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The Integrated Library System: From Daring to Dinosaur?

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The Integrated Library System: From Daring to Dinosaur?

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ABSTRACT. *The automated library system (ALS) has undergone significant changes since its inception in the 1970s. It is no longer simply a database to house and retrieve a library's holdings. It has become an integrated library system (ILS) comprised of robust clusters of systems involving every process and module related to libraries.*

The Internet, open source, the increase in electronic resources, and the rising expectations of library users are changing the nature of the ILS. Library vendors are at times struggling to keep up with the demand for new services while providing support for existing services.

This article details the evolving role of the ILS and discusses where it could and should be headed.

KEYWORDS Integrated library system (ILS), library automation

INTRODUCTION

The automated library system (ALS) has undergone significant changes since its inception in the 1970s. These changes are reflected in the conceptual differences between the ALS and the integrated library system (ILS). The ALS is identified as simply a database to house and retrieve a library's holdings. The ILS is identified as robust clusters of systems involving every process and module related to library operations.

The explosion of the World Wide Web, which we now call the Internet; new and innovative developments with new information technologies, such

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as open source; the increase in electronic resources; and the rising expectations of library users have contributed to the changing nature of the ILS. This has caused library vendors to struggle at times to keep up with the demand for these new services and technologies while providing support for existing services.

It is important that we understand the movement from the ALS to the ILS, how that relates to the information technology industry as a whole, and how the movement changed the ILS and the ILS marketplace in the first 8 years of the 21st century. The authors will discuss the information technologies and library dissatisfaction with vendor reaction to implementing them, and the various new technologies that are impacting the ILS.

FROM AUTOMATED LIBRARY SYSTEM TO INTEGRATED LIBRARY SYSTEM

In understanding the effects of these changes from ALS to ILS not only in the library automation industry but also in the information technology industry, the authors applied the three-phase procession that was introduced by Richard West and Peter Lyman and discussed by Peter Lynch to understand what has effected the changes in the library automation industry.

West and Lyman's three-phase procession of the effect of information technology on organizations is as follows: "modernization (doing what you are already doing, though more efficiently); innovation (experimenting with new capabilities); and transformation (fundamentally altering the nature of the organization through these capabilities)" (Lynch, 2000, p. 60). These phases illustrate the changes in the library automation industry and in libraries very well.

In libraries and the library automation industry, modernization, the first phase, occurred during the 1970s and 1980s. These library systems were "purpose built, stand-alone systems that solved a single problem using what we now consider primitive hardware, operating systems and software" (Andrews, 2007, p. 572). These ALSs were not designed to be interactive or even user friendly. They ran on main frames accessed via "dumb" terminals and were, for the most part, managed by information technology staff rather than library staff. These systems covered the core modules used by library staff: acquisitions, cataloging, circulation, and serials. They were more efficient than the paper systems libraries had been using for generations.

Almost immediately there was a realization that it would be nice if the public could use the librarians catalog to search for library materials. Lynch defines this as the "second automation age," which was the move to an online public access catalog (OPAC) for the public interface with the ALS.

The OPAC of the late 1980s became the face of the library, albeit in a nongraphical user interface; yet it was quite functional and a huge leap beyond the paper card catalog. The advent of the OPAC led libraries into the next phase of West and Lyman's procession, innovation. This phase witnessed significant experimentation, which involved the integration of the core library modules and the OPAC. This heralded the emergence of the ILS.

The ILS of the 1990s, which was mainly designed to perform acquisitions and circulation functions, later became more integrated including inventory systems with a bibliographic database, authority control, and serials modules. The new ILS ran mostly on mini-computers, but could also use mainframe PCs and PC networks. The library staff managed these systems with some support from their information technology staff. Not only did the innovation phase allow the ILS to run on mini-computers but also allowed for MARC record support and used character-based mode as user interfaces for staff (Andrews, 2007, p. 573). Library staffs were very excited about the ILS. They could finally perform their work accurately in their systems and know what was purchased, received, cataloged, and circulated. Many librarians felt that they had finally regained the control over the collections they believed had been lost when the paper card catalog was replaced by the ALS.

Libraries and librarians were not unaware that the online catalogs, "though wildly popular, rapidly created a demand for actual content in digital form" (Lynch, 2000, p. 64). This popularity of the online catalog was a surprise and caused librarians to reevaluate their collection development activities. These activities, which had traditionally centered on print materials, now had to be refocused on electronic content. The majority of the materials with electronic content was and continues to be serial in nature, such as, journals.

By the late 1990s, "the ILS was functionally complete with good MARC support but with varied network support" (Andrews, 2007, p. 573). The ILS of this time had a Web-based catalog, WebOpac, which was done quickly and was not very sophisticated. In essence, libraries were still dealing with an ILS as a "silo." That means they were basically stand-alone units, yet with information being shared across library units. These systems were managed by library staffs, accessed over a network, and operated with a Web- or character-based interface, which ran on a single server.

Libraries entered West and Lyman's final, or transformation, phase of the procession of information technology at the beginning of the 21st century. Libraries realized they needed to transform the way they were providing information and access to this information. Lynch discusses this transformational time as a networked revolution. He defines this as "a vast constellation of digital content and services that were accessible through the network at any time, from any place, could be used and reused, navigated and integrated, and tailored to the needs and objectives of each user" (Lynch, 2000, p. 65). The end user or library patron's needs and objectives have always

been the key to libraries. It is the libraries' reason for existing; but with the advent of the Internet and the requirements for electronic content, the possibilities for information retrieval and distribution changed as radically as the needs of the library patron.

Libraries have proven to be the best examples of the procession of information technology as discussed by West and Lyman. Libraries are in the transformational stage and will probably remain in this stage for quite some time as change is happening very quickly, not only in the library automation marketplace, but also in the needs and objectives of the library patron.

THE CHANGING ILS MARKETPLACE

Prior to 1990, the ALS or ILS marketplace was dynamic and ever growing with new vendors every year. In this marketplace every available type of system any library would need at any negotiable price was available. "The 'favorite' ILS vendors changed from one year to another, and libraries used a wide variety of different systems" (Hakala, 2004, p. 275).

Changes in the industry were steady throughout the 1990s. However, by the year 2000, this equilibrium began to break down. "There are two main reasons for this: the need to provide efficient and unified access to the Web content, including electronic resources licensed by the libraries such as database and e-journals and the need to handle electronic resources created and held by the libraries themselves" (Hakala, 2004, p. 276). The modernization and innovations of the previous decades that ALS and ILS vendors had accomplished were not sufficient to move libraries into the age of the networked environment.

Marshall Breeding in his annual articles in *Library Journal* discusses the changes in the ILS marketplace that illustrate the various aspects of Lynch's networked revolution. In 2005, for example, the first major "reshuffling of companies" began (Breeding, 2006, p. 40). Sirsi purchased Dynix and became the largest automation vendor in the United States. "OCLC, once a major player in the automated library marketplace in the 1980s, went on a buying spree of library automation companies in 2005" (Breeding, 2006, p. 45). This was only an indication of other buyout and mergers throughout 2005.

The year 2006 witnessed even more mergers of ILS companies. "The cumulative effect of years of mergers has resulted in some very large companies, though smaller companies continue to survive—even flourish—by staking out niche markets" (Breeding, 2007a, p. 39). The "niche market," or specialty market, is currently the growing market where single companies offer a single product that uses a new technology. They flourish because they can devote the time to develop one product, whereas the larger companies have multiple products to develop and promote. Breeding states that the industry is less fragmented, dominated by consolidated companies, kept in
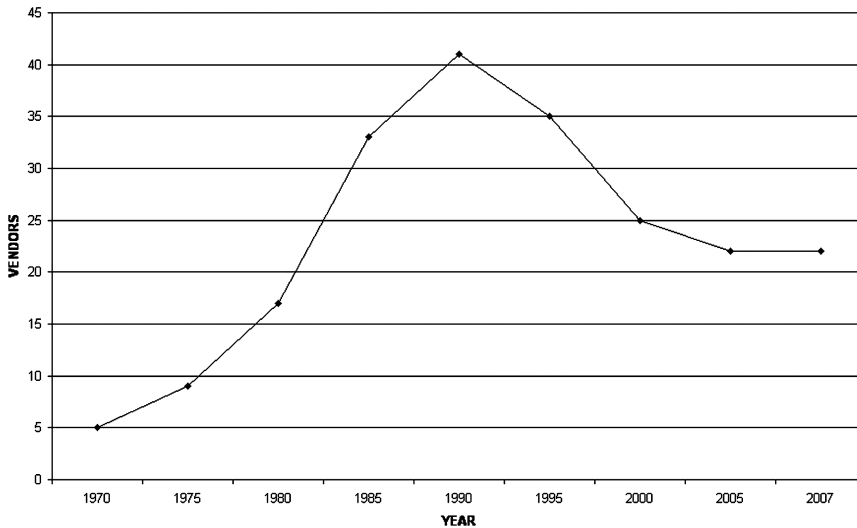
Chart 1 The Rise of Automation Vendors.

check by a slate of smaller companies that continue to grow without the distractions and overhead of integrating acquired businesses (Breeding, 2007a, p. 40).

This slate of approximately 12 to 13 smaller companies is continuing to advance into this industry. Their progress is more in terms of the development of new technologies rather than the quantity of companies. Chart 1 is a line chart representation of information found on Marshall Breeding's Web site on the history of library automation: http://www.librarytechnology.com.

Chart 1 depicts the continual steady upward rise in vendors entering the automation marketplace from 1970 to 1990. The marketplace peaked in 1990. It then began a steady decline. This is slightly deceiving, because many vendors were actually being purchased by other vendors, making them larger companies. In 2005, many vendors did leave the marketplace, but, as was stated earlier, this was the year of the "great reshuffling" (Breeding, 2006, p. 40). The marketplace stabilized for the next 2 years. The review of the literature reveals that the number of ILS vendors will begin to decline again, as the ILS is "split into smaller pieces" (Hakala, 2004, p. 276). These smaller pieces may consist of any number of the parts or modules that compose an ILS.

The WebOpac module split from the ILS was precipitated by several new smaller companies developing "discovery layer" software products. The finding tools that the discovery layer products represent could be added to the front end of the legacy ILSs. This is where the WebOpac was once in place. This discovery layer software does not have to be integrated with the ILS to function with the ILS software or data.

The future of the ILS will be dependent on the large ILS vendors' willingness to allow products, such as the discover layers, from smaller niche

vendors to work in concert with the ILS core modules. The authors define these core modules as acquisitions, cataloging, circulation, and serials. According to Breeding, the pressure to enhance resource sharing will drive automation decisions and vendors that fail to modernize their core ILS systems increasingly will be vulnerable to defections to competing systems (Breeding, 2006, p. 42)

The core modules of a library catalog have always functioned as identifying the location of materials in the library, the cost of the materials, and the status of the materials—that is, they are either on the shelf or are circulating. Coyle states very eloquently that the library function of the catalog has changed from that of identifying a shelf location to pointing to a networked location that can exist anywhere in the world (Coyle, 2004, p. 167). This gives the catalog a more active or dynamic characteristic.

This dynamic characteristic is associated with networked functions and is strongly related to electronic or Web resources. Web resources have gained in importance and command the attention of library staff and library patrons. "In general, the ILS is not used as the platform for these resources, and the ILS is now 'a' resource instead of 'the' resource" (Primich & Richardson, 2006, p. 125). The authors believe that to understand the changing of the ILS' role, the technologies involved in this transformation should be investigated.

COMPETING TECHNOLOGIES LEADING TO A SHRINKING MARKET

As the library vendor industry becomes less fragmented with fewer large companies competing, it is being challenged by smaller companies to develop new technologies (Breeding, 2007a, p. 40). Reacting to the need for libraries to compete with other Web destinations, product development is focusing on Web-based interfaces that showcase faceted browsing, relevance-ranked results, end-user tagging, and visual navigation (Breeding, 2007a, p. 38). This is due to library and patron demand for a Web-based search tool that mimics commercial sites such as Amazon.com, Google, and Yahoo. Vendors also are aware that libraries are either attempting to develop these products themselves or are going elsewhere, and they do not want to lose this part of the market.

The term "ILS" no longer means a "stand-alone product," as new products are constantly being developed as add-ons and there is not one vendor who offers products in all categories (Andrews, 2007, p. 572). Vendors have also abandoned the core products with which they started (Bahr, 2007, p. 11). For example, one significant ILS company began as a stand-alone acquisitions system and over the years has shifted focus to more Web-based products.

GROWING LIBRARY DISSATISFACTION

Many factors contribute to dissatisfaction with ILS vendors and their systems. Breeding states that current ILS products are operating on the assumption of old library workflows when libraries mainly dealt with print collections, and do not reflect current practice such as incorporating digitized collections organized around metadata and managing electronic resources. Libraries would like more attention given to the core modules, such as the serials module, because there are gaps in functionality and what worked well for print resources, does not work well for electronic resources (Breeding, 2007b, p. 40).

Libraries also have to deal with staffing limitations and how that has impacted workflow. Libraries need systems that will do more and do it more efficiently. Vendors are responding to technological demands, but they also need to examine basic library workflow, although libraries may have adapted their workflows to limitations in the ILS (Breeding, 2007b, p. 40). As staff retire or resign, positions are often eliminated, combined with other positions, or changed. For example, when serials were mainly in print format, checking in issues, stack maintenance, and binding were the principal tasks. With libraries acquiring more serials in electronic format and cancelling print subscriptions, the workflow has changed to that of managing licenses and providing access and content to users. Core serials modules have not changed dramatically to respond to the change in format preference, and it may take the intervention of a separate product to manage electronic resources. SirsiDynix has taken a unique approach to this by partnering with SerialsSolutions to integrate e-journal management into their ILS.

Libraries are growing increasingly dissatisfied with the proprietary nature of the ILS and would like more access not only to the software but also to the data through application programming interfaces (APIs; Breeding, 2007b, p. 40). This would make it easier for libraries to add features to their systems and roll out services in their own time frames. This could lead to greater interoperability and integration of systems within the library from third-party vendors, open source (free source code available on the Internet), and homegrown systems and from portals, courseware, and shared library systems such as OCLC (Bahr, 2007, p. 14). This may include incorporating the online catalog into course management systems or having the circulation module work more directly with external accounting and registration systems such as SCT's Banner. It might also provide a way for library users to export their accounts easily into other applications so they would not have to interact with several different programs.

Libraries are also frustrated by the inability to choose their own hardware. Libraries are often locked into certain systems that may limit flexibility, and they would like to be their own administrators (Bahr, 2007, p. 14). Academic libraries, for example, are part of larger institutions that typically

have information technology departments that manage networking. Certain servers may be recommended and supported through the institution more readily than others, and having similar server models would provide more consistency within an institution.

Libraries are also facing growing patron dissatisfaction. There will always be library patrons who are not interested in or who are hesitant to learn about technology, but the current generation has grown up with technology and takes it for granted (Balas, 2007, p. 41). These patrons bring their perceptions of various commercial sites into the library and expect the same from library Web sites (Kenney, 2003, p. 36). In the early days of the Internet, the library OPAC was considered cutting edge, but services offered by Google, Amazon, and You Tube pushed the envelope and have caused the launch of "discovery tools" that mimic these commercial sites (Fox, 2007, p. 242).

TECHNOLOGIES IMPACTING THE ILS

Web 2.0 is sometimes referred to as the interactive or social Web. It refers to such things as Really Simple Syndication (RSS), an aggregator of Web content that can be displayed in one place; wikis, which are Web pages that can be created and modified by virtually anyone; AJAX, a programming language used for Web pages that allows content to display dynamically without reloading the page; mashups and APIs, which integrate content into other sites; blogs, Web sites created by people or groups to share information and solicit comments from others; portals, which provide a single point of entry to many services such as accounting systems, community bulletin boards, and registration systems; streaming media to watch video clips and provide tutorials; tagging, which allows library users to add their own subject headings to bibliographic records; social networking tools such as MySpace that allow users to communicate with others and join interest groups; open access, which provides free access to digital scholarly research material, and open-source or open-content tools such as Wikipedia that allow individuals to modify content (Abram, 2008, p. 20). Several vendors have already incorporated many of these features into their Web catalogs in order to give users a more interactive experience.

Library 2.0 simply refers to how the interactive Web technologies can be used in libraries. It is all about enhancing user experience (Abram, 2008, p. 21). For example, allowing patrons to log into their library accounts and write reviews on items in the library has gained in popularity. Users can get more information from a bibliographic record this way and share their opinions with others. Vendors are responding to customer demands, but unfortunately incorporating the newest technologies come with a price that

may cause libraries to explore other options such as writing their own code or seeking out smaller companies that charge less.

Digital object management systems, or DOMS, are systems designed to store and provide access to digital documents and supplement the online catalog. Popular ones include dSpace and Fedora. Through metadata, objects are searchable and indexed when full MARC records are not needed or desired. They are popular for archival materials and special collections. A drawback to using one is that it makes users search multiple sites for library collections as the material found in DOMS is not searchable in the standard library catalog unless it is cataloged for it. It can be administered locally, however, giving the library more control over the content. The growing popularity of such systems demonstrates the growing need or desire to have more control over library collections and access.

Open Source

Since libraries are not getting the response they want or need from traditional library vendors, many are looking elsewhere, either to other companies providing add-ons for their systems or by using open-source alternatives and doing their own programming.

Open source software (OSS) is software source code that is available free of cost on the Internet. Once downloaded, the software can be enhanced and customized. The software is managed through a licensing process that protects the rights of the creators and collaborators (Jaffe & Careaga, 2007, p. 2). Users are part of a community that share developments and information about the product as well as troubleshoot problems they may be having (p. 2). What makes open source particularly valuable for libraries is that it is peer reviewed, which promotes reliability and quality, and it evolves rapidly (p. 3).

Most of the features of OSS are in direct opposition to what is found with a standard ILS. They include low cost, customizability, interoperability, vendor independence, reliance on open standards, collaborative development, and flexible support options (Jaffe & Careaga, 2007, p. 5). Other features benefit the patron by providing easier access to resources with more enhancements emerging in the open-access publication area (p. 5).

While OSS is a viable solution for some libraries, it is not for everyone and is not the answer to every problem. It can be costly and intimidating if starting from scratch since servers and other equipment will most likely have to be purchased. It is also not easy to implement. Librarians will either have to learn programming skills or enlist the aid of information technology staff to help develop and tweak the code. In many cases, libraries will need to find development partners to share some of the burden because open source needs a lot of customization and is not ready right out of the box

(Jaffe & Careaga, 2007, p. 9). It is also largely invisible. There are a lot of articles about OSS implementations but there are few case studies showing success. This makes it difficult to get support from administrators and even colleagues who may favor the "name brand" over open source (p. 10).

Many of the open-source projects currently in development are, in fact, enhanced online catalogs that provide metasearching capabilities to pull together information from many different areas such as electronic, print, and digital resources and consortium collections. All of these collections can then be grouped according to facets such as language, subject, or relevance.

EXAMPLES OF OPEN SOURCE

Koha. First deployed in 2000, Koha is considered the most successful of the OSS ILS projects (Jaffe & Careaga, 2007, pp. 4–5). An advantage to using the software is that users can get their data out of Koha later on if they decide to change systems (p. 5). Some of the libraries using it are the Horowhenua Library Trust Library in New Zealand (the first Koha site), the Stow-Munroe Falls Public Library in Ohio, and Antioch University in California (http://www.koha.org).

An intriguing feature of Koha is its intranet version (http://koha.liblime.com). It provides an easy-to-use Web interface of the ILS so that staff can edit and add records directly into their Koha catalog. It also allows the importing and exporting of records in multiple formats (MARC, Dublin Core, XML). It also has a quick report feature for such things as the number of items with the most circulation and provides guided reports that let uses specify search criteria. It is currently being used at the Crawford County Federated Library System (CCFLS) in Pennsylvania.

Sakai. Sakai involves several academic library collaborators, such as the University of Michigan and Indiana University, who seek to create a common collaboration and learning environment (CLE) (http://sakaiproject.org). It is a Java-based, service-oriented application suite with features common to course management systems such as WebCT (Jaffe & Careaga, 2007, p. 6). Sakai resembles a campus portal in many ways and can contain a discussion and chat area, grade books, syllabus tools, tests and quizzes, and a calendar.

Evergreen. Originally written by the Georgia Public Library Service Georgia PINES Consortia, Evergreen was developed because of the limitations of the ILS. It is constantly being developed and improved and is available to any library who wants it for free. It serves over 44 public library systems in Georgia and manages over 8 million items (Fox, 2007, p. 247).

Prospero. Prospero is an example of a capability added to a product that, at the time, was not available from the vendor. The application added document delivery capability to Research Libraries Group's (RLG) Ariel. The feature, which is now part of Ariel, shows how a solution could be found outside of the vendor (Jaffe & Careaga, 2007, p. 6).

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
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Browser Extensions. Many extensions are available for Web browsers such as Firefox and Internet Explorer. A popular one for libraries, LibX, was developed by Virginia Tech and it puts a customized toolbar for the library on the Web browser. Libraries that want it are able to download the software and customize it (Jaffe & Careaga, 2007, p. 6). This is in line with the Web 2.0 and Library 2.0 philosophy of taking services to the user through applications they are already using.

BARRIERS TO USING OPEN SOURCE

The open-source movement in libraries has only existed for about a decade. How it will continue to evolve is unknown, but the implications of it are great. It puts some control of the ILS into the hands of libraries, so they are no longer dependent on vendors. It also helps libraries address features and flaws that may never be addressed by a vendor (Wrosch, 2005, p. 525). At the same time, vendors are sitting up and taking notice, and some are responding to their customers with a host of add-ons and products.

VENDORS

Several library vendors are offering more options and services to their customers in response to the changing market. Endeca Information Access Platform is a product to enhance the WebOpac. It was not originally designed for libraries, but North Carolina State University saw its potential as a search tool (Fox, 2007, p. 243). It provides faceted searching by subject, genre, format, and location and is able to provide thesaurus functionality and ranking. It operates separately from the ILS and is re-indexed nightly (p. 243).

Ex Libris develops automation products for academic and research libraries as well as consortia. It has two automation systems: Aleph and Endeavor. Development has centered on Primo, a discovery interface for the OPAC (Breeding, 2008, p. 39). Ex Libris also continues development of MetaLib for federated searching and Verde for electronic resource management and SFX for Open URL (p. 39).

A new offering from OCLC is WorldCat Local. It is a discovery platform with faceted results. It searches the WorldCat database of over 105 million records and singles out local and statewide holdings (Breeding, 2008, p. 42).

Symphony was selected as the new automation system from SirsiDynix following the buyout from Vista Equity Partners in 2007 (Breeding, 2008, p. 33). Symphony features service-oriented architecture (SOA), fully documented APIs, and allows for multiple record formats such as MARC, Dublin Core, and Corsati and multiplatform server support for Windows, Linux, and UNIX (http://sirsidynix.com). A discovery platform is also being developed.

One of Innovative Interfaces' responses to the changing market has been to create a discovery tool called Encore as an attempt to bring together all of a library's resources through a simple search box that resembles Google. It incorporates tag clouds and faceted meta-searching. It is provided by

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the vendor as an add-on product that may make it cost-prohibitive to many libraries, but a library does not have to have the whole ILS to use it (Breeding, 2008, p. 41).

Library ILS vendors are indeed responding to technological demands and to demands from their customers, but are they going far enough? Bahr interviewed several library technology experts and asked them what they would like to eventually see ILS vendors provide (Bahr, 2007, p. 11).

Roy Tennant states that the ILS should focus on the core modules of a library such as acquisitions and circulation. It should not try to be a finding tool, but should allow other finding tools to communicate with it (Bahr, 2007, p. 11). The core modules (acquisitions, cataloging, circulation, and serials) are by their nature organic, dynamic, and continually evolving as part of the library staff workflow in the development of the library's catalog. This workflow benefits from finding tools but is not dependent on them. This was further emphasized by H. Frank Cervone, who states that ILS catalogs could all be rolled out into a centralized system such as OCLC and be shared. The catalog itself could be treated as a database (Bahr, 2007, p. 14).

An interesting concept is proposed by Ross Singer, who states that "the best feature that an ILS could have is the ability for my users to never have to directly interact with it" (Bahr, 2007, p. 11). Integrating the ILS into community and campus portals, course management systems, and applications like Facebook would make getting at library collections easier for patrons who would not even think of visiting a library's catalog to find what they need. For example, students who spend a lot of time in their online courses may not think of using the library or even know how to locate the catalog. If it is placed on the first page of their course pages, it could potentially draw more users who might not have otherwise used library resources, especially if they do not want to leave the application they are using and open a new browser tab or window.

Another important feature would be a standard way to communicate with the ILS such as through an API. This would lead to better interoperability and integration of systems whether they are from open source or other vendors (Bahr, 2007, p. 14). This interoperability is the key to the future of the ILS because users want the convenience of using many programs and systems from one location. For example, students in an academic setting log in to look at their financial information and pay bills. Having all financial information, such as library fines, available centrally would benefit the patron as a convenient way to keep track of all financial information and also the library staff who would not have to spend time contacting students and accounting offices directly, thereby saving staff time for other projects.

CONCLUSION

What future ILSs will become and what libraries want them to become are two separate issues. It is clear that ILS vendors need to continue to observe the trends in delivering content to patrons, but should not lose sight of their core modules as they are vital to libraries. In addition, if vendors spread themselves too thin, they will not be able to effectively develop new products nor enhance the products they currently market and will lose customers.

The new ILS needs to be more open and less proprietary. Vendors should provide access to data even if it is read-only, and libraries should be able to select and set up their own hardware and administer their own servers, if they so choose (Bahr, 2007, p. 14). In this way, libraries will be able to adjust the ILS to suit their needs without vendor involvement. Libraries will no longer feel they are at the mercy of the vendor and will be able to assume more control over delivery of services, which will lead to greater satisfaction among libraries and their users.

The Internet and the rise of the World Wide Web have impacted libraries and vendors in ways that were unimaginable 10 years ago. The way to the future is a constantly evolving path. The next great technological advancement may be just around the corner and may lead libraries in a completely new direction. Libraries and vendors must be flexible in listening to their users. This will enable them to provide the standard services the users expect and newer services that users will come to rely on. Otherwise, the ILS will turn into a dinosaur.

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