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Smarter Libraries Through Technology: Community Source at the Crossroads

By Marshall Breeding

Though a smaller number of library technology products are available today compared to a decade or two ago, the business and development models span a wider range. In the past, more companies were offering more products, but often with little differentiation. Each of the different approaches in play today seems to offer advantages and disadvantages, which will be validated over time.

A quick review of some of the major products highlights these differences:

- OCLC, a nonprofit membership organization, has developed WorldShare Management Services and WorldCat Discovery Services as a multi-tenant platform based on proprietary software. Interestingly, OCLC also owns for-profit companies, mostly in Europe, that offer traditional integrated library systems.
- Ex Libris, a private, for-profit company owned by a private equity firm, offers Alma and Primo Central as multi-tenant platforms based on proprietary software.
- Innovative Interfaces, a private, for-profit company owned by a pair of private equity firms' offers Sierra as its new-generation library services platform, primarily deployed as a server-oriented system, evolving toward a multi-tenant architecture, based on proprietary software.
- SirsiDynix, a private, for-profit company owned by a private equity firm, offers a hybrid model that includes its new BLUEcloud Suite of services deployed in a multi-tenant platform that interoperates with its Horizon and Symphony ILS products, created as server-oriented, proprietary applications.
- Evergreen, an open source integrated library system, is developed and supported primarily through Equinox Software, Inc, a for-profit company that has recently developed a proprietary hosting platform called Sequoia.
- Koha, an open source integrated library system, is developed and supported through a diverse international community of developers, including both nonprofit and for-profit companies. In the United States, the vast majority of its implementations in libraries are supported through for-profit companies, such as ByWater Solutions.
- ProQuest, a large diversified private company involved in publishing content in addition to providing library management and discovery tools is developing Intota as a multi-tenant platform based on proprietary software.
- Auto-Graphics, a publicly held company, offers VERSO as Web-based single-tenant system based on proprietary software.
- Equinox, a small private company,

IN THIS ISSUE

Kuali OLE Now in Production
PAGE 2

Kuali Shifts to a Commercial Business Model
PAGE 4

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offers Apollo, a web-based, multi-tenant platform based on proprietary software.

In addition, another set of middle-sized and smaller companies offer other proprietary integrated library systems, most developed as server-oriented products rather than multi-tenant platforms. Note that even though the product or platform itself may be proprietary, almost all make use of open source software internally. Most, if not all, also offer some degree of openness through application programming interfaces (APIs), providing programmatic access to their data and functionality.

These examples illustrate an interesting matrix of software licenses and business models. Many for-profit companies participate in the ecosystem of open source development, just as nonprofits can produce proprietary software.

The mix of business models and software licenses became a bit more complicated in recent weeks due to changes announced with the Kuali set of business applications for higher education. For the last decade, Kuali projects have been governed through a nonprofit foundation acting on behalf of its membership, composed primarily of educational institutions. The Kuali OLE project to develop a new generation library management system was the most recent addition to that initiative. In recent news, a for-profit commercial entity has been established to take the Kuali applications forward in a more aggressive and ambitious manner. This month's issue of *Smart Libraries Newsletter* covers the initial success of Kuali OLE in its first two production deployments in the libraries of Lehigh University and the University of Chicago. I'll also explore the implications of the changes underway at the Kuali Foundation and the impact on Kuali OLE.

Kuali OLE Now in Production

Kuali OLE has been the subject of attention in the library arena, anticipating an open source alternative to proprietary products offered by commercial companies. The Kuali OLE project crossed an important milestone as the libraries of two institutions have placed the software into production. The University of Chicago and Lehigh University have gone live on Kuali OLE version 1.5, displacing their incumbent integrated library systems. These installations both have centered on functionality related to managing print materials, with management of electronic resources planned through subsequent versions of Kuali OLE.

Lehigh University

Lehigh University, a private university located in Bethlehem, PA with a collection of just over a million volumes, became the first library to place Kuali OLE into production on August 4, 2014. The library migrated from a SirsiDynix Symphony ILS, which had been in place since 1994. According to Chulin Meng, director of library technology for Lehigh University, the implementation of Kuali OLE went relatively smoothly, with all data successfully migrated into the new system. Lehigh implemented Version 1.5 of Kuali OLE, which primarily focuses on the management of print materials. The library plans to implement version 2.0, with additional functionality for electronic resource management and the GOKb e-resource knowledge base in the first quarter of 2015.

Meng reported that the system has performed well in terms of response times for circulation or for staff-oriented tasks. The library has not seen any backlogs of patrons at the circulation desk as a result of the migration.

The library has been working with Kuali OLE 1.5 since the beginning of 2014, testing data loads and training library personnel. Lehigh has implemented the Kuali OLE software, including the underlying MySQL database, on a single server with an 8-core processor and 32 GB of memory. A separate server supports its VuFind discovery interface and the library website.

Kuali OLE provides some functionality that Lehigh had not been able to accomplish with its SirsiDynix Symphony ILS. Acquisitions personnel are now able to load electronic order records from vendors, such as YBP, through EDI. Testing of loading invoices with EBSCO is currently underway. While this capability was available in Symphony, it was an optional, added-cost module. Another advantage is more effective tracking of materials routed across campus library locations. The Symphony ILS was initially configured as a single library, an implementation decision which limited its ability to track in-transit materials. Kuali OLE is being used for serials check-in and for managing the binding of periodicals.

The library has begun to prepare to use Kuali OLE for the management of its electronic resources. E-holdings records were created in the migration process in preparation for the electronic resource management capabilities expected in Kuali OLE v. 2.0. Lehigh University has not previously used an electronic resource management system, but has implemented the SFX link resolver from Ex Libris. The library plans to continue

the use of SFX because Kuali OLE does not provide link resolution services for discovery interfaces.

The implementation of Kuali OLE was essentially transparent for the patrons of the library. Lehigh had implemented VuFind as its discovery interface in 2011. Although switching to Kuali OLE as its production system involved some reconfiguration of VuFind, its overall appearance and functionality remained unchanged. Some performance problems were initially present in some patron look-up functions and in the processing of interlibrary loan requests managed through the Relais ILL system. These issues are expected to be resolved in the next minor release.

The key area in which Lehigh expects to see benefits and efficiencies from Kuali OLE is better interoperability with other campus systems. The library expects more dynamic management of patron-data between the Kuali OLE and its Oracle identity management system, with the ability to push records in real time rather than the batch processes used previously. Work is also underway to investigate the ability to exchange invoices and other financial data between Kuali OLE and the university's Banner ERP system.

University of Chicago

The University of Chicago Library placed the Kuali OLE software into production on August 20, 2014. A member of the Association of Research Libraries with a collections exceeding 11 million volumes, it is the ninth largest research library in North America. The successful use of Kuali OLE will help to validate the functionality of the software and its ability to scale to meet the needs of a very large and complex library.

Kuali OLE replaces two existing systems: a SirsiDynix Horizon ILS, in place since 1995 and used for cataloging and circulation; and a Millennium ILS used to manage acquisitions. The University of Chicago Library has also introduced a new discovery environment, licensing EBSCO Discovery Service for article-level access to its electronic resources. The library previously provided access to its collections through two options: the HIP online catalog module associated with Horizon; and a discovery interface, branded as LENS, based on AquaBrowser, initially implemented in 2007. Adding to the complexity, the automated storage retrieval system in the new Joe and Rika Mansueto Library also requires integration into the automation and discovery environment.

According to Frances McNamara, Director, Integrated Library Systems and Administrative and Desktop Systems, migration of from the two separate systems added to the complexity. The Horizon and Millennium Acquisitions systems were not automatically synchronized, other than to have bibliographic records transferred in batch as they moved out of acquisitions. With the implementation of Kuali OLE, the library will benefit from acquisitions and other resource management functions coming from a unified platform.

In the weeks leading up to placing Kuali OLE into production, the operations were halted on Horizon and Millennium Acquisitions. The legacy systems will continue to run in read-only mode through the end of the year for any additional reporting or reference that may be needed in support of database cleanup and other typical post-migration tasks.

Kuali OLE does not include a discovery layer, instead focusing on providing APIs to support any patron-facing interface the library chooses to implement. The University of Chicago has developed a custom discovery environment using VuFind. The discovery environment requires interoperability for patron account functions and status or availability of materials from the back-end resource management system. The library's 11 million bibliographic records, now managed through Kuali OLE, are exported for indexing in the SOLR component of VuFind. The University of Chicago initially implemented ILS interoperability for VuFind with Horizon, shifting to Kuali OLE as it became the production system. A public beta version of the VuFind-based interface has been available since February 2014. Full production coincided with the launch of Kuali OLE, when both the LENS and HIP interfaces were decommissioned.

The primary developer for VuFind, Villanova University is also is on track to implement Kuali OLE. David Lacey, part of the VuFind development team at Villanova University, created the connector component between the two systems, enabling patron and item interactions.

EBSCO Information Services serves as a Kuali Commercial Affiliate, specifically in support of scenarios like at the University of Chicago, integrating EBSCO Discovery Service (EDS) with Kuali OLE. The University of Chicago opted to use VuFind as the discovery interface, operating with Kuali OLE for print materials and with EDS article-level access to electronic resources.

Version 1.5 of Kuali OLE does not yet include full functionality for the management of electronic resources, which is anticipated for version 2.0, currently under development and in quality assurance. Version 2.0 will include integration with the Global Open Knowledge Base (GOKb), which provides a collaboratively populated resource describing holdings associated with electronic resources packages. The University of Chicago does not currently have an electronic resources management system, using local databases and other means to track the details related to subscriptions. According to McNamara, the University of Chicago libaries currently use SFX as its link resolver, and will continue to do so, even following the imple-

mentation of Kuali OLE 2.0 and its integration with the GOKb knowledgebase. The scope of Kuali OLE does not include the functionality to provide link resolution for discovery services.

The initial implementation of Kuali OLE at the University of Chicago revealed some issues with performance that require improvement to be addressed through both faster hardware and changes to the software. Some tasks involving patron records, for example, were initially programmed to retrieve all items currently charged, which can result in significant delays for those with hundreds of active loans. It is not unexpected to uncover issues in the initial large-scale implementation of a major software platform. McNamara mentioned that fixes to these issues have programmed into the versions that will be implemented prior to the beginning of the new term on September 29.

McNamara considers the implementation of Kuali OLE a success. With the basic migration complete, additional work remains, such as addressing some of the inevitable problems and catching up with tasks deferred during the transition.

Other Deployments Underway or Planned

The production use of Kuali OLE represents but the first steps in moving the system from development into its implementation phase. According to Bruce Taggart, Vice Provost for Library and Technology Services Lehigh University and Chair of the Kuali OLE board of directors, the Bloomsbury consortium in the United Kingdom currently plans to place the software into use by the end of 2014. The remaining investing partners will be shifting to the software through 2015 and 2016, depending on planning and timing issues for each institution.

While the first two production sites for Kuali OLE represent a major breakthrough, many challenges remain. These two implementations primarily exercise functionality related to the management of print resources, not unlike what is currently provided through a conventional integrated library system. With version 2, the scope expands to management to electronic resources, including integration of the Global Open Knowledge base. Success with those touchstones would validate the software as part of the field of new library services platforms.

Kuali Shifts to a Commercial Business Model

Kuali, a group of projects until now governed by a nonprofit foundation, is making a major change, establishing a commercial company to play a dominant role in the development and deployment of its software products. The software will continue to be offered as open source. While many of the details have yet to be determined, the wheels seem to be in motion moving Kuali away from its established community source governance model. Kuali includes a variety of projects, each with their own histories, funding sources, and development trajectories.

This new strategy emerged out of two workshops held in June and July 2014, conducted with stakeholders by the Kuali Foundation board of directors, with more than 100 participants representing 22 of the 59 institutions that have implemented one of the Kuali software products. The proposed shift to a commercial business model came from these sessions, and it was approved at a two-day meeting of the Kuali Foundation board of directors in Chicago. Brad Wheeler, chair of the Kuali Foundation board of directors, announced the decision in a blog post dated August 22, 2014. The change in business model, according to the Wheeler's statement, aims to accelerate the pace of development, to unify the now separate Kuali products into an integrated suite, and to provide more sustainability for the project. An additional concern lies in the need to reengineer the Kuali applications into a multi-tenant platform better suited for deployment through software as a service.

The changes afoot for the broader Kuali organization will have lesser--or at least delayed impact--for Kuali OLE. This project stands apart in many ways from the others through its later entry into the Kuali fold, its ongoing funding through the Andrew W. Mellon Foundation, and other factors. Initial information indicates that these events unfolding in the broader arena of Kuali project will not alter the development of Kuali OLE. The new Kuali commercial entity may offer alternative options for hosting and other services currently planned or underway with other commercial affiliates. Other Kuali projects compete with commercial products with price tags of tens of millions of dollars. Many of their critical concerns may not apply in the same way to Kuali OLE, which is a minor component of a university's broader business infrastructure, though it is a major investment for a library

Initial Decade of Nonprofit Community Source Development

The various Kuali projects have emerged through collaborative processes to create open source software by and for groups of higher educational institutions. Its software applications have until now been managed primarily through a nonprofit foun-

dation representing the consortia of universities that provide funding and other resources for each project. In addition to oversight and governance, the Kuali Foundation has provided project coordination, legal assistance, and many other support services necessary to complex software development projects. The foundation has attracted grant funding, raised funds through membership dues, and coordinated the contribution of resources from its member institutions. The precursor to Kuali began in September 2004, when Indiana University and the University of Hawaii began the development of a new financial system that they planned to make available as open source software. Subsequently additional Kuali projects have been launched to address other key administrative functions within higher education. The Kuali Foundation oversees a number of major business applications for higher education, including:

- Kuali Financial System
- Kuali Student
- Kuali Human Resources
- Kuali Coeus (research management support)
- Kuali OLE (Open Library Environment)

These applications make use of a common package of technical infrastructure or middleware, called Kuali Rice, which provides many of the lower-level components needed to support a services-oriented business application. Kuali Rice allows the developers to focus on higher-level functionality and avoid redundant efforts in the creation of the basic services that support enterprise-level business applications.

Community Source

The Kuali model of cooperative development of open source software is generally called community source. The software conforms to an open source license, meaning that its source code can be downloaded, modified, and redistributed, with slightly varying terms depending on the specific license applied. Kuali software adheres to the Educational Community License, version 2.0. In the community source model, a group of interested organizations pool their resources and directly participate in decision making and other governance issues of the software project. The model places control of the software within the specific community that funds its development. Following development within a defined community, the software is released as open source, available for use by other institutions. With complex enterprise software, most institutions that subsequently adopt the software will opt to join the foundation and take advantage of its resources or those of its commercial affiliates. Sakai learning management system is another example of a project following the community source model.

Andrew W. Mellon Foundation

Kuali has received significant funding for many of its projects from the Andrew W. Mellon Foundation, supplementing the financial and in-kind resources contributed by the institutions participating in each project. The Mellon Foundation investments in Kuali projects total $11,524,700, including $4,986,700 for the Kuali OLE and GOKb. When funding the development of software, the Mellon Foundation stipulates that it must be released under an open source license.

The creation of Kuali OLE would have been much less feasible without the major investments made by the Mellon Foundation. According to Donald J. Waters, Senior Program Officer for Scholarly Communications and Information Technology, "The Andrew W. Mellon Foundation is delighted to see the hard work and other investments of the OLE partnership now coming to fruition, as OLE is being brought into production first at Chicago and Lehigh and soon at other members of the partnership."

The Mellon Foundation has also provided funding for other community source projects for higher education and cultural institutions, including the Sakai learning management system (sakaiproject.org), ArchivesSpace (archivesspace.org), CollectionSpace (collectionspace.org), Zotero (www.zotero.org), and Fluid (fluidproject.org).

The Role of Kuali's Commercial Entity

Kuali's new commercial venture was conceived to accelerate development and expand the use of the software beyond the pace of what has been accomplished until now through the community source model.

Though implementation of this shift has been set in motion, only scant details have emerged. The name of the company has not yet been finalized and other information regarding the structure of the company has not yet been announced. Information has been posted on the Kuali 2.0 blog (blog.kuali.org) describing the aspirations of the new company.

Joel Dehlin has been hired as the Chief Executive Officer and co-founder of the Kuali commercial entity. Dehlin comes to Kuali with direct experience in commercially sponsored open source for higher education as well as a lengthy career in technology leadership positions in a variety of organizations including Microsoft and the LDS Church. Dehlin most recently served as Chief Technical Officer for Instructure, the company that produces the Canvas learning management system. Canvas is offered under the AGPLv3 license has been proposed for the Kuali applications following the commercial restructuring. Dehlin resigned from Instructure in July 2014.

Ownership and Investment

The stated purpose for this change lies in producing open source software for higher education with a more aggressive and timely roadmap than would be possible in the nonprofit community source route. The company aims to attract additional investment from other organizations, such as university foundations that support its interest in providing an open source alternative to proprietary business applications for higher education. According to the statement posted by Wheeler, the company will not seek venture capital or make an initial public offering, but will instead rely on investors interested in the long-term outcomes of the company.

With revenues not yet in place to support operations, the new company will initially depend on the resources provided by its initial investors, which include the nonprofit Kuali Foundation. The composition of the board of directors has not yet been made public.

Change to Open Source Software License

To facilitate this commercial strategy, the software for the Kuali applications will be forked and relicensed from the current Educational Community License 2.0 to the Affero General Public License (AFPL). Under the terms of this license software may be downloaded, used, and modified as with the current license, but it requires that modifications be contributed back to the version controlled by the Kuali company. The Kuali 2.0 FAQ states "This is intended to discourage partners/Kuali Commercial Affiliates (KCA's) from receiving revenue from Kuali software, but does not prohibit them." The AFPL license specifically addresses issues that arise in the deployment through software-as-a-service by requiring that the end-users of a hosted service be offered the access to any modifications made in the source code. This provision hampers the ability of other service providers to create derivative versions based on private code that is not shared with the original copyright owner.

Copyrights for Kuali software are held by the Kuali Foundation. The new corporate entity will not have the ability to unilaterally relicense any of the applications; they will need the support of the boards that govern each project. According to a statement from Wheeler, "Each Kuali project will shift to AGPL3 when its project board of investors votes to do so. This will enable two additional streams of investment into the work in addition to the current model: customer revenue for hosting Kuali as SaaS and investment from the corporate entity."

Initial statements indicate that the Kuali commercial company will assume responsibility for the development of the Kuali applications, though parallel development will also be possible in separately funded projects. During its previous phase, software development was performed primarily through in-house programming staff within the institutions participating in the projects or through external contractors. The new Kuali company will assemble its own workforce to continue the development of its portfolio of applications. The Kuali company will be able to perform its development based on the currently released software. The Educational Community License allows the creation of derivative works with the requirement of appropriate notices and copyright attribution.

The new company will offer a variety of services to produce revenue, especially in the provision of hosting services for the Kuali applications. As the AFPL licenses are assigned to individual applications, the Kuali company anticipates becoming the primary provider of hosted services. The company will also offer custom development and other services surrounding the Kuali suite of applications.

Locus of Decision Making and Control

The Kuali commercial entity will enhance the Kuali software or create new applications according to its roadmap and priorities. The executive management team will set priorities for development, naturally in consultation with the board of directors. This top-down control differs from the community source model, where the development agenda is controlled by boards and councils populated by the investing institutions. These boards and councils will continue to exist, exerting influence, but not control, over development priorities.

Institutions may choose to fund additional projects to create modules or functionality related to the Kuali application beyond the development agenda carried out by the Kuali company. These projects could be channeled through the Kuali Foundation, especially if they involve multiple institutions pooling resources. Individual institutions could contract with the Kuali company or other software development firms.

Development Priorities

The current set of applications developed under the umbrella of the Kuali Foundation has demonstrated the potential impact of community source development. While the general approach has seen considerable success, the development time frames have been long, and the level of adoption, modest. Documents and discussion surrounding the change strategy emphasize the pressing need to perform faster and more aggressive development going forward.

Another priority is reengineering the applications for deployment as hosted services. The current slate of Kuali applications have been developed for separate deployment as part of the enterprise-level business infrastructure for each campus.

The creation of a multi-tenant platform for delivering Kuali portfolio applications as hosted services stands out as a priority in the initial Kuali 2.0 messaging.

This enterprise-oriented design does not necessarily lend itself to being offered as a hosted service. Many institutions prefer not to manage hardware platforms and software applications locally, but to license them in the software-as-a-service model.

The current slate of Kuali products operate independently, making no assumptions regarding whether an institution will or will not use the other applications. Another thread of development lies in shaping the Kuali applications so that they can be deployed as an integrated suite addressing a more comprehensive scope of administrative support for an academic institution.

Role of the Kuali Foundation

The Kuali Foundation will continue to exist, though in a diminished role. As a co-founder of the commercial company, the foundation will participate in business strategies and be represented on its board of directors.

The concept of membership of in the Kuali Foundation changes. Previously, member institutions paid significant dues to participate in the governance of the projects. As the locus of control shifts to the commercial companies, institutions may opt to belong to the Kuali Foundation and to provide general support for the initiative. The amount of dues for membership will be restructured accordingly.

Role of Existing Kuali Commercial Affiliates

The Kuali Foundation has fostered commercial service-providers to its various open source applications with installation, integration, hosting, and development. Kuali provides a matrix describing services offered by each of the commercial affiliates for each product (www.kuali.org/kca/services). The relationship between the new Kuali company and the existing commercial affiliates has yet to be determined. One scenario mentioned involves the Kuali company emerging as the primary provider of hosted services, with other commercial affiliates focusing more on installation, training, or development.

Impact on Kuali OLE

Kuali OLE software is overseen by its own board of directors, chaired by Bruce Taggart, Vice Provost for Library and Technology Services Lehigh University. Following a different process than the other Kuali projects, Kuali OLE has established functional councils of subject matter experts drawn from the ranks of the participating libraries, has developed its own funding, and has independently contracted for the software development. As noted above, the Andrew W. Mellon Foundation funding stipulates that the software created will be perpetually available through an open source license.

Kuali OLE has relied almost exclusively on HTC Global Services for software development, and it has also provided project management and quality assurance. HTC has also been involved with other Kuali projects. Kuali OLE has relied on library personnel of the investment partners to serve as subject matter experts, participate in governance, develop functional requirements, and perform testing and other critical functions.

Kuali OLE remains in an active phase of development. Version 1.5 has been recently completed, which has now been implemented in production in two libraries. Version 2.0 is expected in early 2015. Development of the related Global Open Knowledge Base continues as well.

The Kuali company will have the right to perform new development on its fork of the software at its discretion. In practical terms, however, the key priority of new Kuali company clearly lies in the completion of the Student and HR modules. According to Bruce Taggart, Chair of the Board of Directors of Kuali OLE, the change of strategy for the broader Kuali initiative will not disrupt the progress of Kuali OLE.

A large university can invest many tens of millions of dollars in its business systems related to finance, student accounts, and human resources. Investments in systems to support the library tend to be less than one million. The locus for decision making for procurement lies in the library. The technologies that a library acquires to manage its internal processes may need approval by top-level university administrators, but they tend not to control the process.

Some aspects of the library management system do have direct relationships with campus enterprise business systems. In most cases, the acquisition modules of library management systems track library spending with much finer granularity than the campus financial system.

A statement from Taggart emphasizes that the changes broader organization are not expected to have a negative impact on Kuali OLE: "We, and we alone, govern the OLE project including development priorities, long-term strategic planning and project management. We manage the work of our contracted developers. OLE has its own revenue streams and budget that is separate from the general Kuali Foundation budget. We do not expect any of this to change."

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Editor
Marshall Breeding
marshall.breeding@librarytechnology.org
Twitter: @mbreeding

Managing Editor
Patrick Hogan
312-280-3240
phogan@ala.org

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