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**Cloudy with a Chance of Open Source?: An Examination of Open Source
Integrated Library Systems and Cloud Computing**

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Submitted to

Professor Penny A. Hazelton

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Introduction

The difficult economic climate of the last few years has forced many organizations to more closely scrutinize expenditures and consider more cost-efficient operating alternatives. Law libraries certainly have not been exempt from such scrutiny, especially those dependent upon decreasing taxpayer funding. Although warranted doubt exists about the true efficacy of implementing technological changes to operations in order to save money, such economic concerns could be the impetus for innovation involving library automation and data storage.

One option law libraries may consider is abandoning the use of proprietary integrated library systems (ILS) and instead implementing an open source ILS. The opportunity for innovation exists in the form of a law library's control over their system and their ability to optimize it through customization. However, the waters are still a bit murky as to whether or not implementation of an open source ILS really translates into cost-savings.

Another consideration for law libraries is whether to shift locally hosted services to the "cloud" to save money. Switching to cloud computing would create immediate cost-savings for law libraries, but would those savings be at the expense of something more important (control)?

In times of such economic uncertainty, law libraries must make difficult decisions regarding technology and resources. What may be the best option for one institution may not be the best option for another. This paper will examine the different factors that should be weighed when deciding whether to maintain a proprietary ILS or implement an open source ILS. In addition, the various issues surrounding the consideration of moving the hosting of library services to the cloud are also examined.

Integrated Library Systems

An Introduction to ILSs

An integrated library system uses computer automation to operate library functions through modules, which address specific functional areas.¹ There are typically five standard modules: cataloging, circulation, serials, acquisitions, and an online public access catalog (OPAC).² Standards are in place to ensure interoperability among the modules.³

Most vendors consider the underlying source code of their software their proprietary information, so they neither share nor allow access it.⁴ Libraries typically pay a hefty up-front licensing fee for the software and implementation.⁵

¹ Marshall Breeding, *Open Source Integrated Systems*, LIBR. TECH. REP., Nov. – Dec. 2008, at 4, 5

² *Id.*

³ *Id.* at 6

⁴ Marshall Breeding, *An Update on Open Source ILS*, COMPUTERS IN LIBR., March 2007, at 27

⁵ *Id.*

Libraries who license the software merely receive working copies, so they cannot make any changes to it.⁶ This means that libraries also pay an annual maintenance fee to their vendors to correct, enhance, and upgrade their ILS.⁷ Libraries are essentially at the mercy of their vendors and their vendors' timetables for even corrective action.

In contrast, open source integrated library systems provide libraries with access to the source code of the ILS, so libraries are able to make their own corrections, upgrades, and changes.⁸ They are only limited by the proficiency of their staff at doing so.⁹ There are typically no licensing fees involved; instead, the licenses usually stipulate that libraries must release to the public any modifications they have made in order to help advance the software's utility.¹⁰ Although the software is itself free, there are other costs involved in its implementation and maintenance.¹¹ However, libraries using an open source ILS are no longer at the mercy of their vendors; they are at the mercy of their information technology (IT) staff or contracted support service provider.

The Growing Debate

Over the last decade relationships between proprietary vendors and libraries have eroded, which has led many libraries to consider other options for their automation needs. The growing discontent revolves around many issues. The traditional proprietary module does not work well for electronic resources,¹² which are now commonplace. Due to the staffing limitations now experienced by libraries eliminating and/or combining positions, libraries need systems that will perform more tasks efficiently.¹³ Libraries would like more access to the software and data in order to "make it easier for libraries to add features to their systems and roll out services in their own time frames."¹⁴ Libraries would also like to choose and administer their own hardware, which is often not an option when working with proprietary vendors.¹⁵ Dissatisfaction also exists regarding the functionality of many ILSs that have yet to implement the discovery tools now expected by patrons.¹⁶

Andrew Pace, Executive Director of OCLC's Networked Library Services, analogizes that the choice between major ILSs to the choice between rental cars – there is not much difference within classes.¹⁷ As Pace states, "A combination of

⁶ *Id.*

⁷ *Id.*

⁸ *Id.*

⁹ *Id.*

¹⁰ *Id.*

¹¹ *Id.*

¹² Laura Kinner & Christine Rigda, *The Integrated Library System: From Daring to Dinosaur*, J. OF LIBR. ADMIN., June 2009, at 401, 407

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.* at 408

¹⁷ Andrew Pace, *Dismantling Integrated Library Systems*, LIBR. J., Feb. 1, 2004, at 34

business consolidation, stunted innovation, and rapid Web application development outside the library automation space would lead to disenchantment and restlessness among libraries.”¹⁸ This has now given open source ILSs a foot in the door and law libraries an alternative to consider.

Vinod Chachra of VTLS believes that libraries can reinvent the ILS five ways: by making it format-independent, making it more mobile, making linked records instead of flat ones, creating on-demand delivery, and by creating deep linking into unknown systems.¹⁹ Law libraries could be more assertive with their demands to vendors for these changes, or they could create the changes themselves using other software options, such as open source ILSs. Vendors who fail to listen to customer demands to modernize their core ILS modules will be in jeopardy of losing those customers to competing systems.²⁰

Proprietary Integrated Library Systems

Advantages

Although dissatisfaction with proprietary ILSs has increased among librarians in recent years, there are still advantages to utilizing a proprietary system. These advantages may still outweigh the drawbacks depending on the needs of the institution making the decision. Some libraries may place greater emphasis on functionality, a trusted brand name, good technical support, familiarity with the ILS, and more predictable costs.

Functionality

The evolution of the ILS over the last few decades has seen the creation of very functional and sophisticated systems for handling the traditional cataloging, acquisitions, serials controls, circulation, and online catalog needs of libraries.²¹ The big, proprietary vendors have had the time to work out the major kinks in these traditional operating modules. The convenience and stability these systems provide to libraries is still unparalleled.

Known Costs for Services

For a contracted amount, a library can negotiate with a vendor to receive a myriad of services required for the implementation and maintenance of an ILS, including infrastructure, software licensing for the system and components, and support for upgrades and functional issues.²² The ability to contract for all-inclusive services can mitigate the possibility of hidden costs arising, the importance of which to library budgeting cannot be overstated. The ability to

¹⁸ Andrew Pace, *21st Century Library Systems*, J. OF LIBR. ADMIN., Aug. – Sept. 2009, at 641, 644

¹⁹ Pamela Goodes, Leonard Kniffel, & Greg Landgraf, *Economic Outlook Prompts Tough Talk in Denver*, AM. LIBR., March 2009, at 45,51

²⁰ Kinner & Rigda, *supra* note 12, at 408

²¹ Marshall Breeding, *The Next Generation Library Automation: Its Impact on the Serials Community*, THE SERIALS LIBR., Jan. – June 2009, at 55, 59

²² Breeding, *supra* note 1, at 13

more definitively know the overall costs associated with the ILS each year makes allocating resources easier and can help divert disaster in the form of a hidden, but necessary, cost emerging when no money exists in the budget.

Guaranteed Support & Upgrades

When a library contracts with a proprietary vendor, support services are bundled into the annual fees.²³ The vendor is contractually bound to provide support and upgrades and resolve hardware and software failures.²⁴ This required support also lends itself to maintaining a functional and sophisticated system.

Disadvantages

Costs

Although all-inclusive, bundled services for the implementation, maintenance, and support of a proprietary ILS are very useful for predicting budgets and allocating resources, they can be very expensive, especially the licensing fees. Typically, a library pays an upfront fee for the software license and then pays an annual maintenance fee, which is usually about 15% of the initial licensing fee.²⁵ A medium-sized library may pay an initial fee of \$300,000 for a proprietary ILS and continue to pay an annual maintenance fee of \$45,000.

The aforementioned example is just a hypothetical. While it is common knowledge that licensing fees for proprietary ILSs are steep, most vendors require libraries to stipulate to confidentiality clauses regarding licensing agreements and contracts, which prohibit the disclosure of product and service fees.²⁶ Prices are not fixed, but they are instead the result of a private negotiation between each library and its chosen vendor.²⁷

Technology Does Not Evolve Fast Enough

Library patrons' expectations have rapidly evolved along with technology itself. If the popularity of Amazon and Google had not skyrocketed, patrons may have remained satisfied with the ability to simply search for a book through an integrated system.²⁸ However, a much richer experience is now expected on the user-end of an ILS. Users want to see suggestions for related titles, reviews, more in-depth descriptions of content, book covers, etc.²⁹ In order to provide patrons

²³ *Id.*

²⁴ *Id.*

²⁵ Marshall Breeding, *Library Automation in a Difficult Economy*, COMPUTERS IN LIBR., Mar. 2009, at 22, 23

²⁶ Marshall Breeding, *The Elusive Costs of Library Software*, COMPUTERS IN LIBR., Sept. 2009, at 28, 29

²⁷ *Id.* at 28

²⁸ William C. Dougherty, *Integrated Library Systems: Where Are They Going? Where Are We Going?*, J. OF ACAD. LIBRARIANSHIP, Aug. 2009, at 482

²⁹ *Id.*

with the now expected features, many libraries are spending extra money to add layover products.

They Were Created for Print

Integrated library systems were created during a time when collections were primarily in print.³⁰ Because of the difficulty in “extending these library automation systems to manage electronic content,”³¹ libraries constantly need to add application-programming interfaces (APIs) in order to comport with other programs created to manage other formats in the collection.³² These add-on modules are yet another expense incurred by libraries.³³ They are also proprietary and not typically published,³⁴ so libraries must use them without having access to customize them to the library’s needs. Many libraries also purchase electronic resource management systems (ERMs), OpenURL link resolvers, digital asset management systems, and search platforms in addition to their core integrated library systems.³⁵ The question arises as to whether or not the traditional five-module ILS adequately addresses the work that occurs in today’s libraries.³⁶

Vendor/Product Interdependence

If a proprietary vendor goes out of business, support and development for their products cease.³⁷ Similarly, if vendors merge, products may be phased-out.³⁸ In both instances, support for the ILS no longer exists. Due to the proprietary and closed nature of the software’s source code, other vendors cannot simply fill the vacuum as can be done with open source software. The product “remains closely connected to the company that owns and controls it.”³⁹ Libraries may find themselves in a precarious position because they must solely rely on one vendor for continued support and development of their ILS.⁴⁰ Cessation of product development and support may force those libraries to incur large, unforeseen costs due to premature migration to a different system.⁴¹ Often when faced with this prospect, libraries have no option but to stay with the current vendor and switch products.⁴²

³⁰ Breeding, *supra* note 21, at 58

³¹ *Id.*

³² Dougherty, *supra* note 28, at 483

³³ *Id.* at 484

³⁴ *Id.* at 483

³⁵ Breeding, *supra* note 21, at 58

³⁶ Breeding, *supra* note 21, at 61

³⁷ Breeding, *supra* note 1, at 12

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ Carl Grant, *Gone Open Yet?*, PUB. LIBR. Q., June 2008, at 223, 227

⁴² *Id.*

Consolidation of Industry

Instead of innovation dominating the last decade of the library automation industry, companies were instead busy conglomerating.⁴³ Between 2000 and 2008, the industry experienced over 30 major mergers and acquisitions.⁴⁴ Options were decreased due to diminished competition to force innovation, and the vendors were not mindful of the impact websites like Amazon and Google were having on society during this time. Proprietary product innovation was stagnant. Despite their lack of vision, proprietary vendors remained largely unchallenged in the ILS realm until recently.

The Necessity to Create Work-Arounds

Because proprietary ILSs are not customizable to a fit library's specific needs, institutions often find it necessary to create work-arounds when the vendor will not agree to make changes. Developing these work-arounds can be time-consuming and tedious on the front and back ends.

For example, the Gallagher Law Library at the University of Washington had to create a work-around to resolve an issue with how their proprietary online public access catalog displays results.⁴⁵ The OPAC displays results in reverse chronological order, which moves authoritative resources down the results list if they were originally published long ago even though still current.⁴⁶ The vendor refused to change the software to address the problem, so, on the first day of every year, the library staff manually changes the publication date on the records for the affected resources to reflect the current year.⁴⁷ Since the implementation of this work-around, those resources have enjoyed increased use due to being displayed higher in the results list.⁴⁸

Open Source Integrated Library Systems

Advantages

As previously mentioned, the dissatisfaction of libraries with the response of their traditional vendors, or lack thereof, has led libraries to start exploring other options, such as add-ons and open source software.⁴⁹ Open source ILSs provide attractive features for libraries looking to cut the proprietary cord. Some of those features include low cost, internal control, customization, rapid

⁴³ Pace, *supra* note 18

⁴⁴ *Id.*

⁴⁵ Example given by Penny Hazelton, Associate Dean for Library and Computing Services and Professor of Law, University of Washington School of Law, Marian Gould Gallagher Law Library.

⁴⁶ *Id.* Many multivolume treatises have original publication dates dating long ago, but they are actually updated annually under their long-standing names. One example is Nimmer on Copyright, which was originally published in 1969.

⁴⁷ *Id.*

⁴⁸ *Id.*

⁴⁹ Kinner & Rigda, *supra* note 12, at 409

adaptability, interoperability, collaborative development, flexible support options, independence from vendors, and enhanced features for patrons.⁵⁰

Cost-Savings

Libraries can avoid most licensing fees and annual maintenance contracts that they are currently saddled with by using proprietary software.⁵¹ Libraries are also able to customize their ILS to meet their needs, which they cannot do using a proprietary ILS.⁵² Another advantage is that open source software “gives users more support options and less vulnerability to business transactions.”⁵³ If a proprietary vendor is acquired or goes out of business, development of their products may stagnate or be phased-out altogether, forcing libraries to prematurely migrate to other systems.⁵⁴ Premature migration is forced because there is no access to the proprietary source code for upgrades and support. As long as a library running an open source ILS has access to a knowledgeable programmer or support service provider, they will not be susceptible to the same issues of stagnation and phase-out. Programmers can access the source code to update and change the open source ILS however the library sees fit.

Control & Customization

As previously stated, utilizing and open source ILS will provide a library much more freedom to exercise control and customize the system to meet their needs. The Freed Software Foundation defines four freedoms for users of open source software:⁵⁵

- Freedom to run the program however one sees fit⁵⁶
- Freedom to study the program and adapt it to one’s needs⁵⁷
- Freedom to redistribute copies for the benefit of everyone⁵⁸
- Freedom to improve the software and release those improvements for the benefit of everyone⁵⁹

These freedoms allow anyone, including library personnel, to work with the software’s source code. They can add features, fix problems, or tweak existing

⁵⁰ *Id.*

⁵¹ Breeding, *supra* note 4, at 28

⁵² *Id.*

⁵³ Breeding, *supra* note 1, at 12

⁵⁴ *Id.*

⁵⁵ Scot Colford, *Explaining Free and Open Source Software*, BULL. OF THE AM. SOC’Y FOR INFO. SCI. AND TECH., Dec. - Jan 2009, at 10, 11

⁵⁶ *Id.*

⁵⁷ *Id.*

⁵⁸ *Id.*

⁵⁹ *Id.*

functionality however they see fit.⁶⁰ This level of customization is not allowed with closed, proprietary software.

Adaptability & Interoperability

Using open source software provides the ability for a library to quickly adapt to changes in computer technology, networks, and other software.⁶¹ They can immediately begin implementing necessary changes for adaptability and interoperability instead of waiting for a proprietary vendor to even consider a request for change.

Flexible Support Options

An open source application may actually have more support options than a proprietary product because it has been released to a larger community of programmers (multi-vendor support).⁶² Unlike proprietary ILSs, any knowledgeable person or company can step-in to provide support for a product if the “main” support service goes out of business.⁶³ A library must rely solely on the proprietary vendor for support of its ILS.⁶⁴ This is problematic if a vendor goes under or discontinues that product.⁶⁵

Disadvantages

There are also disadvantages to using an open source ILS. Libraries may face increased costs for in-house technical expertise or outsourcing to a support service.⁶⁶ Guaranteed support and upgrades do not exist either.⁶⁷ As Marshall Breeding, Director for Innovative Technologies and Research at Vanderbilt University, points out, “Using free software does not necessarily mean going without commercial support.”⁶⁸

Costs of Hiring Additional IT Staff

With an open source ILS, there are increased costs for hiring additional staff with the technical expertise to maintain, change, and upgrade the system.⁶⁹ The costs required to hire and maintain an IT development staff’s salaries and benefits would be high:

⁶⁰ Marshall Breeding, *Opening Up Library Systems Through Web Services and SOA: Hype or Reality?* LIBR. TECH. REP., Nov. – Dec. 2009, at 1, 13

⁶¹ Dougherty, *supra* note 28, at 483

⁶² Breeding, *supra* note 1, at 12

⁶³ *Id.*

⁶⁴ *Id.*

⁶⁵ *Id.*

⁶⁶ Breeding, *supra* note 4, at 28

⁶⁷ *Id.*

⁶⁸ Breeding, *supra* note 4, at 29. Marshall Breeding is the Director for Innovative Technologies and Research at Vanderbilt University in Nashville, Tennessee. He is a consultant, speaker, and writer in the field of library automation.

⁶⁹ *Id.* at 28

While it is possible for a library or other organization to avoid buying a proprietary software package, open source may carry a plethora of hidden costs in development and maintenances, particularly if any customization is to be made to the software. These costs may translate into salaries for additional technical staff or possibly external support, development and/or hosting services such as the consulting service LibLime.⁷⁰

Costs of Contracting for Support Services

Libraries who either do not have enough in-house expertise or do not want to invest the money to hire additional staff do have a viable option for implementing and maintaining an open source ILS. Several support service companies have emerged over the last few years, many of which were started by some of the original creators of the various open source ILSs. The support services these companies provide include:

- Conversion services⁷¹
- Installation⁷²
- Configuration⁷³
- Training⁷⁴
- Ongoing support⁷⁵
- Hosting⁷⁶
- Custom development⁷⁷

Although these services mirror services provided by many proprietary vendors, a library can avoid the steep licensing fees by choosing this route. Instead of these services being bundled into the licensing fee (proprietary), services can be contracted for a la carte.⁷⁸

⁷⁰ Colford, *supra* note 55, at 12

⁷¹ Breeding, *supra* note 1, at 11. Whether automating for the first time or migrating from a different system, data has to be put into the new system. A support service provider can prepare and load the data for the library.

⁷² *Id.* The support provider will make sure the software is ready to use and optimized to work with the library's hardware.

⁷³ *Id.* A support service provider can properly code the system requirements into the configuration and policy tables of the system.

⁷⁴ *Id.* A support service provider can provide training services to the library staff to learn to use the new ILS.

⁷⁵ *Id.* at 12. A support service provider can be contracted to resolve software issues that may arise.

⁷⁶ *Id.* Support service providers may also offer software-as-a-service and host the application themselves. This approach saves libraries from having to purchase their own servers and hire in-house technical staff to upkeep of the ILS.

⁷⁷ *Id.* A support service provider can customize the software to fit the library's needs. Extra features can be developed and added.

⁷⁸ *Id.*

Cost assessments will certainly differ on a case-by-case basis.⁷⁹ Libraries should do their due diligence in analyzing projections based upon their specific needs for implementation and maintenance before deciding which is right for them.⁸⁰

While the ability to customize an open source ILS is a distinct advantage, it also makes it more difficult for libraries to project actual costs of implementation and maintenance. Different levels of programming and add-ons for customization will cost libraries different amounts. Of course, cost projections may be clearer if a library chooses to contract with a support service.

On the other hand, there is no guarantee that costs of using these a la carte support services will continue to provide cost-savings into the foreseeable future. Outsourcing could become quite costly if these support providers raise contract rates enough to essentially negate any long-term savings by avoiding proprietary licensing fees. Once a library has migrated to an open source ILS, they are at the mercy of these support providers just as they were with their former proprietary vendors. The library must contract for their services in order to make changes to the system and keep it updated. The only remaining option would be to hire and build a skilled, internal IT staff to maintain, change, and update the system, which would be costly in terms of staff salary, benefits, and time lost due to familiarizing personnel with operations.

No Guaranteed Support or Upgrades

Unless your library has contracted with a support service provider, there is no guaranteed support to resolve software and hardware issues. You must rely on your in-house IT staff. If you do not have an IT staff that is very knowledgeable about the system, you must rely on the development communities to create documentation, write guides, and answer support questions through various forums.⁸¹ Due to the voluntary, collaborative nature of open source software development, there is no guarantee that new versions of the system you implement will even be produced.⁸² Nobody is contractually bound to upgrade the software. Therefore, it basically necessitates the need for a library to either contract for support services or hire a skilled IT staff. Otherwise, problems may arise that the library cannot resolve by itself.⁸³

⁷⁹ *Id.*

⁸⁰ *Id.*

⁸¹ Colford, *supra* note 55, at 13

⁸² Breeding, *supra* note 1, at 13

⁸³ *Id.* at 12

Quality & Functionality

Many questions still remain about the quality and stability of open source ILSs.⁸⁴ Proprietary ILSs have been tweaked and reworked over a 30-year period, so open source ILSs are playing a game of catch-up. In a 2009 white paper, SirsiDynix's Stephen Abram states:

Generally, the available open source ILS platforms have less than half of the features and functions of any SirsiDynix ILS. Some of these features and functions may not be essential to some clients, some will be. However on this order of scale, and with that potential number of needed features, SirsiDynix has the ability to offer libraries the most robust feature set on the market . . . Proprietary software has more features. Period. Proprietary software is much more user-friendly. SirsiDynix has been building this ILS for more than 30 years. It has a feature set second to none. It is important to note that a SirsiDynix ILS has two main user groups – the library workers who process the resources for the library as acquisitions, cataloguing, circulation, ILL, etc. and the end-users who use the OPAC features and other add-ons like self-check. Open source software developers are spending the majority of their time and resources on getting the back room operations right, 30 years after we already completed the process.⁸⁵

One of the more established open source ILSs is Evergreen, which was originally developed for the Georgia PINES consortium of public libraries.⁸⁶ Their offering of an alternative open source ILS has lured some libraries away from traditional, proprietary ILSs in recent years.⁸⁷ However, it “actually falls short on the full functionality of other proprietary ILS systems.”⁸⁸ Stephen Abram also notes in his white paper that one of the major complaints about open source ILSs is how slow even simple searches are, which leave users hanging for minutes waiting for results.⁸⁹ Unfortunately, these shortcomings were highlighted when the King County Library System (KCLS) implemented Evergreen in September 2010.⁹⁰ “Check-in and checkout procedures became more difficult, PINs were changed, the electronic catalog slowed down and familiar features were dropped,

⁸⁴ Zhonghong Wang, *Integrated Library System (ILS) Challenges and Opportunities: A Survey of U.S. Academic Libraries with Migration Projects*, J. OF ACAD. LIBRARIANSHIP, Apr. 2009, at 207, 217

⁸⁵ Mark A. Matienzo, *SirsiDynix Report Leaked, Spreading Fear, Uncertainty and Doubt about Open Source*, THE SECRET MIRROR (Oct. 29, 2009), <http://thesecretmirror.com/blog/2009/10/29/leaked-sirsidynix-report/>. This blog links to a pdf of a white paper written by SirsiDynix's Stephen Abram and originally leaked by WikiLeaks. The white paper is called *Integrated Library System Platforms on Open Source*.

⁸⁶ Breeding, *supra* note 60, at 21

⁸⁷ Pace, *supra* note 18, at 646

⁸⁸ *Id.*

⁸⁹ Matienzo, *supra* note 85

⁹⁰ Keith Ervin, *Patrons Vexed by Glitches in New Library Software*, SEATTLE TIMES, Jan. 30, 2011, http://seattletimes.nwsourc.com/html/localnews/2014085833_library31m.html

and many patrons saw only a blank screen when they tried to access the catalog from home or work.”⁹¹ A March 22, 2011 post by a patron on the Library Journal Insider blog illustrates the frustrations users are still experiencing with KCLS’s system:

The problems with this system are far deeper than the question of access. For example, the login process ties up the user’s browser until login is complete . . . The results are often random and irrelevant . . . Magazines can no longer be requested online—they must be requested in person at the library by a librarian. There is no information on how many holds are on an item until after it is requested. When the site should update, i.e. after renewals or hold cancellations, it doesn’t do so for quite some time. I can’t be more specific because the period is inconsistent as are most aspects of this system . . . Seattle [Public Library], despite being larger (by volume count) manages to maintain and upgrade its catalog and to provide far more features than King County. For example, from the item page on the SPL catalog, one can do related web searches, read several different reviews (including Amazon), and see the cover enlarged without having to go off-site. This is what a modern online catalog should be able to do at a minimum. While I understand the appeal of open source software, Evergreen doesn’t seem ready for prime time. If King County residents are going to be beta testers for this software, maybe the library should offer us an option. I don’t like the idea of my tax dollars going to pay for a system that is unusable.⁹²

The lack of the full functionality of proprietary systems is one of the major impediments to wider implementation of open source ILSs in libraries. Law libraries may be leery of the possibility of losing module functionality and their system not working properly for an indefinite amount of time while they devote countless resources to upgrades and fixes.

Attention: Trailblazers Needed

Because entities using open source software agree to publish updates they create, it may be wise for some law libraries to wait until other law libraries with fewer budget constraints implement open source ILSs and work out the kinks. Columbia Law School’s Arthur W. Diamond Law Library recently hired a Systems and Digital Resources Librarian whose primary duties include “the

⁹¹ *Id.*

⁹² David Rapp, *King County Goes Live with Customized Evergreen ILS*, LIBR. J. INSIDER (Oct. 4, 2010), <http://blog.libraryjournal.com/ljinsider/2010/10/04/king-county-goes-live-with-customized-evergreen-ils/>

selection, migration, and implementation of a new, preferably open source, library system.”⁹³

If Columbia or another law library is willing to take the first step by implementing and updating an open source ILS for use by academic law libraries, it may behoove law libraries with more constrained budgets to wait. The viability and functionality of the chosen open source ILS would then no longer be undetermined and risky for institutions that cannot afford implementing an ineffective system. Breeding points out that libraries “considering ILS replacements are holding off, hoping better options will emerge soon, especially on the open source front.”⁹⁴ That better option may be in the form of a system that has already been implemented, upgraded, and tweaked by a law library.

Comparison Considerations

When deciding whether to maintain a proprietary ILS or migrate to an open source ILS, a law library should consider many factors, including institutional priorities, e.g. cost versus stability. A comprehensive cost-benefit analysis of the different integrated library systems, proprietary and open source, should include:

- Licensing⁹⁵
- Recurring fees, such as maintenance⁹⁶
- Personnel costs for development and maintenance cycles⁹⁷
- Amount and time of additional *development* required for missing features⁹⁸
- Amount and time of *workarounds* required for missing features⁹⁹
- The benefit of contributing to the support community¹⁰⁰
- The “lock in” aspect of committing to a proprietary model¹⁰¹
- The ease with which one can (or can't) migrate to a new platform, if necessary¹⁰²

Whether to stick with a proprietary integrated library system or switch to an open source integrated library system is not the only question law libraries now face when looking at IT operation costs to help trim the fat. After an ILS software

⁹³ Although the original posting no longer exists on Columbia’s website, it can be found through the New Jersey Chapter of the Special Libraries Association’s website at <http://sla-divisions.typepad.com/njslajobs/2010/09/systems-and-digital-resources-librarian-new-york.html>

⁹⁴ Marshall Breeding, *Automation Systems Marketplace 2008: Opportunity out of Turmoil*, LIBR. J., April 1, 2008, at 32, 38

⁹⁵ Colford, *supra* note 55, at 13

⁹⁶ *Id.*

⁹⁷ *Id.*

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ *Id.*

¹⁰¹ *Id.*

¹⁰² *Id.*

format has been chosen, whether proprietary or open source, the next possible cost-savings may come from decisions about hardware and software hosting. Should we stay grounded, or should we reach for the sky [clouds]?

Cloudy with a Chance?

It has long been the norm for institutions to buy their own servers and hardware to host in-house and build their own infrastructure.¹⁰³ Doing so requires purchasing servers and software, allocating physical space for the equipment, installing the hardware and software, ensuring storage and back-ups, and uninterruptible power supplies.¹⁰⁴ In turn, in-house IT personnel are required to perform these tasks.

The capital and recurrent costs to hire and maintain IT staff and possibly outsource IT maintenance contracts can be prohibitive for an organization,¹⁰⁵ especially for those forced to cut budgets in the current economic climate. Understandably, cloud computing has become a very attractive option to organizations who would prefer to concentrate more of their focus and funds on their core mission instead of IT issues. Organizations must understand what cloud computing is and weigh the benefits and risks associated with releasing their operations into the cloud.

What is Cloud Computing?

The National Institute of Standards and Technology (NIST) defines cloud computing as “a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction.”¹⁰⁶ In plain English, cloud computing means that processing and storage of data “happens on computing platforms run by third parties (such as Google, Yahoo, Amazon, etc.)”¹⁰⁷ instead of on traditional in-house computers or servers. The software and hardware may be accessed remotely over the Internet “in a virtualized form.”¹⁰⁸

Cloud services can include data storage, known as *Cloud Infrastructure as a Service* (IaaS); application deployment, known as *Cloud Platform as a Service*

¹⁰³ Bay Arinze & Murugan Ananadarajan, *Factors that Determine the Adoption of Cloud Computing: A Global Perspective*, INT’L J. OF ENTERPRISE INFO. SYS., Oct. – Dec. 2010, at 55, 59

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

¹⁰⁶ Peter Mell & Tim Grance, *Effectively and Securely Using the Cloud Computing Paradigm*, NAT’L INST. OF STANDARDS & TECH., <http://csrc.nist.gov/groups/SNS/cloud-computing/> (last visited Apr. 1, 2011). A PowerPoint presentation created by the authors is linked to the NSIT website.

¹⁰⁷ David Navetta, *Legal Implications of Cloud Computing*, informationlawgroup.com, <http://www.infolawgroup.com/2009/08/tags/security/legal-implications-of-cloud-computing-part-one-the-basics-and-framing-the-issues/> (last visited May 1, 2011)

¹⁰⁸ Arinze & Ananadarajan, *supra* note 104, at 55

(PaaS); and software hosting, known as *Cloud Software as a Service* (SaaS).¹⁰⁹ NIST provides a good, succinct explanation for how each of these works:

Cloud Infrastructure as a Service (IaaS)

- Clients have access to processing, storage, bandwidth, and other fundamental computing resources.¹¹⁰

Cloud Platform as a Service (PaaS)

- Allows clients to deploy their applications to a cloud and run them on the provider’s infrastructure¹¹¹

Cloud Software as a Service (SaaS)

- Clients use the provider’s applications over a network, usually through licensing agreements¹¹²

Benefits

Cloud computing services provide distinct benefits over the traditional “bricks and mortar” approach to locally hosting services on in-house servers. Among those benefits are cost-savings realized through decreased need for personnel and hardware, back-ups through redundancy, reliability through quicker disaster recovery times, energy savings, and easier upgrading.

Cost-Savings

Probably the strongest argument for converting to cloud computing revolves around the cost-savings. Such savings may be realized because libraries would no longer need to “purchase their own infrastructure or software . . . hire people to maintain it . . . [nor] regularly upgrade when necessary.”¹¹³ In-house hosting includes expenses for the hardware; servicing of that hardware; personnel salary and benefits for system administrators; and facilities for the hardware and personnel.¹¹⁴

Depending on the agreed level of service, the cloud vendor can handle infrastructure, maintenance, and upgrades. There is no longer a need for a dedicated IT department. Because cloud providers aggregate server usage across many clients, they are more efficient and, thus, cheaper than in-house servicing. Funds once allocated to salaries, warranties, and maintenance contracts may be reallocated elsewhere.

¹⁰⁹ Navetta, *supra* note 108

¹¹⁰ Mell & Grance, *supra* note 107

¹¹¹ *Id.*

¹¹² *Id.*

¹¹³ Navetta, *supra* note 108

¹¹⁴ Breeding, *supra* note 25

Cloud computing is also cheaper and more scalable because law libraries would no longer need to keep extra server capacity for busier usage times, such as the end of the school term; the cloud essentially provides capacity-on-demand.¹¹⁵ By maximizing server operations through shared cloud computing, less power used also translates into cost-savings for organizations.¹¹⁶

Reliability & Continuity

By using a cloud provider for infrastructure, data storage, and application hosting, law libraries could also ensure redundancy, quicker disaster recovery, and continuity in case of a site failure.¹¹⁷ Because computing resources are distributed and hardware is divorced from applications, single server failure would hardly affect cloud services.¹¹⁸ Recovery time through the cloud could be unnoticeable, whereas recovery time from an in-house system failure could be quite lengthy.

Going green

A “green” incentive may also exist in converting to the cloud.¹¹⁹ Fewer machines are used because servers are shared through cloud computing.¹²⁰ The NIST estimates that the number of servers in U.S. data centers doubled from 2001 to 2006, and their power consumption quadrupled during that period.¹²¹ The NIST also notes “Most servers in traditional data centers operate at only 15% of capacity, yet those data centers consume 1.5% of all electricity generated in the United States.”¹²² Server operation efficiency can be maximized through shared cloud computing, and, thus, decrease needless power consumption.¹²³

Easier Upgrading

Another advantage of utilizing cloud computing is that law library systems could be upgraded much more easily.¹²⁴ Traditional in-house servers often require entire rebuilds of infrastructure in order to upgrade.¹²⁵ The NSIT refers to this as “increased agility in software deployment.”¹²⁶ This also translates into cost-savings in the form of saved labor from no longer having to perform such time-consuming tasks. Upgrades can be more efficiently implemented by IT staff of the cloud computing provider.

¹¹⁵ Navetta, *supra* note 108

¹¹⁶ Mell & Grance, *supra* note 107

¹¹⁷ Kim-Kwang Raymond Choo, *Cloud Computing: Challenges and Future Directions*, TRENDS & ISSUES IN CRIME & CRIM. JUST., Oct. 2010, at 1, 2.

¹¹⁸ Arinze & Ananadarajan, *supra* note 104, at 61

¹¹⁹ *What We’re Watching in . . . Cloud Computing*, HARV. BUS. REV., June 2010, at 24, 26

¹²⁰ *Id.*

¹²¹ *Id.*

¹²² *Id.*

¹²³ *Id.*

¹²⁴ Navetta, *supra* note 108

¹²⁵ *Id.*

¹²⁶ Mell & Grance, *supra* note 107

Risks

Although cloud computing proponents tout the many benefits of using the service, risks also exist. Several of the risks stand in stark opposition to argued benefits, including cost-savings, reliability, continuity, and security.

Security

Undoubtedly, the major concern with utilizing cloud services is security. It may be possible that data can be stolen utilizing a side-channel attack.¹²⁷ Another concern is malware “designed to infect both client and server machines in cloud services.”¹²⁸ Lower control over security by handing your data over to a provider could also lead to less scrupulous providers mining that data to sell to other companies, such as marketing companies or companies driven by more nefarious purposes.¹²⁹

Long-Term Costs

Although cloud-based services may initially be cheaper than in-house servicing, the increase in data transfer costs could increase exponentially if service needs grow over time.¹³⁰ If organizations continue to trend towards shifting their data to the cloud, what is to prevent cloud providers controlling the server farms from hiking their prices?

No Set Standards

Another potential problem with cloud computing is the lack of ethical standards for information professionals and the cloud computing industry in

¹²⁷ Larry Hardesty, *Secure Computers aren't so Secure*, physorg.com, <http://www.physorg.com/news176107396.html> (last visited Apr. 1, 2011). Computer scientists from UC San Diego and MIT examined the popular AmazonEC2 service and were able to load eavesdropping software they had created onto the same servers that were hosting websites they had targeted in advance. This allowed them to use cache monitoring to try to steal secrets. Although law libraries may not deal with information traditionally considered highly sensitive, there is a need to secure accounting information, patron records, etc. Although relatively expensive depending on the password structure, it may also be possible to abuse cloud computing services to launch brute force attacks, which crack passwords and “could have broad implications for systems using password-based authentication.

¹²⁸ Choo, *supra* note 118, at 3. Malware comes in many forms with varying consequences. VM-based rootkits can be used to gain full control of underlying operating systems without being detected. Bot malware can infect a cloud and then infect machines and turn them into “zombies” to be used as remote attack tools. Cyber criminals could potentially use cloud services to carry out large-scale denial-of-service attacks, which would render the law library’s site useless to patrons and administrators.

¹²⁹ *Id.* at 4.

¹³⁰ Harvard Business Review, *supra* note 120, at 28. Although this example was based on a hypothetical retail website converting from in-house website hosting to cloud computing and on the assumption that website traffic would increase over two years and require more processing power, I think the same concept would apply to libraries. They may contract for an initial plan but then require more data transfer if student usage increases or if more in-house data or physical items need to be catalogued and transferred to the cloud.

general.¹³¹ The NIST is currently promoting the adoption of government and industry cloud standards to address security concerns,¹³² but policy-making in the technological arena typically lags well behind rapid advancement.

Continuity & Reliability

Because the library would be dependent on the Internet to access information through the cloud, business continuity could be affected by Internet service disruption.¹³³ Warranted law enforcement seizure of servers hosting data not related to criminal activity but located on the same physical machine could cause serious disruption as well.¹³⁴ Such possible seizures also raise concerns about unauthorized access and disclosure of data incidentally residing on seized machines.¹³⁵

For example, a 2009 Network World article tells the story of Liquid Motors effectively being shut down after their operational data was seized during an FBI raid of a Dallas data center.¹³⁶ Although the FBI seizure of the servers was warranted, Liquid Motors and dozens of other companies were incidental casualties because their data happened to reside on the same server as the company being investigated for fraud.¹³⁷ Liquid Motors filed suit to recover their data, but the court denied their request.¹³⁸ They were only able to become operational again once the FBI offered to make them a copy of their data on a blank tape.¹³⁹ Although the title of the Network World article suggests this is a rare occurrence, how rare will it remain as more and more data is shifted to the cloud and servers shared? As James Urquhart, a market strategist for cloud computing at Cisco Systems, notes on his blog:

The issue, I think, is one of how search and seizure laws are being interpreted for assets hosted in third-party facilities. If the court upholds that servers can be seized despite no direct warrants being served on the owners of those servers (or the owners of the software and data housed on those servers), then imagine what that means for hosting your business in a cloud shared by thousands or millions of other users.¹⁴⁰

¹³¹ Mell & Grance, *supra* note 107

¹³² *Id.*

¹³³ Choo, *supra* note 118, at 3

¹³⁴ *Id.*

¹³⁵ *Id.*

¹³⁶ Robert Lemos, *When the FBI Raids a Data Center: A Rare Danger*, NETWORK WORLD, Apr. 22, 2009, <http://www.networkworld.com/news/2009/042209-when-the-fbi-raids-a.html>

¹³⁷ *Id.*

¹³⁸ *Id.*

¹³⁹ *Id.*

¹⁴⁰ James Urquhart, *FBI Seizures Highlight Law as Cloud Impediment*, THE WISDOM OF THE CLOUDS (Apr. 16, 2009, 8:01 PM), http://news.cnet.com/8301-19413_3-10220786-240.html

Another risk to continuity could be the level of service priority.¹⁴¹ If the capacity of the cloud is constrained during times of high usage, a client's level of continuity may be decreased based upon their cloud fee and usage.¹⁴² A related concern is whether or not cloud providers will adequately upgrade their farms as demand for their services increases.

Insider Access

According to the Cloud Security Alliance, providers often are not transparent about their screening practices for employees and what protocols have been established regarding employee access/restriction to data.¹⁴³ Again, access granted to the wrong people could lead to data mining and/or disclosure of confidential data.¹⁴⁴

Stability of Cloud Vendor

Instability of the chosen cloud provider could prove to have dire consequences. There are some important questions to consider. If a provider goes out of business or is bought by another company, will your data be secure? Will you be able to recover it? What happens to your system if you cannot recover your data, or if you cannot recover your data in a timely manner?

For example, in 2008, the cloud vendor Linkup lost most of its customers' data after its system crashed.¹⁴⁵ Their 20,000 customers were left with no recourse when the company went out of business soon thereafter.¹⁴⁶

What You Need to Know if You Move to the Cloud

Even if your library decides to move servicing to the cloud, you will not want to cut your entire IT department. Although positions overseeing the technical aspects involved in infrastructure, maintenance, and upgrades will no longer serve a purpose, you will still need someone on staff well-versed in IT to handle contracting, licensing, and directing what services your library desires from the cloud vendor and the changes and upgrades to your software and systems you will want, including your ILS. Even if your library opts to use the same vendor to handle both cloud services and your ILS, it is still crucial to have someone knowledgeable on staff to handle implementation, service agreements, fee negotiations, and quality control.

¹⁴¹ Ross Tisnovsky, *Risks Versus Value in Outsourced Cloud Computing*, FIN. EXECUTIVE, Nov. 2010, at 1

¹⁴² *Id.*

¹⁴³ Cloud Security Alliance, *Top Threats to Cloud Computing*, cloudsecurityalliance.com, <https://cloudsecurityalliance.org/topthreats/csathreats.v1.0.pdf> (last visited Apr. 1, 2011). This is a presentation created by the Alliance and linked on their website.

¹⁴⁴ *Id.*

¹⁴⁵ Arinze & Ananadarajan, *supra* note 104, at 61

¹⁴⁶ *Id.*

Due Diligence

It is important that a law library conduct due diligence about cloud service providers before determining to which one they will be handing over all of their data.¹⁴⁷ In her November 2010 article in Risk Management, Lori Widmer suggests carefully examining security, customer support, and corporate integrity when choosing a cloud service provider.¹⁴⁸

Reliable providers will have proactive security protocols intact, including monitoring, processes to limit exposure to threats, swift reaction times, and multiple layers to protect data.¹⁴⁹ A sound vendor will provide customer support 24/7/365 and “zero-hour response time” to any security threats a client may face.¹⁵⁰ Access to support and response teams will be critical to libraries operating with skeletal IT resources because their operations now exist on the cloud.¹⁵¹ When assessing the integrity of cloud providers, you should contact other organizations using cloud services, access public records, read financial reports, and inspecting audit and incident reports.¹⁵² Independent auditing could also signal that a provider is a good candidate for your business.¹⁵³

Service Level Agreements

After choosing a cloud computing vendor, a law library should negotiate a well-defined service level agreement (SLA) specifying guarantees about service and areas of concern. Doing so will address many of the concerns and allay the fears of switching to cloud computing. An SLA should, at a minimum, contain provisions for level of security, level of service availability, rates of service, and agreed service level.¹⁵⁴ There are several important terms a library should insist on being well-defined in an SLA, including, but not limited to:

- Data availability if a provider goes out of business or is bought¹⁵⁵
- Specification of human resources requirements when hiring¹⁵⁶
- Required transparency of security and management practices¹⁵⁷
- Protocols for security breaches¹⁵⁸
- Specification of provider back-up and redundancy strategies¹⁵⁹
- Partial or full disclosure of infrastructure details related to security¹⁶⁰

¹⁴⁷ Choo, *supra* note 118, at 4

¹⁴⁸ Lori Widmer, *The Cloud and Your Data*, RISK MGMT., Nov. 2010, at 36, 40.

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

¹⁵² *Id.*

¹⁵³ *Id.*

¹⁵⁴ Choo, *supra* note 118

¹⁵⁵ Tisnovsky, *supra* note 142

¹⁵⁶ Cloud Security Alliance, *supra* note 144

¹⁵⁷ *Id.*

¹⁵⁸ *Id.*

¹⁵⁹ *Id.* at 12

¹⁶⁰ *Id.* at 14

- What will happen if service goes down¹⁶¹
- If there are secondary clouds in case a cloud goes down¹⁶²
- Whether or not data is backed-up in case a server goes down¹⁶³
- What will happen if cloud network connectivity goes down¹⁶⁴
- If redundancy in place to address cloud network connectivity issues¹⁶⁵

Conclusion

Ultimately, a law library's decision to stick with a proprietary ILS or migrate to an open source ILS may have less to do with cost and more to do with the desired qualities and advantages the deciding library seeks. Although the hidden costs associated with implementing an open source ILS may not save money in the long run, some institutions may give greater priority to the flexibility and customizability it can provide. Other institutions may prefer to maintain a proprietary ILS with a vendor with whom they have a good relationship. They may give greater priority to the stability and functionality a good product can provide, especially if vendors continue to make improvements.

The same can be said for a library's decision whether or not to institute a cloud computing servicing model. That decision may have more to do with an institution's needs than strictly costs. If a library feels that the stability and continuity risks of cloud computing outweigh the financial benefits, moving services to the cloud is not the right decision for them. However, some libraries may decide that the risks are no greater than those to which they are already susceptible using local hosting and that the financial gains far outweigh such risks. In the latter example, that library should seriously consider cloud computing services. Caveat emptor though. When moving services to the cloud, the most important steps a library can take to minimize the risks are thorough research and savvy contract negotiations laying out as much detail as possible.

No matter what decisions a law library makes regarding open source ILSs and/or cloud computing, staying informed about the different options now available is wise. These new technologies will likely improve, providing even more alternatives and forcing traditional vendors to rethink their strategies and products. At a minimum, understanding the possibilities these alternative technologies can provide can give law libraries more bargaining power when dealing with traditional vendors.

¹⁶¹ Arinze & Ananadarajan, *supra* note 104, at 61

¹⁶² *Id.*

¹⁶³ *Id.*

¹⁶⁴ *Id.*

¹⁶⁵ *Id.*