proportion of the small libraries in Ohio participate in consortia, gaining access to top-level automation systems and other technology services. Compared to other states, the distribution of ILS products in municipal and consortial implementations is skewed toward high-end products (Table 4).

In the current automation environment, small public libraries have multiple options in the way they gain access to automation systems.

Consortium

Small public libraries can gain access to full-featured ILS products through participation in a consortium. This arrangement usually comes with the benefit of integrated resource sharing. All the members gain access to each other's collections with expedited delivery to satisfy requests from any affiliated patron. Although business models vary, in most cases each local library will be charged a prorated amount to cover the licensing and support costs paid by the consortium to the ILS vendor. Libraries may also pay some fees for administration and courier services. In some cases, these benefits can be offset by perceived diminishment of control, where local preferences may be overridden by consortial practices or policies. Also, the complex features of the ILS products that scale to support large consortial implementations may exceed the needs of the smaller participants and seem overwhelming to the library worker.

The open source Evergreen ILS was designed for consortia of public libraries. Most Evergreen implementations comprise small or mid-sized public libraries. Multiple consortia, sponsored by statewide initiatives, are expanding by attracting libraries with standalone ILS implementations that can gain access to consortial resource sharing and lower automation costs.

Pragmatic Low-cost Products

Small public libraries implementing an ILS independently will naturally need to find an affordable product. It is common for a small public library to implement a product designed for K-12 school libraries because they are less expensive. These products cost a small fraction of the top-line ILS products designed for public libraries. While the features of a school library ILS may not be perfectly matched with a public library, it is a pragmatic option for those with limited budget possibilities.

ILS Products Designed for Small Libraries

A few ILS products have been developed especially for small libraries not participating in a consortium. These products not only target the features appreciated by smaller libraries, but also are affordable within their budgets. Products able to satisfy larger libraries must offer almost any feature imagined for their larger collections and complex operations. This expansive feature set is not only excessive for small libraries, but also makes the ILS unwieldy and difficult to use. Small libraries rarely have in-house technical expertise and may not have dedicated acquisitions or cataloging personnel. Web-based services that do not require software installed on local computers is preferred. The ideal ILS for small libraries embodies all these factors.

A handful of products fit into this genre, including:

Table 3. Funding Source Trends for Public Libraries in Ohio

Year	Total Income	Local Govt	State Govt	Federal Govt	Other
2018	$860,724,871	$389,904,358	$393,612,199	$310,564	$76,897,750
2017	$831,490,766	$369,232,986	$378,391,351	$540,203	$83,326,226
2016	$803,744,211	$357,089,166	$376,155,942	$321,504	$70,177,599
2015	$797,687,318	$344,219,620	$379,453,769	$445,631	$73,568,299
2014	$757,966,654	$332,528,033	$345,037,953	$459,460	$79,941,208

- Apollo, a web-based ILS specifically designed for small to mid-sized public libraries.
- LibraryWorld, a web-based ILS for smaller libraries of all types, used mostly in schools, but also used by small public libraries and special libraries.
- Mandarin Oasis, a web-based ILS used by school, small public, and small academic libraries.
- OPALS, an open source web-based ILS developed by Media Flex and designed for schools and other small libraries.

Table 4. Product Distribution, Ohio

Company	Product	Count	Percent
ByWater Solutions	Koha - ByWater Solutions	74	38%
NA	*Not Automated	39	20%
LibraryWorld	LibraryWorld	38	19%
SirsiDynix	Symphony	1	1%
Innovative Interfaces, Inc.	Polaris	1	1%

Some other ILS products are designed for mid-sized library sector, but also find considerable use in small libraries, such as Auto-Graphics VERSO, Library.Solution from The Library Corporation, and Atriuum from Book Systems.

This issue of *Smart Libraries Newsletter* features a new web-based integrated library system designed for small libraries. Developed by LibraryWorld, a pioneering company in the library automation arena, WikiLibrary was launched to provide a modern ILS for small libraries offered for a low annual subscription fee. LibraryWorld is positioning WikiLibrary, now available in a general beta release, to be its flagship offering as it gains new features and capabilities in the coming years.

LibraryWorld Launches WikiLibrary: New Integrated Library System for Small Libraries

LibraryWorld has introduced WikiLibrary, a new web-based product for small libraries. This new product, now available in its first public beta release, is based on a modern cloud-hosted platform and provides a discovery interface and a target set of integrated library system capabilities. WikiLibrary is designed for the needs of smaller libraries of schools, businesses, hospitals, or museums, as well as small public and academic libraries. As a platform based on current web technologies, WikiLibrary offers a modern path forward for its current product line, introduced two decades ago. LibraryWorld expects WikiLibrary to become its flagship product over the next few years as it matures in features and gains acceptance by its current and future library customers.

A Web-based ILS for Small libraries

WikiLibrary provides a targeted set of features for cataloging and circulation along with an online catalog for patron access. Other features include printing of barcodes and labels, circulation notices sent by email, inventory, and display of cover art. As a product designed for small libraries, it offers a select set of features without the complexity of systems designed for large organizations. WikiLibrary also accommodates organizations with multiple libraries, such as school districts, multi-branch public libraries, or consortia. It allows multiple libraries to be included in an instance, with no restrictions on record counts, functioning as a union catalog that can also be limited by branch.

Pricing

WikiLibrary's affordable price tiers include a free option for collections with less than 500 bibliographic records and 1,000 items. The standard tier, with a subscription price of $240 per year, supports collections up to 10,000 bibliographic records. WikiLibrary Premium supports libraries with more than 25,000 records at an annual subscription of $360.

LibraryWorld remains the company's offering for larger libraries. Though a trial period is available, the annual subscription cost for libraries using it in production is $495. LibraryWorld supports libraries with up to 500,000 records.

Renewed Product Cycle

The launch of WikiLibrary marks the beginning of a new product cycle for LibraryWorld. This new product line is based on new technology underpinnings and brings new, modern interfaces for staff and patron features. WikiLibrary is based on cloud infrastructure instead of the dedicated servers the company maintains for its existing products. This shift to cloud technologies reduces the cost of operations and provides additional layers of redundancy. As a new development initiative, WikiLibrary does not recycle the codebase of its current LibraryWorld ILS, but rather leverages the company's 35 years of experience developing automation products for schools and other small libraries.

As this new product enters the market, the company will continue to fully support its current LibraryWorld ILS. In the longer term, WikiLibrary will become the next generation of LibraryWorld. Libraries using LibraryWorld will be able to shift to the newer product according to their preferred timetables.

Customer Profile

LibraryWorld focuses primarily on small to mid-sized libraries. About two thirds of its 3,000 customers are school libraries, with the other third split among special libraries, small public libraries, and small academic libraries. Initially, WikiLibrary will be marketed to the smaller tier of libraries, though over time it will be offered to those with larger collections.

Technology

WikiLibrary leverages the company's long history with library automation to create a new product with new interfaces and technical underpinnings. Its employs current JavaScript frameworks, such as Bootstrap and jQuery, to deploy an interface following the conventions of social networks and other business services. A dashboard presents an overview of the library's use of the system, including activity levels, circulation statistics, collection breakdown, staff user accounts, and other details. A persistent menu on the left part of the page enables quick access to all system functions.

LibraryWorld has deployed WikiLibrary through Google Cloud Services, one of the major providers along with Amazon Web Services of infrastructure-as-a-service. The application itself was developed using popular components for web applications, including PHP and Perl as the programming languages, Oracle MySQL as a relational database, and virtual instances of Linux for hosting. This approach enables LibraryWorld to scale the capacity of the WikiLibrary platform as the number of subscribing libraries expands.

LibraryWorld Company Background

LibraryWorld is privately owned and managed by its founder Norman Kline, who continues to serve as its chief operating officer. The company can support a large customer base with a small workforce through a technology strategy based on efficient web-based SaaS products.

CASPR, later known as LibraryWord, was founded in 1985 by Norman Kline to develop utility programs for mainframe computers. At that time Kline worked for Apple as Worldwide Product Marketing Manager, focusing on communications and networking. In parallel to his work at Apple, Kline created two library applications for CASPR. MacCards, a program for creating catalog cards and book labels, and the Mac Library System (MLS), a full integrated library system. The Apple corporate library and its law library both implemented MLS in 1986. Apple stipulated that CASPR limit its development to products that ran on Macintosh computers and demonstrated MacCards and MLS at trade shows as part of its marketing for the educational and library sectors. CASPR also developed LibraryBrowser, a patron catalog compatible with the Apple II family, to access the library collection managed by MLS.

Kline left Apple in 1991 to focus on CASPR, which by then had a growing number of library customers. Although Macintosh computers were widely used in schools at that time, Microsoft Windows was also gaining widespread use, especially in the business and government sectors. CASPR began development of a cross-platform version of MLS that operated on both Windows and Macintosh computers, branded as LibraryWorks. In 1999 more than 8,000 libraries had implemented LibraryWorks. Using a cross-platform development environment, the same source code could be compiled for Windows and Macintosh environments and access the same network-based databases.

LibraryDisc was released in 1992, taking advantage of the CD-ROM technologies that were increasingly used in

libraries for commercial citation database products. LibraryDisc enabled libraries to search their own collection plus their CD-ROM databases.

CASPR acquired the Columbia Library System from the School Systems division of McGraw-Hill in 1997. The Columbia Library System operated on the DOS operating system and was not Y2K compatible. In the spring of 1999, CASPR released a fix to CLS to enable it to address its Y2K bugs, though this was only a stopgap until CASPR was able to migrate these libraries to LibraryWorks on Windows computers. At the time of the acquisition, about 2,700 libraries were using the Columbia Library System.

In 1998 the company developed librarycom.com, a web-based public catalog for libraries using its LibraryWorks ILS. By May 2000, the full ILS was available through web interfaces and was rebranded as LibraryWorld.

In June 2007, CASPR changed its operating name to LibraryWorld, adopting the brand of its flagship product.

Since its founding in 1985, LibraryWorld has maintained its position as a company providing automation systems to smaller libraries by redeveloping its products through multiple cycles of technology. Established in the time of microcomputers, the company subsequently adapted its products to local area networks, CD-ROM storage, and eventually to the web. WikiLibrary takes the company into a new generation of technology, employing current cloud infrastructure services and modernized interfaces.

Smart Libraries Q&A

Each issue Marshall Breeding responds to questions submitted by readers. Email questions to Patrick Hogan, Managing Editor, at phogan@ala.org.

What are the concerns from publishers or libraries about IP authentication? What are trends in authentication systems for enabling remote access to library resources?

From the earliest years of electronic journals, libraries have relied on IP network address recognition as a pragmatic mechanism for identifying authorized users. Reliance on network addresses works relatively well to associate a user with an institution that subscribes to a restricted resource. IP address recognition basically assumes that if a device resides on the campus network, anyone using that device should be allowed to access resources with subscriptions associated with that institution.

This method requires institutions to provide each of their content vendors with a comprehensive list of the IP address ranges associated with their campus. An institution may also provide address ranges for specific departments or schools that independently purchase resources not available to the entire campus.

The process of transmitting IP address ranges to vendors can be complex, given the large number of potential vendors involved and the instability of IP addresses. Technical reconfiguration or expansion of campus network equipment can change the IP address ranges. Some libraries make use of third-party services, such as RedLink, to manage the transmission of IP address ranges to vendors (see https://www.redlink.com).

Authorizing access to resources via IP network, while protecting privacy somewhat, has limitations.

- It provides some anonymity to users, especially on networks with dynamically allocated IP addresses, the predominant practice. Because a device may receive a different IP address each time it restarts, it is difficult to trace a search or the access of a document to a specific individual.
- Even with static IP addresses, It identifies a device, not an individual. This characteristic can also be a benefit since it enables access to walk-in users.
- IP addresses can be spoofed. With available software tools, it is possible to forge communications in a way that assumes a trusted IP address even though it comes from an unauthorized source.

While IP authentication works relatively well for users with devices residing on campus, remote use introduces additional complications. Common approaches to enabling individuals to access IP-restricted resources from off site include Virtual Private Networks (VPN) or proxy services. A VPN inserts an off-site device into the institutional network, providing it with an authorized IP address. It establishes a secure, encrypted tunnel for network traffic between the user's remote computer and the VPN server within the institutional network. Once the VPN session is activated, the device is recognized with an authorized IP address. Proxy servers operate in

a similar way, dynamically rewriting the URLs of a restricted resources with an authorized domain name and IP address.

EZproxy from OCLC (https://www.oclc.org/ezproxy) has been widely implemented by libraries to enable access to restricted resources. This product can be implemented on a server within the institution's network or as a hosted service by OCLC. OCLC recently announced that it will offer EZproxy as a hosted service only for new sites, but will continue to provide upgrades and support for both local and hosted installations. OCLC also offers EZproxy Analytics, which captures use statistics and generates reports.

Proxy services and VPNs require some form of authentication before they are enabled for a remote user. In most cases, they use the institutional authentication service to prompt the user for their username and password or other security credentials. EZproxy, for example, can use all the major authentication methods, including LDAP (Lightweight Directory Access Protocol), SAML (Security Assertion Markup Language), CAS (Central Authentication Service), SIP (Session Initiation Protocol), and Shibboleth.

Proxy servers provide reasonable confidence that the user comes from an authorized institution. But they can also be vulnerable to misuse:

- An open proxy provides access to restricted resources without requiring authentication, usually through misconfiguration. This can also happen through an unauthorized proxy server that an individual might set up to access campus resources. An unofficial or clandestine proxy can open a security vulnerability to the network.
- Individuals may share usernames and passwords, enabling unauthorized access to restricted resources. Previously compromised passwords, social engineering, or intentional sharing can lead to wholesale access to restricted resources. These stolen or borrowed passwords can lead to large-scale extraction of resources that may be ingested into sites such as SCI-HUB. The publishing industry considers SCI-HUB as violating intellectual property laws and a major threat to their business model. Many publishers monitor their document access sites for suspicious high-volume activity and may temporarily disable access for an entire institution until the open proxy or other source of potential leakage has been resolved.

While IP address recognition remains in wide use in the library sphere, most organizations rely on other mechanisms for authentication. Staff member access to institutional resources requires a much more rigorous authentication. Business and consumer services today make use of stringent sign-in methods, employing cryptographic technologies and protocols that provide protection against even the most sophisticated attempts to circumvent. Institutional authentication services can be based on applications such as Microsoft Active Directory.

Two-factor authentication is increasingly implemented. It requires a second layer of confirmation, such as through a code sent to a mobile phone or email address. Even if a username and password combination are compromised, it cannot be used unless the intruder also has access to the user's phone or email account.

Academic campuses and corporations typically implement single sign-on environments, where an individual can gain access to all major applications without having to reenter usernames and passwords. In the library arena, it is expected that an integrated library system, discovery services, and other major applications interact with institutional authentication services rather than maintaining their own database of passwords. Proxy services likewise would rely on the institutional authentication service as they enable a user to gain access to IP-restricted resources. Protocols such as Kerberos, LDAP, or CAS can be implemented to enable diverse applications to operate with the institutional authentication service.

Looking beyond authentication within the institution, many scenarios require authentication of individuals spanning multiple organizations. Example: Organization A wants to provide access to a resource to an individual from institution B. Instead of performing its own authentication of the Institution B user, Organization A only needs assurance that the user has properly signed into Organization B environment. This framework of federated authentication relies on a set of technical protocols, usually SAML, implemented among trusted institutions.

Federated authentication represents a modern and scalable model for enabling access to restricted resources. Educational institutions and publishers can establish trusted relationships among their authentication environments. Based on SAML protocols, a publisher can provide access to resources to authenticated individuals associated with trusted institutions without the need for IP address recognition.

A broad group of stakeholder groups, including NISO, scholarly publishers, and libraries have collaborated to produce an implementation of federated authentication branded as SeamlessAccess (See https://seamlessaccess.org). Seamless Access builds on RA21: Resource Access for the 21st Century and the NISO document "Recommended Practices for Improved Access to Institutionally-Provided Information Resources" (see https://ra21.org). Based on SAML, Seamless Access enables service providers, such as scholarly publishers,

to interoperate with authentication services of individual universities, or through collaborative identity federations such as OpenAthens (https://www.openathens.net) or InCommon (https://www.incommon.org).

SeamlessAccess and other SAML implementations raise concerns for patron privacy. In a federated authentication environment, selected attributes about a user are passed from the authentication service and the service provider. To ensure the privacy of individuals accessing resources, it is important to exchange only general descriptive attributes and not any personally identifiable information, such as email address, name, or any unique identifiers. The specific attributes exchanged are not fixed, leaving it to the discretion of the organizations involved. One concern is that attributes set at the institutional level may be inconsistent with library privacy values. SeamlessAccess was designed to respect privacy, though it also depends on institutional implementation.

While federated authentication gains momentum, IP recognition continues to be widely used for access to subscription-based library resources. The move to modern federated authentication services has strong support among large publishers. They are especially interested in more modern and scalable methods to support access to their services. Access to resources based on IP address recognition takes considerable effort to sustain, however, shifting to any new approach will be a slow process. Today SeamlessAccess is well positioned as the way forward.

Yet small publishers may not have the technical capacity to make such a change. Universal support for federated authentication will take many years to develop. Likewise, IP address recognition has become deeply entrenched in library processes. It will likely continue to have a major presence in the library resource ecosystem for a long time to come.

Note

1. "libraries.org." Library Technology Guides. https://librarytechnology.org/libraries. These figures are consistent with the statistics published by IMLS. I periodically recheck these libraries to see if they have since acquired web sites or catalogs and only occasionally find new implementations.

Questions or suggestions for topics in future issues?

Contact Patrick Hogan at **phogan@ala.org**

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