

An Environmental Scan of Library Technology

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A Selective glossary of library technology terms

APACHE SOLR: This is an open-source search platform. It is widely used because of its impressive speed and scalability. (<https://solr.apache.org/>)

AUTHENTICATION: This is a process used to identify users who are accessing online resources. Authentication has many purposes, but for a library there is one overriding purpose. We need to identify users to ensure that a person using electronic resources is able to do so under the terms of our license with database vendors. Vendor licenses are very specific and vendors can withhold service if they believe a library is not acting in good faith to protect the vendor's intellectual property.

AACR2: American Cataloguing Rules version 2

API: Application programming interfaces (API) are tools to enable separate computer programs to communicate with a programming language. They are software interface, offering one service access to software components of another service. Any software package that meets this standard is said to implement or expose an API. Usually, APIs are used to create customized tools or interfaces. See MIDDLEWARE.

TRU library uses the SirsiDynix Symphony API to create custom scripts to handle patron records exported from Banner or to modify MARC records to be exported to other institutions.

BIBFRAME: Or bibliographic Framework is a model for bibliographic description designed to replace the MARC standards. MARC stores bibliographic information in a single file. BIBFRAME uses linked data, that might be stored on different servers. The Library of Congress is a major proponent of this model.

BOOKMARKLET: a type of bookmark contains JavaScript commands. Bookmarklets add new features to the browser. They can perform a variety of tasks, such as running a search query from selected text or extracting data from a table.

BROWSER EXTENSION: a small software module used to customize a web browser. The modifications might include user interface modifications, cookie management, ad blocking, and the custom scripting and styling of web pages.

CHATBOT: A chatbot is a software tool that uses language processing, decision trees or artificial to understand user questions and automate responses to them, simulating human conversation.

COUNTER 4: a standard used by librarians, publishers, and other content providers for reporting usage statistics for electronic resources in a consistent format.

CONTENT MANAGEMENT SYSTEM (CMS): A web-based system to create, manage, and modify HTML content on a website without the need for technical knowledge of web design or HTML knowledge. CMS systems are easy to use and provide consistency across an organization's web site.

DATABASE: A searchable electronic index of online resources. All databases provide some form of indexing, some may provide access to full text. Library databases typically are provided by a small number of vendors. Some vendors, such as EBSCO or ProQuest, also provide discovery layers, but a database is not a discovery layer.

DISCOVERY SYSTEM: Also called DISCOVERY LAYERS, these are a search engine technology. Intended to supplement or usually replace the ILS OPAC catalog. Most often a module of a particular ILS/LSP or database product, are sold by that product's vendor ie EBSCO Discovery Service. The commercial systems most used are: Summon (Serial Solutions), Primo (ExLibris) EBSCO Discovery Service, and the WorldCat Discovery (OCLC) Discovery Layer. It is important to note what a Discovery System is not. It is not a database, but a search tool and it is not a light version of Google.

DCRM(B): Descriptive Cataloging of Rare Materials (Books) (DCRM(B)) is the international standard for rare books cataloging, created and maintained by the Rare Books and Manuscripts Section (RBMS) of the Association of College and Research Libraries (ACRL).

DUBLIN CORE: or Dublin Core Metadata Element Set (DCMES ISO 15836), is a set of fifteen main metadata items for describing digital or physical resources.

EDI: Electronic Data Interchange is the system to system exchange of document or data.

EDS: The discovery layer used at TRU is called EDS or the EBSCO Discovery Service. This is the primary search tool for TRU's users.

ERM: Electronic resource management systems. These systems are used to help the library keep track of its electronic subscriptions to periodicals and other online resources. ERMs usually contain a database of subscriptions and related information. See SUSHI and Counter.

FACETS: These are properties of information elements. (Such as publication date, language, type of publication, and so on.) Usually derived by analysis of the text or from pre-existing fields in a database such as author, descriptor, language, and format.

FREEMIUM: Freemium is a business model where a basic version of the software is offered for free, but with the choice of paying for use. A free basic plan means the software can be used indefinitely without payment but will be limited in the number of features or capabilities available. Premium or advanced functionality is available to paying customers.

ILL (Interlibrary Loan Service): The TRU library, like most university libraries, can borrow items from other libraries when needed. This service allows our users to access a much greater amount of material than TRU alone has acquired. A piece of software called Relais is used to operate the ILL service. Relais keeps track of items loaned to and borrowed from other libraries.

INTEGRATED LIBRARY SYSTEMS (ILS): Also known as a library management system (LMS). Enterprise software for a library or archives, used to track the status of items, purchases and orders, material budgets, and patron records. An ILS has three parts, a database, software to interact with that database, and user interfaces (one for patrons, one for staff).

ILS software is also used to catalog owned material and facilitate the discovery of those items. An ILS performs the day-to-day tasks that library staff perform. They used to be the single most important application used by a library when libraries primarily collected and circulated print and physical material.

The ILS used at TRU is called SirsiDynix Symphony.

THE INTERNET OF THINGS: The Internet of Things (IoT) describes a system of networked physical devices, vehicles, home appliances, and other items. The IoT allows objects to be sensed or controlled

remotely using existing network infrastructure, allowing more direct integration between the physical world and the internet.

ISO2709: an ISO standard for bibliographic descriptions

KBART: (Knowledge Bases and Related Tools) is an industry standard used by Knowledge Bases and Libraries to find out what eBook and Journal content they licensed and how to link to it.

KNOWLEDGE BASE: A database of owned or subscribed holdings information customized to individual libraries. Used by discovery layers and search engines to limit search results to material accessible by individual institutions.

LAMP / LAMP STACK: The term LAMP refers to four common open source software resources used to build websites and web applications. LAMP is an acronym for the operating system, Linux; the web server, Apache; a database server, MySQL; and the programming language, PHP.

LDAP: Lightweight Directory Access Protocol (LDAP) is an open, industry standard for software that allows the sharing of information about users. A common use of LDAP is to provide a central place to store usernames and passwords. Most departments at TRU use LDAP so that users can login to different pieces of software, such as Moodle or Outlook, without having to remember multiple passwords.

LIBGUIDES: LibGuides, a product from Springshare – an online web services provider. The LibGuides product, is a hosted, content management system almost ubiquitous in libraries in the English-speaking world. The word libguide has become shorthand for a subject, course, or program specific web page attached to a library web site.

LOCAL COLLECTION: A local collection is a group of titles defined by a library and held locally. (The physical items on a shelf.) In another sense a local collection is a file of data that describes the physical collection and informs a discovery layer which titles are included in your collection.

LTI / Learning Tools Interoperability: An educational software technology specification developed to standardize a method for a learning managements system to communicate with external software systems. For example, LTI protocols are used by Springshare to connect with Moodle.

MARC 21: A highly structured text file format used for describing bibliographic information. (<https://www.loc.gov/marc/bibliographic/bdintro.html>)

MARCXML: MARCXML is a Document Type Definition (DTD) describing the MARC 21 format in XML.

MIDDLEWARE: Software that lies between an operating system and applications, or two or more applications. Middleware enables a translation layer, communication and data management for distributed applications, and is usually invisible to end users.

MULTI TENANT ENVIRONMENT: This is a form of SaaS. Multiple clients share an instance of software on a shared server. The instance is often centrally maintained by the vendor, but some consortia host Multi-Tenant Environments as well. (The Sitka consortium <https://bc.libraries.coop/services/sitka/>) multi-tenancy offers is advantageous for the library using a SaaS product because of the economies of scale. For member libraries can share the cost software development, and new features and bug fixes can be rolled out with little or no downtime.

NCIP/SIP/SIP2: is intended to address interoperability between self-service applications and circulation applications. (For example, an ILS and a self-serve checkout kiosk.) The 3M Standard Interchange Protocol (SIP) is the de facto standard interface for self-service applications.

NISO CIRC: (NISO Circulation Interchange Protocol=NCIP 2), a North American standard which allows disparate library systems to communicate

OAI-PMH: Open Archives Initiative Protocol for Metadata Harvesting, a mechanism for repository interoperability. Using OAI-PMH metadata can be shared among separated document repositories.

OCLC (Online Computer Library Center): OCLC provides a single large catalog that list items from hundreds of libraries. The OCLC catalog is important for inter library loans.

ONIX: ONLINE Information eXchange) XML standard metadata formats for use primarily for capturing and communicating bibliographic data relating to books.

OpenURL: OpenURL is a standardized format for describing a resource within a Uniform Resource Locator (URL). OpenURLs allow Internet users to find articles or documents from remote databases. Together with Discovery Layers an OpenURL can make single search sites a reality.

PROGRESSIVE WEB APP / PWA: A Progressive Web Application is a type of application delivered through the internet to a web browser, built using common web technologies including HTML, CSS, JavaScript. A PWA is intended to work on any standards-compliant browser. PWAs provide an experience similar to a platform-specific application.

POSTGRESSQL: PostgreSQL is a free, open-source relational database management system. It is SQL compliant.

PROXY SERVER: Generally, a proxy server is a computer or piece of software that acts as a go-between for users seeking resources from other servers. Specifically, to TRU we use Ezproxy to authenticate users so they can access electronic resources. Without a proxy server all the library's subscription databases and search tools could only be used by people on campus. Any TRU users who use library resources from off campus, such as Open Learning or people doing work at home, must use Ezproxy.

RDA: Resource Description and Access (RDA) is the successor to the cataloging rules, AACR2. RDA completely revamps the structure of the cataloging instructions by closely following the entity-relationship model.

RESPONSIVE DESIGN: Responsive design is a technique of web design, using advanced CSS styling, which causes the interface to adapt to the device's layout. This is especially useful for people accessing web resources on a phone or tablet. Responsiveness allows the web elements to adjust automatically so that elements such as images and videos are resized and repositioned based on the screen size and format.

RFID: Radio Frequency Identification. An RFID system uses a radio receiver and transmitter to activate and read tags. When triggered by an RFID reader device, the tag small emits a unique id number. The reader then passed the unique id onto the ILS. RFID systems can replace optical barcodes and magnetic strips, greatly simplifying the identification and inventory control systems.

RUBY ON RAILS: A very popular, powerful server-side web development framework. This is used to create database web sites. Ruby is available through the MIT open-source license.

SSL CERTIFICATES: SSL (Secure Sockets Layer) certificates are digital files that authenticate the identity of a website and encrypt information sent between servers. They are very widely used to make a secure connection between a user and a web site.

SaaS: Software as a Service. This is also called cloud software. It refers to enterprise software hosted remotely and accessed over an internet connection. The software vendor is entirely responsible for updating the software.

SAML: (Security Assertion Markup Language) A protocol that authenticates users and then passes the authentication information, or token, to another application or server. SAML allows users to gain access to one or more applications or services with only one sign on. See SSO.

SSO: Single sign-on is an authentication technology that allows a user to log in with a single ID to one or more related, yet independent, software systems. To use a TRU specific example a student might login to an SSO system to gain access to full text via the discovery service, but then the SSO system will also grant the user access to the My Folder feature in EDS. Potentially a well configured SSO could allow a student to log in to Moodle, but then have access to full text options in EDS.

SQL / STRUCTURED QUERY LANGUAGE: Structured query language is a common programming language used in relational databases. SQL was adopted by ANSI and ISO standard groups to become a standard "Database Language SQL" language definition.

SRU: Search/Retrieve via URL - is a standard XML-based protocol for search queries, utilizing CQL - Contextual Query Language - a standard syntax for representing queries.

SUSHI: a protocol developed to automate the harvesting of COUNTER reports from SUSHI-compliant providers.

WEB SCALE DISCOVERY: Web-scale discovery systems are tools To search a wide range of local, remote, and subscription content and provide relevance-ranked results. By being able to link to sources of full text in a result list they, ideally, provide a single point of entry to a library collections. See DISCOVERY SYSTEM

Z39.50 : a protocol that allows libraries to search and import library records from remote databases. It is most often used for copying catalog records.

An Environmental Scan of Library Technology

In an interview for the first edition of PC magazine Bill Gates said: "Who cares about what's inside the machine? People are buying a solution, not a computer..." (Bunnell, 1982). Please don't buy a PC, device, or enterprise software and scramble about finding the best way to use it. Technology should be acquired after a thoughtful process to determine how it can further an institution's core goals. An excellent place to begin that process is to see what technology currently exists or is likely to exist shortly—an environmental scan. With that information, an organization can match needs with the right tools for the job. This environmental scan will not be a recommendation to acquire a PC or any one piece of software or equipment.

This environmental scan will review the current state of library automation and its potential impact on our library and users. It will also include an analysis of library automation trends and developments and how they affect libraries and users. The scan will identify the key vendors and products and issues and challenges facing libraries in this area.

The marketplace for library software appears to be dominated by a handful of large companies, such as EBSCO, ProQuest, OCLC, SirsiDynix, Ex Libris; however, smaller open-source software ILSs, such as Koha and Evergreen, are starting to gain greater acceptance.

Open-source vs commercial is not the whole story. In the segment of this market geared to smaller and more specialized libraries, there are a surprising number of vendors. Naturally, this is a reflection of the large variety of libraries. In addition, the international market for library products is very lively. (Breeding, 2023) I will not examine products that would not be suitable for post-secondary libraries. So, for example, excellent software products designed for schools and smaller public libraries will be omitted from this document. You will not find a discussion of Follet Titlewave, SirsiDynix Horizon, or other products for schools, public, and special libraries.

During the pandemic, library vendors made extraordinary efforts to help customer libraries cope with the unexpectedly changed environment. At the same time, they continued product development looking beyond the pandemic. Newly instituted workflows, such as online selection and checkout of materials, and touchless pickup of materials are likely to remain in the post pandemic world, but there many more changes to library automation catalyzed by the pandemic. (Breeding, 2021) Chromebooks were everywhere as schools rushed to provide children with the tools for remote teaching. This made people think about the advantages of a cloud-based computing system. Zoom, Teams, and Slack helped take video calling beyond a novelty and into the office. The pandemic forced people to discuss how to use technology, perhaps in a way that they had never done before.

I want this document to help inform a solid discussion of how we can use technology to find a solution and meet and exceed our institutional goals. After that discussion, a library technology plan can be developed. Finally, we will acquire software and hardware that conforms to our goals, financial constraints, and staffing realities.

This document will be filled with specialized terminology and acronyms. Refer to the selected glossary of library terminology.

Which areas of technology will be covered?

When library staff speak about library technology, depending upon where they work in a library, they most often mean the Integrated Library System (ILS), Library Services Platform (LSP), or the Discovery Layer, but there is much more technology that has a significant impact in a modern library. These are the most significant library technology I will examine:

1. Integrated Library Systems (ILS): Integrated Library Systems, or Library Service Platforms, are comprehensive packages of software to facilitate library functions, including cataloging, circulation, acquisitions, and more.

2. Library Discovery Systems: Library discovery systems provide a single search interface to access diverse library resources, including catalogues, databases, e-resources, and more. Discovery systems employ federated search, relevance ranking, and user interface design to improve discoverability and access to the full text.

3. Content Management Systems: Libraries rely on websites. This cannot be overstated. Increasingly all library software will run inside a browser window. The relevant technology includes content management systems (CMS), responsive design, and usability principles.

4. Data Management and Research Support: Libraries increasingly support researchers with data management services. Digital preservation might involve developing strategies, tools, and standards for long-term access to digital materials. This would include metadata preservation, file format migration, and ensuring data integrity.

5. Library self-checkout systems.

6. Emerging Technologies: These include chatbots, browser extensions, artificial intelligence (AI), machine learning, natural language processing.

7. Authentication systems: Providing access to full text is what libraries are all about.

To begin with, I think a discussion of how successful technology is implemented in the library.

Where we find ourselves now

Academic libraries have demonstrated great ingenuity in adapting to change over the last few decades, but then came a global pandemic. Libraries implemented novel technologies and processes to meet user needs and support academic success. The pandemic hastened the change that was already underway. The transition to self-service technologies, online repositories, mobile devices and social media was well underway before COVID-19. Now the change is unstoppable and academic libraries have moved from a monolith composed of physical monographs to ebook-only, online full-text access service-based, research data management, open-access presses, virtual reference services and digital literacy.

Before the pandemic libraries were experimenting with new ways to support teaching. (Breeding, 2021) COVID gave that trend some much needed impetus. New products such as reading list software and browser extensions are being implemented to integrate library resources into campus Learning

Management Systems (LMS). There is a realization that a discovery layer, no matter how good it is, is not enough to meet the needs of students and faculty. (Breeding, 2023)

Our library is moving its focus from physical to electronic collections. Suddenly, all of us, not just libraries, confront the challenges of artificial intelligence. Makerspaces, the Internet of Things and BYO technology will also affect how we move forward. COVID-19 changed users' expectations vis-a-vis working and studying modes, the provision of user support, and increasing an acceptance that experimentation should be embraced.

Technology is an enabler, but a clear mission is the fundamental change driver. Understand why you need change, or if you need it, and users' needs, and then the compelling technology needs will be apparent.

New technology projects: purpose, benefits, and pitfalls

- Change can raise the library's visibility, profile, and status within the campus community.
- Change can provide opportunities to energize library staff and help them understand why day-to-day work fulfills its mission. Collaboration with other entities, departments or institutions exposes staff to new ideas, knowledge, and goals from others.
- Success breeds success. A well-done project boosts confidence and lays the groundwork to develop even newer goals. Staff can apply new skills in other projects.
- Of course, any of the points above only apply if there is success in completing well-thought-out projects. Each positive outcome contains the potential to create a problem. Failure can breed more failure, and nothing lowers an organization's profile like overpromising and under-delivering.

Constraints in choosing library technology

- Choosing which technologies to adopt is difficult. All solutions contain their own incumbent training and cost implications. This document will help with that.
- Libraries don't exist in a vacuum. We work with other bodies on campus and consortia, which may restrict a library's freedom of choice in technological developments. However, leveraging the campus and consortium's buying power and technical support just as often presents new opportunities. Collaboration can mean access to broader expertise, knowledge, and ways of knowing.
- New and updated systems must integrate with relevant existing library and university infrastructure.
- It is easy to underestimate the time needed to consult with stakeholders to plan, implement, test, and assess new technology.
- It is possible to overcomplicate the design of a service or system. This is especially true during times of rapid technological change.
- Nothing lasts forever. Implementing new technology is only part of the process. We must accept that some solutions may have a short shelf life and require significant review and restructuring work.
- Money doesn't grow on trees.

Potential Pathways to Success

- A project needs clear goals and transparent, effective project management. Can you state the need for change?
- Successful implementations usually depend on support from others on campus, especially senior management, department heads, and deans. Consultation with stakeholders ensures that a project focuses on user needs and priorities.
- Projects proactively addressing the human side of change are more likely to meet their objectives. (Gutierrez, 2019)
- Processes are essential to ensure quality control, review progress, make course corrections, and incorporate ideas from similar projects.
- Who and how will you manage the transition from implementation to production?
- Engage with appropriate library staff early in the project to address their issues.
- Most organizations tend to preserve the status quo. Encourage risk, innovation and experimentation.
- Technology upgrades may include opportunities for academic librarians to develop new teaching and research support roles.
- Although technology can aid academic libraries in becoming more user-service-oriented, it is not a panacea. Merely incorporating new technology does not guarantee to achieve this objective. Upgrades can provide staff with opportunities *if* they can use them. Furthermore, implementing new technology does not guarantee to expand library services beyond traditional user groups.
- Following the previous point, any project should align with user behaviour, preferences, and expectations.
- Therefore, marketing and promotion strategies are essential.
- Well-chosen and implemented technology can impact the nature of staff workloads. A desirable goal is to streamline workflows, automate processes, and rationalize and speed up services. Poorly chosen and implemented technology can have the opposite effect.
- Having skilled staff is crucial for success. Don't let concerns about their knowledge, skills, and confidence prevent you from pursuing a good idea. With proper training, staff can acquire the necessary skills, but it is essential to have a plan in place for staff development.
- Ongoing evaluation is essential. Don't hesitate to solicit stakeholder feedback while still implementing a new system. There is no rule requiring that only completed projects can be assessed. Assess, assess, assess. The final step in any project is to see what you did right. And what you did do wrong. Use analytics, focus groups and surveys to assess the new service or system.

Trends informing the design, implementation, and assessment of library systems

Library technology evolves in response to market forces, social trends, government mandates, and other external factors. These following trends are currently the forces dictating library software design and should also serve as criteria against which to evaluate new products.

1. Digital Transformation: Libraries, like all sectors, must undergo significant digital transformations to adapt to a changing information landscape. As mentioned earlier, this means electronic-first or electronic-only collections for libraries. For example, this fundamental shift in library operation means that Electronic Resource Managers (ERM) and Holdings Managers will entirely replace the serials module in ILSs, significantly altering how collections and acquisitions are used.

2. Open Access and Open Educational Resources (OER): Most academic libraries actively promote and use open educational resources. Some vendors, such as SirsiDynix, have created discovery tools to search OA material exclusively. (<https://www.sirsi-dynix.com/wp-content/uploads/2020/07/CloudSourceOA-collateral-Academic.pdf>)

3. Information Literacy: Libraries promote information literacy -data literacy needs to be included in the mission. The role of information literacy is especially vital in a landscape that features ChatGPT and similar AI products. While information literacy has been traditionally a function of reference, we should recognize the potential of software to play a role in this. In the future, AI tools might help users evaluate and critically analyze database information results lists. (Libbrecht, 2020)

4. Partnerships and Consortia: Libraries collaborate with other libraries, institutions, and organizations to enhance services and share resources. Consortia-enabled software is a must. For example, holdings managers must know specialized data sources created for the widest variety of consortia. Simply turning on access to a consortia-provided database package is infinitely preferable to having staff create custom data sources.

5. The move to cloud-based Systems: Many libraries are transitioning from traditional on-premises ILS to cloud-based systems. The cloud-based offers advantages such as remote accessibility, scalability, automatic updates, and reduced maintenance costs. Okanagan College suffered a severe cyber-attack, and one of the only systems on campus that was still functional was the cloud-based Folio LSP. (Gomez, 2023) Some institutions, such as UNBC, have issued RFPs specifically requiring cloud-based service as a requirement. (T. Fyfe, personal communication, May 17, 2023)

Data privacy and security features in ILS and discovery systems are no longer "nice to have" but must be considered essential.

Along with the improvement of open-source software comes a natural increase in the complexity of the software installation and maintenance. Many open source products require significant technical support. Paying someone to host open-source software for you is becoming the default choice for libraries. As a result, companies like Baywater Solutions, (<https://bywatersolutions.com/>), can host mission critical products like the CORAL ERM or Koha ILS for libraries.

I can speak to this point from personal experience. TRU library currently pays SirsiDynix to host an instance of CORAL (<http://coral-erm.org/>), but we used to host this software locally. I underestimated the effort required to maintain a LAMP-based open-source product. By paying SirsiDynix, a significant amount of time has been freed up, but more importantly, I do not have to worry about a vital piece of software failing on us.

6. Web-based Interfaces: This follows from the previous bullet point. Modern ILSs are designed with intuitive web-based interfaces that are user-friendly and accessible across different devices. Even locally hosted systems now deliver services via browser. SirsiDynix Symphony can be used with an optional component that replaces desktop client software with a web page. (Although Symphony was designed to be a client-server application.) Web interfaces offer a personalized experience for library staff and patrons, allowing them to easily search, manage accounts, and access digital content. More importantly, web interfaces meet clients where they are – on their own devices.

6a. Mobile Applications: This bullet is a subset of 5 and 6. Mobile applications to access library resources on devices are essential now but will become less critical over time. Improvements in cloud support and web design will make standalone apps less critical.

For example, during the cyber-attack on Okanagan College, staff could use their phones to access Folio and circulate items to users. (R. Janyk, personal communication, May 29, 2023) This was done without an app other than the phone's built-in browser. Proper deployment of PWAs and modern web design will one day spell the end of apps as we know them. (Although this is a hotly debated topic. (Majchrzak, et al. 2019)) For now, mobile apps have a place. They often include features like catalogue searching, account management, event notifications, and digital lending, enhancing user convenience and engagement. Still, there is an inescapable problem with apps – they must be installed on a device by the user. That is something easier said than done. It is a safe bet that all modern devices ship with a web browser.

7. Open-Source Systems: Open-source solutions are popular as they offer flexibility, customization options, and potential cost savings. The potential for libraries to adapt and modify software according to their needs is often overstated. Many libraries simply do not have the technical ability to customize software. All the same there is benefit from a collaborative community of developers and users. Implementation of open-source software has its unique challenges but also some unique opportunities. An active developer community will encourage a more modular design of library systems. Folio, for example, was designed to work with user-developed or commercial plugins. This shared development approach offers maximum flexibility and is being incorporated into commercial products such as Ex Libris' Alma.

8. Data Management and Preservation: Libraries increasingly actively manage and preserve research data to ensure its long-term accessibility and compliance with data-sharing and retention requirements. Even small academic libraries now maintain digital collections of historical or institutional significance. Digital preservation should be a priority within a library technology strategy. Discovery layers should mesh with institutional repositories and other software, such as journal hosting platforms, to further support their preservation efforts.

9. Integration with External Systems: Even the most full-featured ILS cannot do everything. Integrating ILSs and discovery systems with external systems will enhance functionality and improve workflow. New software must facilitate the integration of discovery layers, electronic resource management systems,

institutional repositories, learning management systems, and other third-party applications. The ease of integration with 3rd party systems must be a consideration when choosing what systems to acquire.

To get some idea of the level of interaction, examine the chart of *TRU library technology services interactions* in the appendix. This high-level chart lists the relationships between the TRUs library server, other servers provided by TRU IT, vendors, and with consortia partners.

10. Data Analytics and Reporting: Leveraging data generated by a library system(s) is essential. ILSs, discovery layers, and authentication systems collect a wealth of data, but using this data is often problematic. Analytic tools allow libraries to make informed decisions in resource allocation, collection development, technical troubleshooting, and user services. Evaluation of analytics tools should be essential in evaluating the overall value of a library system. If any software lacks embedded analytics tools, determine if it can work well with third party purpose-built analytics software.

11. Linked Data and Semantic Web: The MARC format is nearing the end of its useful life. Libraries will adopt linked and semantic web technologies like BIBFRAME to enhance discovery and interoperability. Links with external datasets and vocabularies can provide more meaningful connections between resources, enabling better search results and integration with other information systems.

The Library of Congress is implementing the FOLIO library services platform in no small part because of FOLIO's BIBFRAME readiness. (<https://www.niso.org/niso-io/2022/09/library-congress-goes-open-source-folio>) The change from MARC to BIBFRAME will probably take longer than expected, but it will happen. Libraries should plan for that eventual changeover.

12. User Experience (UX) Design: Libraries are in an unenviable position of always playing catch up with non-library software design. User expectations for how software should look are formed outside the library by major corporate websites. User-centered design means intuitive workflows, personalized recommendations, responsive layouts, and accessible features. Educational software must primarily meet the educational goals of an institution but be familiar enough for users to readily understand its use.

13. API Integration and Interoperability: ILSs, LSPs, and discovery tools, are increasingly shipping with robust application programming interfaces (APIs) to facilitate integration with external systems and services. To provide seamless information exchange and interoperability, APIs enable libraries to connect their ILS with other platforms, such as discovery layers, repositories, authentication systems, and third-party applications. APIs also allow an institution to customize results lists and the appearance of a software package. Of course, APIs are only useful if an institution has the capacity in the form of programming skills to use the API. If a library does not have the programming capacity, then it must not evaluate software based on the API but instead concentrate on the out of box experience.

With this background out of the way, let's move on to an examination of the major ILS and LSP systems.

LIBRARY SERVICE PLATFORMS, THE NEW INTEGRATED LIBRARY SYSTEMS?

Are library service platforms really a thing?

(ILS) The ILS, or Integrated Library System, performs the day-to-day tasks that library staff perform. This includes circulating books and storing our catalogue of items. The ILS used at TRU is called SirsiDynix Symphony. An ILS has three parts, a database, software to interact with that database, and user interfaces (one for patrons, one for staff).

Examples of primary ILS functions, also called modules, include:

- **acquisitions** (ordering, receiving, and invoicing materials)
- **cataloging** (classifying and indexing materials)
- **circulation** (lending materials to patrons and receiving them back)
- **serials** (tracking magazine, journals, and newspaper holdings)
- **catalogue or OPAC** (a public user interface that combines a search feature and some user functionality)

The ILS is primarily concerned with managing paper resources. That does not mean that ILS vendors and developers have not added more features over time to deal with the reality of electronic purchasing. A current ILS should be able to handle all the library management tasks of traditional ILS systems and also incorporate modern features, such as responsive design, my account features, saved searches and linkable online content (Soultron, n.d.).

ILSs are being replaced by library services platforms (LSPs) if the sales numbers of a leading LSP such as Alma are any indication. Adopting the FOLIO LSP by the Library of Congress and other major libraries is proof that a tipping point has been reached. (Breeding, 2023) Library service platforms are the logical evolution of an ILS that must deal primarily with electronic resources. Beneath the hood, so to speak, there are more significant differences between ILSs and LSP other than a concentration on electronic record management. LSPs are typically meant to be cloud-centric, sometimes multi-tenanted, extensible through APIs or 3rd party modules, entirely web-based, and most importantly LSPs do not have OPACs. LSPs are meant to be used with a Web Discovery Service.

ILSs may well be replaced by LSPs because of the growing importance of subscribed electronic resources and the reduced importance of physical monographs. Many librarians find the term LSP unnecessary or even confusing; they find this next-generation rebranding unnecessary, and a good case can be made that the rebranding is a purely commercial endeavour. (Breeding, 2013) A current generation LSP does have more functionality than a traditional ILS, but a current generation ILS has more features than its older versions but is still called an ILS. New features are added to cars every year to make them safer, more reliable, or simply more desirable, but that does not change the usability of older vehicles. Cars with backup cameras and driver assist are still called cars, not personal transport cubes.

No matter what you call library enterprise software LSPs are desirable compared to ILSs because of the undeniable need to accommodate both electronic and print collections. A library services platform (LSP) is the next generation of an Integrated Library System (Breeding, 2012). But what exactly is the difference?

As mentioned earlier an ILS is an enterprise software application that provides library services to manage primarily physical resources. LSPs are unified systems that manage print, physical, electronic, and digital materials in a single interface. By design, LSPs can address complex multifformat collections requiring an expanded set of work processes, metadata formats, and access scenarios (Grant, 2012).

However, what really separates LSP and ILS is the addition of modules tailored explicitly to electronic resources. These include:

Electronic resource management systems: (ERM) The ERM allows a library to track its electronic subscriptions, electronic vendors, periodicals, and online resources.

Repositories / Digital libraries: These modules manage collections of digital items (including, but not limited to, text files, images, video, audio, or other computer files.).

OpenURL link resolvers: An Open URL is a specialized URL that refers to an article, book, or other resource. OpenURLs can connect a search engine to a database or even to an interlibrary loan system. Resolvers allow users to find if their library has the full text of a given resource.

Discovery layers / Web-scale discovery service: Sometimes called a search engine, a discovery layer is the next step in the evolution of a library catalogue. They provide a Google-like search, the ability to search multiple simultaneously, and a feature-rich display of search results. This will be discussed at length in another section.

APIs: Application programming interfaces allow programmers to create customized tools from an underlying enterprise software package. APIs are available from some ILSs as an option. (TRU subscribes to the Symphony API.) LSPs, however, make an API a central piece of the product. Extensibility is an important selling point because there is a recognition that LSPs are complicated pieces of software that a 3rd party or the software vendor usually hosts. Hosting agencies have highly skilled staff to maintain, update, and customize effectively.

The promise of APIs is customization and integration with other pieces of enterprise software, i.e. Banner or Moneris. This promise can only be realized by a team of staff with the time and ability to handle the complexity of APIs. Simon Fraser University has a team of seven people administering their Alma LSP; three are programmers. (C. Mah, personal communication, May 9, 2023)

Is there a third way?

If the difference between an ILS and LSP is the addition of extra module geared towards electronic resources, would it not be possible to extend the life of a ILS by acquiring third party products to fill the gaps?

That is what TRU library is doing now. We use the SirsiDynix Symphony system, which is a perfectly serviceable ILS. To extend the life of the product we have added extra features:

- OpenURL resolving is done through our EBSCO discovery layer subscription.
- ERM is done with a subscription to a SaaS hosted version of the CORAL electronic resource manager.
- Our digital repository is Arca, part of a shared Islandora installation.
- We pay SirsiDynix for an API to use with Symphony. EBSCO also offers an API for EDS.

Naturally there are pros and cons to the a la carte approach.

- Mixing and matching gives an institution flexibility to choose the exact tool they want, but at the cost of a seamless integration offered by an all-in-one strategy.
- The combined price of an a la carte system might exceed that of a single integrated package.
- A la carte systems mean staff need to learn to use different workflows. Integration usually means separate modules share a commonality of design and operation, and that means simplified workflows.

The point is that options exist, perhaps too many, but more is usually better than less. And this is where a clear idea of what a library needs becomes vital. Once you know what you really need evaluating the options becomes easier.

HOW TO PREPARE FOR AN UPGRADE OR MIGRATION

Library technology is rapidly changing, and keeping on top of the changes is significant but essential work. Doing it will allow critical assessment of which products best fits your institution. An added benefit of monitoring the technology scene is that libraries must plan for future staff hiring and training. New software is only as efficient as the people using it. Proper assessment of staffing and training will ensure that institutions have sufficient resource that might be required by a new piece of software. It cannot be said often enough that staffing numbers, staff skill levels and workplace culture have an enormous impact on the success or failure of any software implementation. (Pu & Fitzgerald, 2013)

Before a migration or upgrade It is crucial to identify the real needs, the key stakeholders, the implementers, and how much time do you have to spare. Questions to ask include:

Is there some urgent requirement that only a new LSP can fulfill? It could be that a well-featured, well-configured ILS is enough for a smaller library. Perhaps a subscription to a third party product to bolster your existing system will suffice. Differential between wants and needs.

Will a new system seamlessly integrate with all other systems and software? Vendors promise that their product will be more user-friendly, help create a single login environment with learning management systems (LMSs), and free up library personnel and resources. However, merging different systems is more complicated in practice than vendor would have you believe. Software demonstrations are often done in a tidy sandbox environment. When considering an ILS migration to an LSP, more than ever, libraries must think about their digital infrastructure holistically alongside whatever other systems are in place within their greater institution.

Interoperability is the central promise of an LSP, but that requires a single login environment for staff and students. Any new ILS or LSP must be fully compatible with your campus authentication system. (Such as LDAP or Shibboleth.) The same applies to financial/enrollment applications such as Banner. An LSP with a demonstrable track record integrating with LDAP and Banner is more desirable than those without.

Therefore, supplying a complete and accurate list of third-party services in use at your library and university is essential to evaluating what an LSP can promise to deliver *for your campus*. It will be important during the implementation phase as well. The implementation team will need that information. Producing this list is a significant amount of work. You must contact other departments and inquire about the services/software they use and, importantly, what software they will reasonably expect to use in future.

Who will execute the final contract? Will the upgrade migrations be done in-house, or will upgrade support be purchased from the vendor, or a third-party hosting provider? This is where a solid understanding of staffing becomes essential. Migrations and upgrades of this scale require a team approach; this implies enough staff with enough training are available.

Who handles the connection of an LSP with campus enrollment systems, financial software, and LMSs? One promise of LSPs is greater integration with other software services. Usually, the library is not responsible for these services and usually has limited, if any, access to the external servers. The campus IT department will need to be involved. This will necessitate extensive communication, planning and scheduling.

If IT has projects looming near the library's potential go-live date, ensure the project can proceed without IT systems support. If not, the project may need to be rescheduled. Determine if any other significant system changes are pending. For example, if IT is upgrading financial software while the library is updating the LSP, that will be a problem.

We are all the leading players in our own drama, and for librarians, it is sometimes easy to forget the other players. All functional areas of campus have mission-critical pieces of software. Ask what systems or software are pivotal and essential to your campus colleagues. Start a discussion to see if interoperability with the LSP is desirable *for them*. Early consultation with colleagues will minimize the risk of being unpleasantly surprised by a competing upgrade.

Where will the software reside? Perhaps one of the most overlooked considerations in evaluating new software is where. Where will the software be hosted, on a server in your institution or the cloud? The answer to this question will affect the software package's cost, reliability, and security. A brief examination of Local hosting/ Cloud computing / SaaS is needed.

How is software hosted?

There are an amazing number of ways to host software such as an ILS, but to simplify matters they are variations of three models.

Local Server Hosting: This means the server, in this case an actual physical server, resides on site and is connected via a LAN or Internet. This is how TRU hosts the Symphony LSP and EZproxy servers. (libapp.tru.ca and ezproxy.tru.ca) Institutions that host servers have complete control over the servers and IT infrastructure, but they also absorb all associated costs including hardware support and replacement, labor costs and so forth.

Remote or cloud hosting: means the computing environment is physically removed from an institution. The promise of cloud computing is scalability, rapid upgrades, innovation, and flexibility. For organizations, it offers economies of scale and *no* issues related to the maintenance of IT infrastructure.

Most people are unaware of how many pieces are needed to make the device on your desk or in your hand work. In many people's minds, the Internet is "the cloud."

Cloud networking services allow an organization's computing services to be situated on an external network (Usually the Internet.) Cloud computing connects users to a cloud platform where they access *rented* computing services (PC Magazine, 2020). Cloud-based computing includes virtual storage capacity, servers and computing, and networking. Applications are hosted in the cloud, but those off-site applications are just one part of cloud computing and are more appropriately referred to as **Software as a Service -SaaS**.

SAAS IS NOT EQUAL TO CLOUD COMPUTING

SaaS stands for "Software as a Service." It is a software delivery model where software is hosted on a cloud and accessed through the Internet. Ex Libris, EBSCP.OCLC, SirsiDynix and OCLC offer library enterprise software using the SaaS model. SaaS is becoming increasingly popular with higher education IT departments that want to streamline operations quickly without significant overhead (Shaw & De Sarkar, 2021). The flexibility of SaaS is a strong inducement for educational institutions to turn to the cloud (Erturk & Iles, 2015) (Akande & Van Belle, 2016).

Here are some advantages of SaaS for libraries: (Modern Campus, 2021)

1. Reduced IT Complexity: SaaS simplifies IT infrastructure for the client.
2. Lower Cost of Ownership: Reducing your university's IT infrastructure translates into a lower total cost of ownership. (For the university, not necessarily the library.)
3. Predictable Costs: Calculating the total cost of running enterprise software can be challenging. SaaS supplies predictable costs because the vendor is responsible for unexpected infrastructure expenses.
4. Scalability: SaaS is scalable and can be easily expanded or contracted based on the needs of the university. Once again, the vendor incurs the cost of moving the software to a different server.
5. Faster Implementation: SaaS can be implemented quickly, especially if the vendor is also the software developer.
6. Data Security: SaaS vendors usually have skilled teams handling the security infrastructure and patching. (Modern Campus, 2021) Okanagan College has adopted a SaaS/Cloud first server strategy because of the significantly better security. (R. Janyk, personal communication, May 29, 2023)

THE CASE FOR AND AGAINST SAAS

Perhaps the best way to explain the advantages and limitations of SaaS/Cloud Computing is not to think about complex multi module enterprise software such as an ILS. Instead, think about a website editor, something most librarians use and understand.

TRU library uses SaaS in the form of the Springshare Libguide content manager system (CMS). Libguides are critical to the library web site. We pay Springshare to use their web editing software, and to host the pages we create on remote servers and provide technical support and help.

TRU library also subscribes to the SirsiDynix Electronic Resource Management system. It is a SaaS product especially important to the library's mission. ERM is a mission-critical tool for us. The software and data are stored remotely.

TRU Library uses Springshare's SaaS to supply a large part of our web offering, including Libguides, the LibAnswers chat reference and problem reporting system, and LibAnalytics, among other heavily used services. Arguably these web tools are just as critical as the ILS. For the library to reject SaaS out of hand, we would have to rebuild much of our backend web tools and a significant amount of our public-facing web.

We have already crossed the Rubicon; it would be unwise to reject using a LSP/ILS out of hand because it is not installed on a local server.

There are real concerns about SaaS solutions, but they can be addressed.

One of the more significant, in Canada at least, is where personal data will be hosted and how it is protected (McKinnon & Turp, 2022). There are legal and other reasons to have personal data stored on Canadian servers. (Government of British Columbia, 2019) SaaS is inherently cloud-based, and so there is potential to have data stored anywhere in the world. Library software vendors are primarily based in the United States, but these vendors are aware of legal restrictions in other jurisdictions. As a result, major vendors, such as OCLC, EBSCO FOLIO, and SirsiDynix, have cloud servers in Canada. (EU privacy regulations require EU personal data to be stored in Europe.)

Any institution that selects a cloud-based solution will need to have a privacy impact assessment done.

Another concern is latency (the delay before a transfer of data begins following an instruction for its transfer) and uptime (the time during which a computer, especially a server, is in continuous operation between reboots or malfunctions); these are valid concerns (Wiseman, 2014) but can be addressed with terms of service written into contract language. In this case, a complete discussion with representatives from IT is needed. And it might be that the campus IT infrastructure is a determining factor in determining if local or cloud-based software will be chosen.

With all this in mind, let's look at the significant ILS/LSPs for the academic market.

COMPARISONS OF THE MAJOR THE ILS/LSP SYSTEMS

KOHA

Koha is an open-source ILS originally developed in New Zealand. The koha is a Māori word for gift. It is used around the world by a variety of organizations, including academic and special libraries. (<https://wiki.koha-community.org/wiki/KohaUsers/NorthAmerica>) Koha is a clientless, web-based ILS with a SQL database backend. Bibliographic data is stored in MARC format and accessible via Z39.50 or SRU. Koha has a configurable interface and has most of the features expected in a modern ILS.

Limitations of KOHA are those shared with other open-source systems, and they are a heavy reliance on in house technical support. (Although commercial support packages are available.) Installing Koha requires good technical knowledge of LAMP software. Making changes in the Koha application will often require scripting and Perl programming. No major academic institutions in Western Canada use Koha as their ILS.

Architecture: Koha is usually hosted locally on a LAMP stack server(s). Although, as mentioned earlier, Koha is available as a hosted SaaS.

Functionality: Koha's features include:

- Union catalog facility
- Customizable search
- Circulation and borrower management
- Koha has a full acquisitions system, including budgets and pricing information (including supplier and currency conversion).
- There is a simple acquisition system for smaller libraries.
- Ability to cope with many branches, patrons, patron categories, item categories, items, currencies and other data
- Serials module
- Reporting module
- An ILL module is available but will not work without customization.

Integration and Interoperability: Koha can be configured to work with 3rd party discovery services such as EDS. (<https://bywatersolutions.com/education/introduction-to-ebSCO-discovery-service-in-koha>) This would be achieved by sending MARC records to the Koha server. (TRU uses this method to update EDS and OCLC holdings.)

Koha was built using standard library protocols, including MARC 21 and z39. 50, SRU/SW, SIP2, SIP/NCIP, ensuring interoperability between Koha and other systems. Support is available through 3rd party vendors. (<https://koha-community.org/support/paid-support/country/>)

Koha has no ERM, OpenURL, or discovery functions, so third-party solutions will be needed.

Analytics and Reporting: Koha is based on a standard SQL database. Reporting can be clunky, but SQL is a very well-established system, and all university IT departments will have SQL experts on staff.

Community and Collaboration: Koha is a popular open-source product with an active online community. Commercial support is available, which would alleviate the need for in-house capacity. (Bywater Solutions is one vendor offering Koha hosting and support.

<https://bywatersolutions.com/services/hosting>) also. (<https://koha-community.org/support/paid-support/country/>) Social media features such as tagging, social sharing and RSS feeds are built into Koha.

Impressions: The idea behind Koha is interesting. It is a place to park MARC records and provide an inexpensive ILS to handle legacy items. A library using Koha would then select components to meet the needs of a digital library to come up with an a la carte solution. This strategy favors flexibility over integration. Koha was one of the respondents to UNBC's RFP for a cloud-based ILS.(G, Boyd, personal communication, May 17, 2023)

EVERGREEN / SITKA

Evergreen is an open-source ILS developed by the Georgia Public Library Service to create a statewide resource-sharing consortium. Evergreen ILS is now used worldwide in hundreds of libraries. Because of its design history, it is not surprising that Evergreen is used to power several consortial catalogues, including the BC Libraries Cooperative catalogue. (<https://bc.libraries.coop/services/sitka/>) The BC cooperative hosts a multi-tenant installation called Sitka. Academic Sitka clients include Vancouver Island University and Vancouver Community College. Although academic institutions use Sitka, older open-source ILSs have a design focus best suited to public libraries and print collections. (Fournie, 2020)

Architecture: Evergreen is a clientless, web-based ILS with some features expected in a modern ILS. Search/Retrieval is done via URL and Z39.50. The Evergreen user community is very active, so there is a large body of expertise to draw on from the user community. APIs are also available to provide middleware to integrate e-resources into discovery layers such as EBSCO EDS, Bibliocommons, Summon, Vufind and Blacklight.

Local hosting is an option for Evergreen, and the system requirements are relatively modest. Evergreen will run on any server capable of supporting LAMP, but a team of knowledgeable support staff is essential to operate the LAMP applications. Installing and configuring Evergreen requires solid experience with LAMP software. Making changes in the application will often require scripting and programming expertise. The cost of in-house expertise should be included in the operating cost of open-source software. Where Evergreen shines is in its consortial sharing ability. Membership in a consortium can greatly reduce the overall cost of this ILS.

When Evergreen operates in consortia (multi-tenancy) mode, a shared catalogue of bibliographic records is created. That is both an advantage and a problem. (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023) Shared records facilitate easy copy cataloguing, but using shared records presents challenges when purging records or mass editing records. It is possible to purge bibliographic records that other consortia members need accidentally. Large-scale updating of bibliographic records requires the extra step of consulting with other consortia members. For example, indigenizing subject headings requires consultations with other institutions with a different philosophies on how to proceed with this type of project.

Functionality: Evergreen's features include:

- Circulation module
- Cataloging module
- Acquisitions module
- An OPAC is available, but a modern academic library will use a 3rd party web discovery layer. VIU uses Summon, and VCC uses EBSCO EDS. (J. Fournie, personal communication, May 2, 2023)

Integration and Interoperability: Evergreen lacks an integrated ERM or holdings management system. The discovery layer is updated by uploading batches of MARC records to the discovery layer server. Fortunately, operators can configure this process to happen automatically. (J. Fournie, personal communication, May 2, 2023) In any system where the discovery layer does not directly access the bibliographic database, there is a lag between when a record is updated in the catalogue, and those changes are reflected in the discovery layer. The lag varies based on several factors but can be longer than a day. (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023)

SIP 2.0 support: for self-check machines and other applications. (Sitka does have a simple self-check-out module built in, and this low-cost option means the expense of a kiosk can be avoided. Although the Sitka module does not support desensitizing items.) (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023)

Analytics and Reporting: Evergreen has a powerful reporting module for retrieving statistical information in the union database. Because Sitka uses a union database model, library staff who use the reporting module must sign a privacy document. Users have access to a union database which contains information about users at institutions other than their own. (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023)

Community and Collaboration: Evergreen has an active user group community to draw upon.

Impressions: Similarly to Koha, Evergreen is a place to park MARC records and provide an inexpensive ILS. A library using Evergreen meets the needs of a digital library to come up with an a la carte solution. This strategy favors flexibility and freedom of choice. VIU has a commitment to open-source software, a Sitka subscription was a good choice for them. (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023)

INNOVATIVE / SIERRA

Innovative Interfaces developed the Sierra Library Services Platform. Innovative Interfaces is now part of Clarivate, the owner of Ex Libris. Concerns about the consolidation of the library software market have raised concerns with the United States Federal Trade Commission, but it is too early to tell what the long-term effect will be. (Breeding, 2021)

Sierra is a comprehensive library system that provides various features and functionalities you would expect. It is very much a previous-generation ILS that has added functionality over time to keep the product relevant. (For example, a mobile interface, APIs to aid extensibility, and since Innovative's purchase by Clarivate, better integration with the Summon discovery layer.) Sierra still has a sizable user base, and Innovative is working on a radically new product called Vega

(<https://www.iii.com/products/vega/>). Vega promised to be a competitor for FOLIO or Alma, but it is still in development.

FOLIO

The FOLIO library services platform is an open-source system that is the youngest of the major ILS products. FOLIO (stands for the Future of Libraries is Open) offers a modular architecture, allowing libraries to customize and configure the platform to meet their specific needs. (Once again, this possibility is limited by the technical ability of your organization.) Extensive libraries, such as the Library of Congress and the Shanghai Public Library, are moving to FOLIO, but many small institutions are also using FOLIO. (<https://www.folio.org/community/support/>)

Okanagan College uses FOLIO as its LSP.

Architecture: FOLIO is cloud-native by design and is usually a SaaS: This means the typical use case scenario involves subscribing to FOLIO on a hosting service. The hosting services typically use cloud-based web services. This scalable architecture ensures that the hosting platform can adapt to the needs of various libraries of all sizes.

FOLIO does not require client software. All modules will run in any modern web browser. Administrators can restrict the number of modules available to staff depending on the staff's work requirements.

A list of hosting providers is found at <https://www.folio.org/community/support/>. Some consortia or very large universities can host FOLIO locally. Texas A&M, for example, hosts its instance. User-friendly web-only Interface:

Functionality: FOLIO provides essential library management features, including acquisitions, cataloging, circulation, resource sharing, and analytics.

FOLIO was designed to be extensible. (<https://docs.folio.org/docs/about-folio/benefits/#extensible>) A microservices-based framework means that different components are developed and deployed independently. (Microservices are loosely related pieces of a larger platform.) In a sense, FOLIO is like a smartphone with a basic set of apps. If you are happy with the base version, you need to do nothing else, but if you are like most people 3rd, party apps are always available to customize your phone. Enabling flexibility and scalability. (https://www.youtube.com/watch?v=Y0V4pPkVC_E&t=5s)

3rd party developers can create custom modules for Folio. For example, Panorama Essentials is an analytics app included with an EBSCO FOLIO subscription. EBSCO developed this app to enhance the value of using EBSCO as a FOLIO hosting service. (<https://www.ebsco.com/academic-libraries/products/ebsco-folio/apps-features>) It is not inconceivable that other commercial developers might create a FOLIO module. For example, Amazon, or other booksellers, could create applications to make FOLIO work seamlessly with their online stores.

This modular approach has several promising possibilities.

The app/module model allows libraries to add new features as needed. Okanagan College used the ERM module before adding other modules to their installation. The institution's subscription to Voyager lapsed, and partial adoption of FOLIO allowed them to concentrate on maintaining their discovery layer during the migration process. (R. Janyk, personal communication, May 29, 2023)

Institutions could even use FOLIO's licensing and eUsage modules alone to replicate a full-featured ERM system. (Fournie, J. 2020)

Integration and Interoperability: FOLIO supports integration with other systems and services, such as institutional repositories, discovery layers, learning management systems, library automation devices, and third-party applications. FOLIO supports middleware and communication protocols such as Z39.50, NCIP, SIP2, and OAI-PMH, among others.

(<https://wiki.folio.org/display/SYSOPS/List+of+Integrations#ListofIntegrations-InstitutionalRepositories/DigitalCollections>)

It is not inconceivable that other commercial developers might create a FOLIO module. For example, Amazon, or other booksellers, could create applications to make FOLIO work seamlessly with their online stores.

Analytics and Reporting: FOLIO has basic reporting functions. However, Panorama Essentials is an analytics app with an EBSCO FOLIO subscription. EBSCO developed this app to enhance the value of using EBSCO as a FOLIO hosting service. (<https://www.ebsco.com/academic-libraries/products/ebsco-folio/apps-features>)

Community and Collaboration: EBSCO is a major partner in the development of FOLIO; However, it does not own FOLIO, which means that EBSCO product integration into the basic FOLIO installation is very robust. A strong user community exists, and it is reasonable to expect that the larger FOLIO clients, including the Library of Congress, will ensure a dynamic development community will exist for many years.

Impressions: FOLIO is an impressively modern system, but it still has major contributors building on the framework. I would not say it is a work in progress, because it is ready to be used now, but there is still development being done. The documentation has not caught up with the development of software. (R. Janyk, personal communication, May 29, 2023) I expect this issue will be resolved as more commercial hosting services enter the market. Apart from the modular, extensible design, FOLIO's big advantage is EBSCO's role in the development. FOLIO integrates well with EBSCO products.

EX LIBRIS / ALMA

Ex Libris sells two major library systems, Voyager and Alma. These differ in terms of their architecture, features, and capabilities. A comparison of the two systems is interesting because it demonstrates the library software development and theory trend. Voyager is the older of the systems, and Alma reflects the new thinking about library software.

Architecture: Alma is a cloud-based library services platform. It is hosted in the cloud by Ex Libris, eliminating the need for local server infrastructure or contracting with a third-party hosting solution. Alma, like other cloud-based products, has automatic updates and maintenance. U of R pays for an Alma Sandbox (a test installation for trying new processes and training.)

Functionality: Alma provides a broad range of functions. In addition to core ILS features, Alma includes advanced capabilities for ERM, license management, analytics, collaborative collection development, and integration with other library systems.

Integration and Interoperability: Alma is designed to be an interoperable platform. It offers extensive APIs, web services, and integration frameworks that facilitate seamless connectivity with various systems, such as discovery layers, learning management systems, and institutional repositories. Alma provides robust integration capabilities out of the box. During site visits to Alma libraries, staff praised the holistic approach to library operations.

Analytics and Reporting: Alma offers pre-built reports and customizable dashboards to gather data about collection usage, circulation trends, license compliance, and more. Staff at U of R were impressed with the analytics and reports for the technical services components. (C. Bakker & B. Nelke, personal communication, May. 25, 2023) Alma uses Oracle as the underlying database, and Oracle has impressive analytical tools.

Impressions: I spoke with staff at the University of Regina and Simon Fraser University, two very different universities, using Alma.

U of R has gone all in on Ex Libris/Alma. They use Alma as the LSP and marry it to the Primo VE discovery layer (we were previously on Primo UI). In addition, they use Leganto to integrate readings in U of R's Moodle instance. A recent migration from ContentDM to Alma Digital means U of R's digital collections reside on an Ex Libris product. (C. Bakker, personal communication, Mar. 3, 2023)

U of R staff are pleased with Alma, especially the tight integration between the different components of Alma, especially the linkage between Alma and Primo. A bonus of the integration is that there is a commonality that is very helpful during staff training. (C. Bakker & D. Storie, personal communication, May. 25, 2023)

The impression I formed speaking to staff at both U of R and SFU is that the technical ability of Alma comes at a price. It is technically demanding and requires a great deal of work to get value out of the system. (E. Elnoshokaty, personal communication, May 30, 2023) SFU has a team of six administrators, and U of R distributes administration to a person in user services, technical services and collection, and to a system admin. (C. Bakker & D. Storie, personal communication, May. 25, 2023) Staff at Regina, where the migration to Alma was more recent, informed me that Ex Libris would not sign off on migration until two persons pass a test to qualify as a system administrator. (C. Bakker & B. Nelke, personal communication, May. 25, 2023)

Ex Libris sits under the umbrella of Clarivate. Clarivate is primarily an analytics company, and by the standards of the library marketplace it is huge. Alma is a very popular library platform and is still attracting new clients. (Breeding, 2023). As a result, Ex Libris supports an active community of Alma users, encouraging collaboration and sharing. Alma has APIs available, which supports the notion that Alma is truly a platform and a basis for future improvement and customizability.

EX LIBRIS / VOYAGER

Voyager is a much more traditional library product.

Architecture: Voyager is a locally hosted ILS that requires local server infrastructure and maintenance. Voyager uses a client-server model, and the library installs and manages desktop software locally.

Functionality: Voyager offers a complete set of modules for managing library operations, including acquisitions, cataloging, circulation, serials management, interlibrary loan, and more. It provides traditional ILS functionality.

Integration and Interoperability: Voyager supports integration with external systems through APIs and by supporting library standards. However, due to its older architecture, integration options may require more customization and development effort.

Analytics and Reporting: Voyager provides a basic reporting feature and can generate reports on standard library metrics.

Community and Collaboration: Voyager has a long-established user community that has contributed to its development and improvement over the years. Users can engage peers through user groups and conferences. Voyager is part of the Clarivate family of products and will probably continue effectively working with Clarivate's other products, such as Summon and Primo.

OCLC WORLDSHARE

WorldShare Library Management System (WMS) is a cloud-based integrated library system (ILS) providing a comprehensive set of modules and functionalities covering most library operations.

Architecture: Cloud-Based Infrastructure: WMS operates entirely in the cloud, eliminating the need for local server infrastructure. This cloud-based approach ensures reliable and secure access to library services and allows for automatic updates and enhancements.

Functionality: WMS offers a unified platform integrating library functions, including acquisitions, cataloging, circulation, interlibrary loan, resource sharing, electronic resource management, and analytics. Usually, this level of integration allows for shared workflows and efficient data sharing across different library departments.

WMS acquisition/cataloging modules are outstanding and manage the entire acquisition process, from ordering and receiving to invoicing and license management. The system streamlines cataloging workflows, supporting original and copy cataloging, and offers integrated access to bibliographic and authority data from OCLC's WorldCat database.

It should be said that OCLC's bibliographic origins show at times, for example, acquisitions workflows enter around an OCLC bibliographic record published and available in WorldCat; because OCLC bibliographic records exist in public/published ecosystem, acquisitions staff cannot attach orders to records that are not publicly available through WorldCat. A more common acquisition process is to create a local skeletal bibliographic record and then attach an acquisitions link to the skeletal Record. There may not be a bibliographic record to attach an order to if the item is an unusual or unique special collection or a new local item. (K. Louro, personal communication, June 28, 2023)

Integration and Interoperability: Because WMS is part of OCLC's network, connecting libraries for resource sharing is streamlined, especially for interlibrary loans and OCLC's extensive cataloging and resource databases.

OCLC, like other cloud-based systems, offers APIs to extend the functionality of the base systems. For example, a gallery of API extensions can add improvements such as label printing and connections with Talis Aspire. (<https://www.oclc.org/developer/gallery.en.html?>)

OCLC's Relais has always been a problematic service. It will be replaced by Tipassa, OCLC's cloud-based ILL product. UNBC is in the process of moving over to Tipassa. (T. Fyfe, personal communication, June 28, 2023)

OCLC can be configured to work with kiosks. UNBC uses Meescan self-service kiosks.

Analytics and Reporting: WMS offers solid analytics and reporting capabilities. Libraries can generate pre-built reports or create custom reports using the system's reporting tools. If that is not enough, APIs are available to create enhanced reports.

Community and Collaboration: Ongoing Support and Community: OCLC provides ongoing support and training for libraries using WMS. They offer technical support, documentation, training materials, and a community of users where libraries can share knowledge and best practices.

Impression: WMS is a new modern LSP, and an improvement over older ILSs. This OCLC product is cheaper than Ex Libris Alma. (G. Boyd & T. Fyfe, personal communication, June 28, 2023) Most technical services department already use some OCLC products and so the learning curve will be less severe.

SIRSIDYNIX SYMPHONY

This is the ILS currently used by TRU. Symphony provides a comprehensive suite of modules to manage library operations, including cataloging, circulation, acquisitions, serials management, and course reserves.

Architecture: Symphony typically uses a client server model. A desktop client, Workflows, must be installed on each user's computer. Although SirsiDynix does offer an optional product called SymphonyWeb. This cloud-based product puts Workflows into a browser.

(<https://www.sirsiDynix.com/symphonyweb/>)

SirsiDynix also offers Symphony as a SAAS.

BLUEcloud Suite is a cloud-based library services platform offered by SirsiDynix. BLUEcloud products can attach to a local server or Symphony as SAAS. The modules and applications include:

- BLUEcloud Cataloging
- BLUEcloud Circulation
- BLUEcloud Analytics

Integration and Interoperability: Symphony has a powerful API which offers options for integration with other systems, but only for technically sophisticated users. At TRU connections with other systems on campus with API calls from Linux shell scripts. For example, Symphony can import Banner exports but the process is far from automatic.

Symphony supports all common information exchange standards and protocols.

SirsiDynix offers a cloud-based version of the CORAL ERM. TRU uses this feature filled product to track electronic resources.

Analytics and Reporting: Has a solid reports module. Subscribers to the Symphony API can draw upon experts at SirsiDynix to create custom reports.

BLUEcloud Analytics is an advanced reporting tool from SirsiDynix. This cloud-based option enables libraries to work with their local data to generate reports. Analytics ships with many pre-built reports and customizable dashboard to assist in evaluating key performance metrics.

Community and Collaboration: SirsiDynix has excellent customer support. Their user support portal provides ongoing support and training as well as a way to track problem history. The SirsiDynix user group is large and very active. COSUGI provides a community of users where libraries can share knowledge and best practices.

Impression: I find Symphony to be a good ILS, with excellent support, and although there are new products to supplement the basic features of the Symphony/Workflows combination the client server model is increasingly difficult to sustain.

Web Scale Discovery Tools

Web-scale discovery tools (search engines as most people know them) consists of a pre-made index linked to a user-friendly discovery layer that supplies a single search across a library's local, open access, and subscription collections. WSDs are not like huge internet search engines such as Google or Bing, but search engines do influence the design of WSDs.

In comparing a very large search engine such as Google or a WSDs, remember that discovery services used by libraries differ in scale, and focus on providing access to subscription data sources. Internet search engines are funded by advertisements and screen views, and so large results lists are preferable to smaller more accurate results list. Typically, the type of information collected by libraries has much more metadata attached. Often the extra metadata is referred to as facets. (Facets are properties of information elements, such as publication date, language, publication type, peer review status, and so on.) All commercial WSDs have "Googlelike" simple search features, but it is in the advanced searching mode that the real distinction between Google, its peers, and WSDs become apparent.

The single search works across a library's local, open-access, and subscription collections. The advanced option searches for the same material but offers many more options than Google or its competitors.

How WSDs work and what they do

The process used by a WSD to collect information and make it searchable follows this sequence.

1. Data Collection: A web discovery layer continuously collects and aggregates data from various sources. This can include web pages, databases, and other relevant sources. In academic settings library staff assist this process by configuring a tool called the holding manager.

Holdings manager refers to a database that manages and provides information about the availability and location of resources within a library collection including physical or electronic subscription resources. Holdings managers inform the WSD which materials are accessible and where they can be found. This is a vital task because this is how the WSD can offer full text access to the user. Holdings managers are a major difference between Google or Bing and a WSD.

Holdings managers in a typical academic discovery layer typically integrate with the organization's ILS or LSP. The holdings manager retrieves data about a library's holdings, including books, journals, databases, etc. The process can be automatic or manual depending upon the ILS and WSD involved. Naturally if an ILS and WSD come from the same vendor configuration tends to be easier.

2. Indexing: The collected data is indexed to allow for efficient searching and retrieval. Indexing involves extracting relevant information, such as text, metadata, and contextual data.

3. Providing a user Interface: The web discovery layer provides a user interface that allows users to interact with the indexed data. This interface can take different forms depending on the specific implementation. Also most interfaces can be customized at run time by the end user.

4. Search and Discovery: This is typically the public facing side. Users enter queries or browse available content using various filters and categories. A WSD employs search algorithms and machine learning techniques to understand user intent and deliver relevant results. (Examples text prediction is used in

search fields, alternate subject headings are suggested, and related subjects might be mapped together. (IE Obamacare is mapped to The Affordable Care Act, or haemophile is equivalent to hemophilia.)

5. Content Retrieval: When a user selects a specific item from a search results the discovery layer retrieves the corresponding content an index. This can include displaying web pages, displaying text, playing media files, or accessing external resources through links, openURLs, or APIs.

6. Integration and APIs: Some discovery layers provide integration capabilities and APIs, which allow the subscriber or third-party developers to build applications and services on top of the WSD. This enables the incorporation of the discovery layer into other platforms, applications, or expanding functionality.

A WSD tool is made up of three components.

1. **Pre-harvested Index:** Metadata and full content are systematically and periodically accumulated and processed in advance. This data is gathered from multiple sources and processed into a central index.
2. **A Central Index (CI):** This is a collection of pre-harvested and processed metadata, and full text from other sources forms an institution's searchable database. A WSD searches this index, not the individual databases and resources. It is important to remember that a WSD is not a federated search engine. In many ways a WSD is only as good as the CI. This index is a checklist of resources that must be supported by library staff (by making sure the HM is up to date). This is a semi-automatic process, and the amount of work required to maintain a central index should be considered when selecting one product over another.
3. **The Discovery Layer:** The patron facing side of a WSD is a user interface and search system for discovering, displaying, and interacting with the content in the central index. Like it or not, Google is the standard library patrons use to measure ease of use and is what they have come to expect. In selecting a WSD, a library must meet the expectations of patrons.

The Central Index, the heart of a WSD

The Central Index (CI) is the heart of the WSD. A CI is a collection of pre-harvested, usually processed metadata and full text that forms the searchable content of a WSD. Pre-harvesting dramatically increases the speed of WDS. (It is important to remember that the WDS is not searching individual data sources at the time of a search. It is searching for an index; this is much faster and more efficient.): CIs can include.

- **Publisher supplied metadata and full text:** This can include citation metadata, abstracts and keywords, and full text. Some journal and ebook publishers supply the full text of articles and chapters so that this material can be indexed and searched; however, the full text can be viewed only if the library has paid to access the content.
- **Local bibliographic holding data:** In addition to indexing provided by publishers and vendors the library can supply data such as MARC and metadata from local collections, catalogues, archives, and institutional repositories. Often during the initial service configuration, a library supplies files of MARC records to be incorporated into the central index. After that, MARC files consisting of additions, changes, or deletes are used to update the CI. Location codes and MARC mapping can be time-consuming. Usually, this work is done as part of the first configuration, but changes are possible later. The setup process is very time-consuming, but once finished rarely needs to

be modified. Supplying updates is much less work. Continuous MARC updating is usually semi-automatic and done by support staff.

- Metadata from digital collections and institutional repository: This content can be harvested using the OAI-PMH protocol-compliant tools. The library can set the frequency of MARC and OAI-PMH updates.
- Open access/public domain data metadata: This could include indexing and abstracts, and some have full text from open collections and indexes.
- Vendor-licensed material: WSD vendors provide access to their material or seek agreements with aggregators and other content providers. This enrichment of the central index is a commercial consideration. The enrichment can be as simple as incorporating an electronic encyclopedia's content, or it could be extensive full text from one of the vendor's database products. The exact deals between WSD providers and database vendors vary and are subject to change. A problem arises because some database vendors can WSD competitors. (For example, EBSCO and ProQuest). Unsurprisingly, the databases from one vendor might not appear in the major indexes of competitors.
- When choosing a WSD, a vital consideration is whether the search engine works seamlessly with your most essential/well-used databases. All discovery layers work with all major databases, but how easily they work together can considerably impact user satisfaction. This is especially important in the display of full text results. Single click access is the gold standard, conversely requiring a user to leave the discovery layer or choose options is undesirable. For example, EBSCO databases work seamlessly with EBSCO databases; the same applies to ProQuest products.
- Some database vendors do not supply metadata to any central indexes, instead these vendors drive users to a portal. For example, JAMAevidence is not included in any central index.

The Discovery Layer

This is the user interface and search system. Standard features of discovery layers include:

- Single search across the central index. (Google like searching)
- Advanced searching across the central index. (Multi-field searching)
- Short response time
- Relevancy-ranked or date-ranked results list
- Facets, sort, and other limiting tools for refining and using the results
- Connections to full text via direct links or OpenURL
- Links back to a library's ILS to display the availability of a physical item. (Some Discovery Layers offer ways to interact with an ILS, for example placing holds and renewing items in the library catalog.)
- End-user accounts and features. Including the ability to export results in various formats or citation styles. Also, RSS feed-type features to allow automatic notifications and repeated searching.

The interaction of Central Index and Discovery Layer

The content available in results listings is affected by three factors:

1. Configuration choices made by the library makes about what data to expose
2. Content the WSD vendor chooses to exclude or include in its central index
3. Overlap between the library subscriptions and the vendor agreements with database and full text publishers

Libraries configure and customize their WSD during implementation. These choices can affect how a discovery layer works, luckily most choices can be revisited if the initial configuration does not meet a library's needs. These choices are most visible in the results listings after a search is run.

An institution's reference philosophy often decides how libraries choose to expose available content. A library may display metadata for all content, even unsubscribed content. (To the limit of information contained in the CI.) Users can discover unsubscribed resources and request them via interlibrary loan. This option allows maximum discovery at the cost of potentially slower access.

Or, as TRU library does, a library can partially hide content not linked to full-text access. (Although we allow the possibility of seeing the results if a patron chooses to.) This choice places full-text access ahead of complete discovery but allows dedicated searchers to carry out more complex queries.

Finally, a library can hide all metadata for content for which full text access is not available. By focusing results lists on content that will be immediately available to users this option places access above all other considerations.

When investigating a new WSD or deciding whether to subscribe to new databases, the common question is, "Does the discovery layer include x data source (target)?" This is not always a yes or no question.

Some databases may be indexed in one central index but not another. For example, some smaller EBSCO and ProQuest databases may be available only in their vendor-supplied discovery layers.

To add more confusion, a WSD vendor may not include an entire database's indexing but may have basic, citation-level metadata for some of it. This means that subject headings, abstracts, and other metadata are missing.

Rating WSDs

The central index is the core of a WSD service, but the discovery layer is the public face. Typically, users rate a WSD based on their experience with the discovery layer. This is to be expected of users, but librarians should dig deeper. These are features common to all WSD products but are implemented differently. In evaluating a WSD careful examination of these features is important.

Customization: Vendors support branding that lets a library use its institutional logo and colors. Libraries do this through administrative modules or by requesting the vendor to make the changes. The degree of customization and the ease with which that happens can vary. Usually, the library chooses from a small set of predefined layouts. This option is helpful for institutions with limited IT/programming support. If libraries desire a much more customized interface some vendors provide APIs and cascading style sheets (CSS), which enable more extensive options for the look and layout.

Searching: All WSDs provide Google-like basic search options and these basic attributes:

- Basic search includes keyword, author, title, and subject fields searching.

- Proper use of Boolean operations, phrase, truncation, wildcards,
- Auto-completion suggestions, and spell-check.

There is not much difference between vendors in this regard, but comparing advanced search features is more complicated. There are different approaches to accomplish similar results.

For example, one product might provide a limiting field on the advanced search screen, whereas another may use a limiter after the search and restrict the results. For this reason, when comparing systems, consider whether a system can produce results with given criteria rather than looking at exact search fields, limiters, facets, etc.

Easy to use results listings: Naturally, discovery layers work best with database and ebook products from the same vendor. Each vendor will capitalize on the specific content strengths of their central index.

Usually there are options on a results list to sort items by relevancy or date. Each vendor has a relevancy algorithm designed around its central index. While relevancy algorithms are not published it is fair to say that, but they all consider factors such as the following:

- Currency or date of publication
- Frequency of the search terms in the title, subjects, author fields, or full text.
- The adjacency of search terms to one another

End-user features: Discovery layers offer many tools for organizing, saving, and exporting results. Often these tools are vital for users. All WSD vendors have taken up the use of responsive design. This allows their products to be used on phones, tablets and PCs. Widgets can bring in additional functionality, such as ask-a-librarian chat features. Some widgets allow users to send a search to an external database that is not included in the CI. For example, search parameters could be sent to YouTube.

Advanced features: Test and evaluate these features thoroughly, often these fit and finish type features have a big impact on how users feel about the WSD.

Do end-user features work as the users expect? Do these features (such as creating folders or lists, tagging, result and citation exporting, saving search strategies, setting up notifications and others) add real value to the WSD?

- Is specialized indexing searchable? (For example, special subject heading formats like MESH should be available.)
- Does the relevancy ranking expose the kind of material essential to your users?
- Basic and advanced options, facets, and limiters will be present in all WSDs, but do they *really* allow users to find the content they look for.
- Is it possible to enhance the results with syndetic and other external information?
- How well does a WSD work with a library's ILS and an institution's authentication system?
- How much work will it take to maintain the CI?
- Can customizations be done through a management console, or do they require programmers to use an API?

CURRENT WSD SERVICES

Here are the top commercial web discovery services (and two open-source products) most likely to be used by post-secondary libraries.

EBSCO Discovery Service (EDS)

EDS is a widely used discovery solution that provides a unified search experience across EBSCO's extensive library resources, including books, journals, databases, and a wide array of third-party targets. (https://connect.ebsco.com/s/article/What-content-is-included-in-my-EBSCO-Discovery-Service-EDS-profile?language=en_US)

The EBSCO holding manager is easy to use and powerful, and the central index is impressive. EDS offers advanced search capabilities, customizable interfaces, and good integration with diverse library systems. EBSCO shines when displaying full text from the EBSCO database.

EDS is ILS agnostic; in BC alone, EDS is used with Evergreen (Vancouver Community College), FOLIO (Okanagan College), and Symphony (TRU).

When combined with an SSO, EDS's personalization features are quite powerful. Many users without a single sign have difficulty using the My Folders option in EDS. Okanagan College's SSO has made the integration seamless.

OCLC - WorldCat Discovery

WorldCat Discovery provides excellent access to the extensive WorldCat database, which includes millions of records from libraries worldwide. Although OCLC does offer a comprehensive LMS option, which includes WorldCat Discovery, this discovery service will work with other ILSs, even Koha.

(https://help.oclc.org/Discovery_and_Reference/WorldCat_Discovery/Troubleshooting/Will_my_ILS_integrate_with_WorldCat_Discovery_to_deliver_real-time_availability_status)

WorldCat Discovery will work with target databases and collections via OCLC's central index of metadata or via remote access from a third party subscription provider's site. Third party content providers determines how a database is searchable, (in the central index or as a remote database) as a result the ease searchability of third party databases varies. (

https://help.oclc.org/Discovery_and_Reference/WorldCat_Discovery/Search_in_WorldCat_Discovery/060Search_the_Central_Index_and_Remote_Databases_in_WorldCat_Discovery)

Ex Libris Primo

Primo, developed by Ex Libris, is a widely adopted web discovery and delivery platform that pairs especially well with Ex Libris' Alma systems. While Primo is compatible with ILS systems from other vendors, it's important to note that the level of integration varies depending on the specific ILS.

Ex Libris offers two versions of Primo; Primo, a general discovery service and Primo VE, designed to be tightly integrated with Alma.

Primo and other Ex Libris products are powered by the Primo Central Discovery Index (Primo CDI). Both the Primo and Summon discovery services share CDI. (CDI is also used by the Ex Libris OpenURL resolver SFX). Primo CDI has over five billion records and is the core component of Primo's search functionality.

[https://knowledge.exlibrisgroup.com/Primo/Content_Corner/Central_Discovery_Index/Documentation_and_Training/Documentation_and_Training_\(English\)/CDI -](https://knowledge.exlibrisgroup.com/Primo/Content_Corner/Central_Discovery_Index/Documentation_and_Training/Documentation_and_Training_(English)/CDI_-_The_Central_Discovery_Index/010An_Overview_of_the_Ex_Libris_Central_Discovery_Index_(CDI)_)

[The Central Discovery Index/010An Overview of the Ex Libris Central Discovery Index \(CDI\) \)](https://knowledge.exlibrisgroup.com/Primo/Content_Corner/Central_Discovery_Index/Documentation_and_Training/Documentation_and_Training_(English)/CDI_-_The_Central_Discovery_Index/010An_Overview_of_the_Ex_Libris_Central_Discovery_Index_(CDI)_)

Because of this level of integration, a subscription to Alma is also a subscription to Primo.

Summon - ProQuest (Ex Libris)

Summon is the other discovery service by ProQuest. Summon's most direct competitor would be EBSCO EDS. As mentioned, Summon used the impressive Primo CDI. Summon displays ProQuest database results and full text seamlessly. Summon can certainly display full text from outside the Clarivate family of products but with varying degrees of success. (The same situation applies to the display of non-EBSCO resources in EDS.)

Summon is ILS agnostic and works with Evergreen (at VIU) and other ILSs.

Blacklight

<https://projectblacklight.org/>

Blacklight is another impressive open-source project that should only be considered by very large institutions. Blacklight uses two powerful and popular open-source products to provide an interface and indexing: Ruby on Rails" provides a basic discovery interface for searching an Apache Solr index.

The list of institutions that use this system is large and impressive. Ivy League schools and similar institutions can make highly specialized discovery systems for themselves.

<https://projectblacklight.org/#examples>

Blacklight is not a realistic option for most universities, but it is included to show that open-source + endless resources = amazing.

VUfind

<https://vufind.org/vufind/>

VUfind is similar to Blacklight; it is only ever an aspirational product for most institutions. The University of Chicago used it to create a custom discovery tool.

<https://vufind.org/wiki/community:installations>

VuFind runs on Apache Sol and offers impressive performance and scalability to allow VuFind® to respond to search queries in milliseconds time.

Alternatives to WSD (or supplementary tools)

Google Scholar, OpenURL, and Browser Extensions.

There is a free alternative to subscription WSD services, and students use that already. Google Scholar is the go-to search engine for many students and faculty.

Research suggests that using Google Scholar declines after a paid-for WSD is implemented. (Wang, 2020). Others argue the opposite. (Bartsch, 2022) Google Scholar cannot be ignored. “The scale and sophistication of the technology involved in Google Scholar far exceed that of the library-oriented service providers” (Breeding, 2015).

Other popular free sites such as Wikipedia, ResearchGate, and PubMed are heavily used by students and faculty even though good subscription alternatives are available. Google and Wikipedia are easy to use. Positive development of this trend is a constant improvement in the usability of commercial search engines and databases. Google, in particular, has set the bar for ease of use, and commercial providers cannot ignore the users’ expectations. Because of this, libraries struggle to convince users to use our discovery services, with varying degrees of success.

One possibility many institutions are exploring is meeting the users where they are. This could mean reference instructions on the best way to use Google Scholar et al. or that libraries hook themselves directly into third-party search engines. Most libraries have some of their full-text links visible in Google Scholar.

This is why extensions and bookmarklets are used. These add-on packages play to the library’s biggest strength – the ability to provide full-text access to citations and result lists.

Open Access Button: or OAB (<https://openaccessbutton.org/>) enables scholars to find free copies of open-access full-text articles with a browser extension that detects paywalls. OAB is an open-access tool in more than one sense. It was created by a collective of unpaid programmers. The results from this product are of mixed usefulness, but the primary concern is that Open Access Button will not link a user back to any subscribed full text.

Unpaywall: (<https://unpaywall.org/>) points you to legal, author-posted manuscripts hosted on university, NGO, and government servers. While the name might suggest otherwise, Unpaywall only harvests data from legally accessible sites. If Unpaywall indexers encounter indexed content posted in violation of copyright, it is removed from the Unpaywall index. (<https://unpaywall.org/faq>)

Unpaywall harvests content directly from open-access repositories and journals from around the world. That includes open data from PubMed Central, the DOAJ, Crossref, and DataCite. The citation data is used to make an index. When you load a new webpage, In use, the Unpaywall extension scans the text of that page, looking for a DOI. If one is found, they send it to their server to retrieve an OA location for the article. All of this happens in the background. All the user sees on a result list is a green icon that will eventually link to the full text.

[before the Crimean War](#), Hutchinson – via archive.org

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Wikipedia results without Unpaywall installed

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The Wikipedia results with Unpaywall installed. The PDF icons indicate a link to full text. All browser extensions display result lists in a similar fashion.

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EBSCO full text icons displaying in a result list from PubMed.

This is a screen grab of a result list from PubMed. The EBSCO extension works in a similar fashion, but links users to paid for resources. This requires an extra step during the installation process.

When configuring the plug-in, a user must specify what institutions they are affiliated with. When the user clicks on a full text icon, they will be re-directed to an institution's authentication page. After successfully authenticating the user is re-directed again to an EBSCO database or to EDS with the full text.

The Google Scholar Button extension operates differently. This extension places an icon next to the browser address bar. Clicking on that icon opens a pop-out window containing a Google Scholar search box.

Unpaywall's provides legal links to freely available full text, and that means it will not link back to library subscription full text, but there are browser extensions that legally connect to commercial databases. Commercial alternatives to OAB and Unpaywall can link search pages to subscribed full-text sources. The commercial extensions work with holdings managers to provide legal links to subscriptions.

EBSCO Passport: (https://connect.ebsco.com/s/article/EBSCOhost-Passport-Browser-Extension?language=en_US) is a free browser extension that dynamically inserts links to the full text. EBSCO's extension will direct you to access on EBSCOhost, link to access from your institution's subscribed content, or finally direct you to the preferred Open Access source via Unpaywall.

The EBSCO extension enhances the value of a subscription to other EBSCO products. There is no cost to use the extension. (For any institution that subscribes to an EBSCO product, that is.) During the extension installation, you will be asked to identify your institution. After the extension is activated, result lists in supported search engines, such as Wikipedia or PubMed, will display an icon that links to the full text. The icon indicates access is available through the institution or as Open access. Access is checked by matching DOIs. Your institution needs no setup, but a user may be prompted to log in to the authentication service.

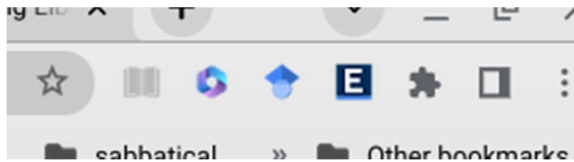
The **Lean Library** (a Sage Publishing product - <https://leanlibrary.com/>) and **LibKey Nomad** (a Third Iron product - <https://thirdiron.com/products/libkey-nomad/>) are two commercial providers selling extensions that focus on providing access to subscription-based library materials (Tay, 2019). For example, Lean Library extension can be integrated with information providers, including PubMed, Google Scholar, Elsevier, EBSCO, Wiley, and ProQuest. The commercial products provide access to articles from both journal publishers and aggregators like EBSCO and ProQuest. These products require a subscription to be purchased by institutional libraries. Once subscribed, users at those institutions can freely add the extension to their browsers. After a quick setup process, the extensions will link search pages to sources of the full text. If full-text access is available, you will be prompted to input your login credentials, and full-text access is granted. Where full-text access cannot be fulfilled from subscription resources, Lean Library searches for a legal Open Access alternative.

To further extend library resources into patron search results, Lean Library has partnered with Springshare to integrate LibGuides with the Lean Library browser extension (Sage Publishing, 2021). This integration allows libraries to display relevant instructional material from the library to any results list or website. Libraries can configure how much of their LibGuide content will be displayed. Linking LibGuides and Lean Library will have the effect of driving users back to the library web resources.

LibKey Nomad is used by Simon Fraser University. (<https://www.lib.sfu.ca/find/research-tools/libkey-nomad-browser-extension> / <https://thirdiron.com/>)

Lean Library is in use with Royal Roads University and is considered successful in that it supplements or replaces the discovery layer to some degree. (R. Croft, personal communication, Feb. 23, 2023) (<https://libguides.royalroads.ca/leanlibrary>)

If libraries have a goal of reaching the large mass of users who do not visit or use library resources browser extensions are useful, and the possibilities are endless, but they are not a magic bullet. The extensions have to be installed by each user into their own browser.



Icons for installed browser extensions on the control bar of a Chrome browser.

Many users will find out about the extensions themselves, but most will probably not be aware of their existence. As a result, many of the patrons that could be helped by a browser, those users who never visit the library, will not get the help they need. These users will remain stuck in the Google Scholar trap of limited access.

For this reason, if a library decides to employ browser extensions as a part of their technical plan, then they must also assume a considerable user education drive as well. (Hopefully in a more proactive way than a simple LibGuide <https://infoguides.rit.edu/googlescholar/unpaywall>)

Browser extensions can do more than provide access to full text. Altmetric, for example, provides a bookmarklet to view altmetrics in articles with a DOI. (<https://www.altmetric.com/solutions/free-tools/>)

Chat/IM, chatbots, business communication platforms, and other potential developments

Libraries, including TRU, use messaging software to provide reference services to users unable or unwilling to visit a reference desk. Chat reference is a low-barrier alternative to library resources for a number of reasons. (Dempsey, 2019) For students it is available at their point of need -usually at their home. (Also, TRU has a mandate to provide reference to BC Open Learning.) This is a contingent of users who may never visit Kamloops let alone our physical library. Chat reference usually anonymous, or at least faceless, is desirable for users who might never ask a question in person. (Dempsey, 2019) Examining the pros and cons of chat reference is outside of the scope of this document, but I will highlight the technical possibilities for offering remote reference access.

Among the tools Librarians can use are the good old telephone, SMS text/instant messaging, web-based text messaging. Recent developments with AI, chatbots, and co-browsing/cooperative browsing -which involves interactive control of a user's web browser, have made virtual/asymmetric/remote reference a much more viable option.

Virtual reality and augmented reality have been used to provide digital reference services. (Think of librarians setting up shop in the Second Life virtual world. <http://secondlife.com/>) A Google Scholar search using the terms Second Life, library, reference, will yield no articles written in the current decade. It is fair to say that virtual reality reference is an experiment that did not pan out.

Chat reference is hardly a new development. (Ehrenpreis & DeLooper, 2022) Libraries used commercial Instant Messaging (IM) software, Such as Yahoo, AIM, MSN and Google Talk, to provide reference services. This was an early attempt to provide reference support to users where the user was.

AIM (America Online Instant Messenger) was once an extremely popular IM service. Providing reference using this tool was a successful idea for its time, but it is also a cautionary tale. Commercial IM services all have unique interfaces. Librarians needed to learn the intricacies of multiple IM services to provide effective service. Also using multiple commercial IM services meant that reference staff time was consumed by constantly switching between different IM queues. (Sessoms & Sessoms, 2008) AIM went the way of many software platforms. America Online was acquired in a merger and eventually the AIM service was shut down.

Another disadvantage of using commercial IM tools was that those tools were developed with a one-to-one chat in mind. IM reference is a one-to-many proposition, one patron to, potentially more than one librarian. At the very least libraries were forced to share one IM account among many staff. Although there were ingenious processes and software put in place to deal with the limits of IM, it soon became clear that a purpose-built chat reference system built for library use was needed. (Sessoms & Sessoms) Several companies, as well as some open-source developers, responded to this need. As a result, the library marketplace is now well served with options for messaging servers. As with discovery services there are commercial and open sources options available for chat/messaging.

A quick Google Scholar search will reveal many articles detailing how libraries used chat reference, some for the first time, to deal with COVID 19. Microsoft Teams, a proprietary business communication platform, was very popular. (Boeninger, 2020). Because Teams is part of the Microsoft 365 family of

products and many universities subscribe to 365 in some form Teams is essentially a free option for a chat/video call reference tool.

Another visit to Google Scholar will reveal that many libraries used Slack (<https://slack.com/>) to provide asymmetric reference. (Vela, 2018) Slack is a proprietary service that primarily competes with Teams, offering workspace chat and videoconferencing. Advanced video calling features in commercial messaging products are very attractive to students. (Oviedo, V. Y., & Tree, J. E. F, 2021). The advanced messaging capabilities of commercial applications such as Teams, Slack and Zoom make any of these products a satisfactory option¹. Libraries will use the tools already installed at their own institution and learn to make the best use of their messaging platform.

I will omit a listing of messaging platforms, because not only would it take pages, but be of little use. Most institutions do not actively choose a messaging platform. Either they use the tool selected by a consortium they are a member of, they use the chat tool provided by their institutional IT department, i.e. Teams or Google Workplace, or else fall back on the Springshare option – Libanswers. Libraries use software they already own to provide virtual reference.

Chat reference, chatbots and AI chat tools

There are numerous other chat reference products on the markets. All of them require a higher commitment of library staff than the three products already mentioned. In exchange for the extra work libraries can expect to have a more effective and customizable experience at the price of extra work. (Ehrenpreis & DeLooper)

Springshare (<https://springshare.com/libanswers/>) offers a chat reference platform. (Springshare, 2023) It's advantage is that it is already embedded in many libraries, although unlike Teams, the library must pay for this subscription itself. In addition to human based chat LibAnswers provides a Chatbot based on a rule-based module (not an AI chatbot.) The intention of this product is to provide a first point of contact for chat patrons. Chatbot can guide them through search options, assist with finding relevant FAQ and general library information, and pass them off to live chat operators when needed. There is no need to choose between full feature messaging tools and Springshare products. Incorporating links to an external messaging tool is easily done with LibGuides or LibCal. (Boeninger, C., 2020)

There are numerous other chat reference products on the markets. All of them require a higher commitment of library staff than the three products already mentioned. In exchange for the extra work libraries can expect to have a more effective and customizable experience. (Ehrenpreis & DeLooper) Chatbots are hardly a new innovation. Many companies use chatbots on their websites. Starbucks incorporate chat features and natural language processing into it's mobile app. (<https://www.chatbotguide.org/starbucks-bot/>) Chatbots will probably continue to find a place on library web sites because they fulfill an important reference need. Chatbots are perfect for answering repetitive and simple reference queries.

¹ Although the words Zoom or Zooming have become synonymous with video calling Zoom is a relative newcomer to the video calling industry. Zoom was founded in 2011, but AT&T unveiled their Picturephone in 1964. (<https://time.com/5834516/video-chat-zoom-history/>)

Royal Roads University is implementing the Springshare Chatbot. RRU will be able to leverage some of the existing FAQs developed for the Springshare LibAnswers service.

RRU has benefited from labor savings by using Springshare's LibAnswers to answer simple and repetitive questions. LibAnswers provides a tool to communicate between users via email form or a chat widget. In addition, LibAnswers has a FAQ tool that provides the ability to collect answers in a knowledge base so they can be reused later. Recording answers to repeated questions is a significant time saver and has an important benefit in that the answers provided to all users are quick and consistent. LibAnswers can support multiple knowledge bases. RRU uses two knowledge bases, one for general library queries and a second knowledge base for questions sent to the writing center.

Questions related to citation formats and academic writing are easily answered by chat or FAQ type tools. The answers to this type of question are very proscribed and not reliant on interpretation. 1.5 persons maintain LibAnswers at RRU, but in return the labor savings have been significant. (R. Croft & C. Keenan, personal communication, Mar. 7, 2023)

Another component of LibAnswers is the chatbot functionality. Springshare's chatbot uses a decision tree and natural language to parse user questions and automate responses to them. The Springshare chatbot leverages the LibAnswer FAQ, and LibGuides to provide answers.

A decision tree, also known as a rule-based approach, is a conversational model that uses branching logic to guide users through questions and responses. Think of a flowchart, where each answer leads to a different path or outcome. A well-structured approach helps chatbots easily navigate complex topics and provide relevant assistance to users.

In 2023 AI driven chat tools, such as ChatGTP, came seemingly out of nowhere and are beginning to influence all sectors of the economy, potentially including libraries.

A rule-based chatbot and an AI chatbot differ in their underlying approaches and capabilities. These are the key distinctions between the two:

1. Approach to Handling Queries:

Obviously, a rule-based chatbot uses a predefined set of rules. It follows a specific decision tree to respond to user inputs. The chatbot's responses are limited by the rules programmed into it. This can be seen as a bug or feature. I prefer to regard it as a valuable feature. AI chatbots, as advanced as they are, still are not reliably accurate. (Dreibelbis, 2023) Rule based chatbots provide users with vetted answers created by humans. Springshare's chatbot developers use a rule-based approach because they want chat to be a tool for librarians, and not a replacement for them. (S. Zivkovic, personal communication, Mar 23, 2023)

An AI chatbot employs techniques, including natural language processing and machine learning, to understand and generate responses. By analyzing user inputs, they learn from interactions, and adapt responses to suit the context. AI chatbots can understand language and generate dynamic replies.

2. Training and Learning:

A rule-based chatbot requires programming of rules and scenarios. All possible user input must be anticipated in the rule set. Not having learning capabilities, their responses are limited to predefined, human mediated patterns.

An AI chatbot can be trained using various automatic and semi automatic techniques. Through training, AI tools can improve their understanding and generate more accurate responses over time.

3. Flexibility and Adaptability:

Rule-based chatbots are rigid and cannot handle complex or ambiguous queries that fall outside their programmed rules. To address this issue rule based chatbots usually give the user the option to communicate with a human operator.

AI chatbots generalize from training data and make informed guesses to respond to novel or ambiguous queries. This approach does not always guarantee a successful answer.

4. Ongoing Improvement:

Rule-based chatbots require manual updates and modifications to incorporate new rules or handle unanticipated user queries. They cannot improve or update themselves, but library staff are able to update or modify the rules and answers manually. Continuous examination of logfiles is essential for any automated process. Chatbots are like a garden, they require constant attention and pruning.

AI chatbots can continuously learn and improve based on user feedback, training data, and ongoing updates. Even so, continuous examination of the AI tools performance is a good idea, otherwise you might accept on faith that the AI tool is working as advertised. It goes without saying that uninformed users tend to give uninformed feedback.

I believe that AI tools will be embedded in library software at some time² in the future, but in the short-term options are limited. AI software is expensive to develop. (S. Zivkovic, personal communication, Mar 23, 2023) Large search engine providers have already created these tools. It is hard for a small company, and library software developers are relatively small companies, to compete with a freely available tool from Microsoft or Google. AI chat tools exist on the open internet and will disrupt library references services. Like Wikipedia and Google Scholar, chatbots are here to stay, are being used *now*, and libraries need to work that reality. The increased use of virtual reference triggered by the COVID 19 pandemic is here to stay and libraries will need to pay more attention to the software tools they select to provide virtual reference.

² I documented my experience using the Bing AI Chat tool. See the appendix for *Bing AI Chat Answers* and *Bing AI Chat Health Questions*. I was surprised at the capabilities of this new technology.

READING LIST / E-RESERVES SOFTWARE

Most ILS products ship with a course reserves module. Typically Course Reserves allow users to search for courses and view reserved materials in your physical collection. Users can search for courses by name, prefix, instructor or department. Reserve modules are quickly becoming irrelevant as more students use learning management systems as their learning hub. Traditional course reserves pre-date online resources, and although library staff have developed ingenious workarounds, it is time to retire the course reserves module.

As mentioned, libraries are experimenting with new ways to support instruction and incorporate their resources into the places students and faculty work. Reading list software is one such tool.

Depending upon the vendor, reading lists can:

- Offer a public-facing form to allow faculty to populate a list of reading material (reserves). If widely used, this tool can significantly reduce the time library staff need to create course reserves, but with the significant proviso that the library must be able to convince faculty to use the forms.
- Offer tools to integrate a reading list into LMSs
- Assist in copyright clearance.
- Integrate reading lists/reserves with other library software. Like the public-facing form, the restrictions with this aspect of reading list software are not technical limitations but how much faculty librarians can generate.

Considering the nature of this product class, it is not surprising that these modules are all cloud-based. OCLC, FOLIO, and Alma all have course e-reserve components built in.

1. Talis Aspire (<https://talis.com/talis-aspire/>): Talis Aspire's key features include collaborative list-making, library system integration, discovery layers, and copyright clearance tools. Talis provides a bookmarklet that faculty can install on their browsers. The browser extension facilitates the easy addition of web resources to lists. Aspire integrates with library catalogues and discovery systems, allowing users to quickly find and access resources from within the interface.

Talis is a smaller vendor, and Aspire is its flagship product. As a result, it is very good at what it was designed to do. Okanagan College uses Aspire for its course reserves even though FOLIO has a course reserves module. (<https://okanagan.rl.ca.talis.com/index.html>) A perfect example of how cloud-based systems make mixing and matching different products easy. (R. Janyk, personal communication, May 29, 2023)

2. Springshare E-Reserves (<https://springshare.com/libguides/er.html>): TRU uses this product. E-Reserves were acquired during the pandemic to bolster a touchless delivery system. Naturally, it is also a useful tool for distance users. Springshare E-Reserves is a module within the broader LibGuides platform. It allows libraries to create and manage electronic reserves, including course reading lists, a faculty input form, and copyright compliance. The key to E-Reserves' success is its integration with other products, such as LibGuides and LibApps. E-Reserves is Learning Technology Interfaces (LTI) compliant and offers several options for customization and integration with library systems, including Moodle.

3. Leganto: Leganto, unlike the previous products, is not offered as a standalone addition. Ex Libris developed it. While Leganto is designed to work seamlessly with Alma, it is typically offered as an add-

on module or feature within the Alma subscription. Because of this, Leganto works well with Ex Libris's Primo discovery layer.

The University of Regina and SFU have Leganto as part of their Alma subscriptions.

In Regina, Leganto is considered essential to link library resources with Moodle. (C. Bakker & D. Storie, personal communication, May. 25, 2023) It is also vital to the copyright clearance process.

SFU uses the Ex Libris API to customize Leganto. (S. Wong, personal communication, May 9, 2023) The customizations streamline links to lists of full-text resources.

REMOTE ACCESS / AUTHENTICATION / AUTHORIZATION SYSTEMS

The ILS used to be TRU Library's single most crucial self-hosted application. That made sense when the library primarily collected and circulated print and physical material. Now the library primarily makes available online resources, we still collect printed materials, but that material represents a tiny portion of our annual acquisitions. Our users need and use online resources. As of 2023 the library's most important server is now ezproxy.tru.ca. Our electronic resource vendors control access to their products using IP addresses. We are contractually required to restrict access to TRU users and EZproxy is our primary tool to achieve this goal. If EZproxy stops working, the effect on library access will be instant and severe, and the reference desk phone will start ringing.

Authentication is something that does not seem important until it is gone.³ Authentication and authorization are often conflated, but they are distinct processes.

During the authentication process, the user's identity is verified against a database of user credentials. The organization responsible for maintaining this database is typically the IT department. Authentication is used to answer the question, "who are you?" On the other hand, authorization involves checking whether a user can access a particular resource, answering the question, "can you use this?" It's important to note that authentication is always carried out before the authorization process.

To explain how an authentication/authorization process works, imagine clicking on a link in a search result list. Your remote access tool, such as EZproxy, sends your request to an authentication tool like LDAP or CAS. This tool then verifies your login credentials and sends a yes or no message to the remote access tool. If EZproxy confirms your identity and determines that you or your organization have access to a subscription resource, your request is forwarded to the vendor or database.

Typically, libraries are not interested in authentication, that is a campus IT responsibility, but remote access tools are often configured by library staff. Tools like EZproxy can use many methods of authentication. (

https://help.oclc.org/Library_Management/EZproxy/Authenticate_users/EZproxy_authentication_methods) So when evaluating a remote access tool it is critical that you confirm that it works with your institutions authentication system.

For the rest of this discussion, I will use the term authentication to mean all the remote access process.

Proxying is the most widely used technology for authenticating offsite access to electronic library resources. (Guajardo, Hamparian, & Katz, 2018). The most used proxy server used by libraries is OCLC's EZproxy. (<https://www.oclc.org/en/ezproxy.html>) EZproxy is easy to configure and set up, and there is a large user community to offer extra assistance with any issues. Still, there are concerns that proxy-based authentication will not last much longer. Federated identity technologies, such as OpenAthens and Shibboleth, have been in use for over a decade, and for almost as long, there has been a debate about their potential to replace proxy authentication.

³ Librarians have a bad habit of using the word authentication and authorization interchangeably.

Federated identity allows the exchange of authentication information about a user's identity from the authentication server (the identity provider) to other servers or organizations – federation (service providers). Sharing the authentication data with other entities means a single sign-on is possible. SSO removes the need for a database or service to authenticate a user themselves. Identity providers confirm and supply user information, and service providers give access to content.

Shibboleth (<https://www.shibboleth.net/>) and OpenAthens (<https://www.openathens.net/>) are single sign-on (SSO) systems that use the Security Assertion Markup Language (SAML) protocol to authenticate users. They are the most used alternatives to EZproxy. Because both systems are based on the same protocol, they work more or less the same way. The difference between the two is how an institution accesses them. Shibboleth is open-source software that is usually installed and managed by an institution. OpenAthens, on the other hand, is delivered as a cloud-based solution.

Choosing between a locally hosted solution such as Shibboleth and a cloud-based option such as OpenAthens depends on the financial and technical resources available. It boils down to a decision to do the work in-house or pay someone else to do it for you. The set of skills required to administer SAML installations is not inconsiderable. (<https://iam.harvard.edu/resources/saml-shibboleth-integration>) (Romano, & Huynh, 2021).

Cloud-based, hosted options are desirable because of the technical complexity of modern authentication systems. Any implementation of an SSO technology requires support and buy-in from campus IT departments. The ILS/LSP authentication services must be configured to work with other servers on campus.

Folio, itself a cloud-based system, can use the Microsoft Azure cloud computing platform to authenticate users. (<https://folio.zendesk.com/hc/en-us/articles/360045846772-Setting-up-Single-Sign-On-with-Microsoft-Azure>) Azure can also work with other EBSCO SSO products. At Okanagan College the SSO system links users directly to the My Account features in EBSCO products. (R. Janyk, personal communication, May 29, 2023) This type of power comes at the price of technical complexity and requires IT department assistance to configure. For these reasons many libraries choose a simpler authentication system.

Simple is a relative term, but EZproxy is more straightforward in operation than SAML-based systems.

EZproxy is an URL rewriting proxy server residing between users and the databases they are trying to access. Operators of an EZproxy installation maintain a config.txt to identify various websites or hosts that require authenticated access. The remote user connects to the EZproxy server using a specially configured URL on the institution's website. EZproxy checks the URL against config.txt and then forwards the user to a login page. (The actual authentication is usually done by an institution's IT department. TRU's EZproxy server uses the TRU LDAP server to verify usernames and passwords. EZproxy supports many methods of checking credentials.) When the user authenticates successfully, EZproxy deposits a cookie in the user's browser, granting remote access.

EZproxy is typically a locally hosted service. It does not require an institution to be part of a federation, whereas Shibboleth and OpenAthens do. As a result, the institution has great control over its EZproxy installation. In addition, federated identity requires the provider to be an active part of the federation. Major providers are configured, but smaller services are not. (<https://www.openathens.net/blog/why->

[openathens-is-the-mplete-solution-you-need/](#)) For this reason, OpenAthens include a proxy authentication service of its own.

To confuse matters further, OCLC offers a SaaS version of EZproxy.

(<https://www.oclc.org/en/ezproxy/hosting-options.html>) Okanagan College acquired hosted EZproxy after their previous locally hosted instance was corrupted by a cyber attack. (R. Janyk, personal communication, May 29, 2023) Hosted software maintained by a team of professionals is the gold standard in reliability. Considering the vital importance of authentication in academic libraries, this move was a wise decision by Okanagan College. And this demonstrates the fact that choosing an authentication system is too important to be left to libraries alone. Libraries must work with IT to select an authentication system or even have that system chosen for them.

INSTITUTIONAL REPOSITORIES / JOURNAL HOSTING SERVICES

Institutional repository software is a specialized segment of the broader library technology market. Repositories are digital platforms that enable libraries and their academic institutions to collect, organize, preserve, and provide access to scholarly and research materials produced by faculty, students, and staff. That might include various types of content, such as pre-prints, articles, theses, dissertations, datasets, conference papers, and multimedia files.

Like the market for ILS/LSPs, there is a mix of open-source and commercial products. Key features and functionalities of institutional repository software may include:

- **Content Management:** The ability to ingest, store, organize, and classify digital content, ensuring proper metadata and version control.
- **Compliance and Standards:** Support for industry standards and protocols, such as Dublin Core, OAI-PMH, SWORD, and OpenURL, will ensure interoperability and compliance with best practices.
- **Integration and Interoperability:** Interoperability with cataloging systems, institutional databases, and discovery layers is a significant asset.
- **Search and Discovery:** Robust search capabilities, advanced metadata indexing, and browsing options to facilitate the discovery of resources within the repository. (If a discovery layer is not used as the primary interface.)
- **Access Control and Permissions:** Flexible access control mechanisms allow administrators to define user roles, access levels, and permissions for different types of content. For example, indigenous documents might be subject to use restrictions consistent with a community's traditions. (<https://localcontexts.org/labels/traditional-knowledge-labels/>)
- **Long-Term Preservation and Archiving:** Tools for ensuring the long-term preservation and archiving of digital assets, including support for preservation formats and metadata.
- **Analytics and Reporting:** Built-in analytics tools are desirable, preferably tools that export data in standardized formats.
- **Customization and Branding:** Nice to have, but a consistent look and feel is essential for users.

There is a growing demand for institutional repository software as academic institutions showcase and preserve their research output. Funding agencies also mandate that publicly funded research be made available to the public and require that research data sets be preserved. Increased competition among vendors results in various options available to libraries and institutions of varying sizes and requirements.

Open-source software plays a significant role in the realm of institutional repositories. Some of the notable ones are:

1. DSpace: DSpace (<https://duraspace.org/dspace/>) is a widely used repository software. It provides extensive customization options, community support, and rich features.

2. EPrints: EPrints is open-source software designed specifically for institutional repositories. It offers extensive configuration options. EPrints supports various file formats and offers version control, access controls, and comprehensive reporting. Eprints have not been updated recently.

3. Islandora: Islandora is a digital asset management system built on top of Fedora Commons. (<https://duraspace.org/fedora/>) It combines the advanced features of Fedora with a Drupal-based user interface. Pairing the powerful back end with the customizability of Drupal makes for a powerful solution for managing institutional repositories. Islandora offers rich metadata management capabilities, advanced searching and browsing options, and integration with other library systems.

The Arca repository in British Columbia is a major shared installation of Islandora.

(<https://arcabc.ca/arca-repositories>) Arca demonstrates the utility of Islandora and the significant entrance requirement to implementing such a system. Islandora, like most powerful open-source library software, is too complex for smaller institutions to run locally. Luckily Islandora is well suited to multi-tenant installation.

5. Omeka: While primarily known as a web publishing platform for cultural heritage content, Omeka frequently serves as a lightweight institutional repository. (<https://omeka.org/>)

6. Invenio: Invenio is an open-source repository framework developed by CERN.⁴ It is primarily used for managing large-scale digital repositories. Considering Invenio's creators, it is unsurprising to learn that setting up an instance is a significant technical challenge. Luckily TIND Technologies, an official CERN spin-off enterprise, offers Invenio as SaaS. (<https://www.tind.io/>)

These open-source software options provide libraries with the advantage of community-driven development, active user communities, and the potential to customize the products to your requirements. They also require significant technical expertise for implementation and maintenance. Refer to the discussion on open-source ILS products if considering open-source repository software.

Commercial software solutions provide libraries with a turnkey solution. Here are some notable commercial software options for institutional repositories:

1. Digital Commons: Digital Commons, developed by bepress, is a widely used commercial institutional repository software. It offers a comprehensive suite of tools for managing scholarly content. (<https://bepress.com/about/>).

2. Rosetta: Rosetta from Ex Libris is a digital preservation system that functions as an institutional repository. Similarly to Alma, Rosetta features APIs to enhance customization, and Ex Libris is moving Rosetta to a cloud platform. Rosetta supports extensive metadata management, preservation workflows, and long-term archiving capabilities. It is to be expected that as Rosetta is updated, it will integrate with other Ex Libris products more thoroughly.

3. Figshare: Figshare (<https://figshare.com/>) started as a project to assist researchers in sharing research outputs, including datasets, media files, posters, and more. Figshare operates on a freemium model - individuals can open free accounts, but the company sells commercial solutions to institutional

⁴ CERN also gave the world the first website. <http://info.cern.ch/>

customers. Figshare offers features such as DOI assignment, altimetry, and integrations with popular research tools.

4. **CONTENTdm:** OCLC's CONTENTdm is a digital asset management system / institutional repository. Naturally, CONTENTdm integrates well with other OCLC library services.

When it comes to hosting academic journals, various options are available, ranging from open-source platforms to commercial solutions. These software options provide publishers and academic institutions with the tools to manage the editorial workflow, publish articles, and provide access. For most libraries, however, open-source solutions are the only option because they typically host smaller and fewer online publications.

British Columbia plays a significant role in this niche of library technology. The Public Knowledge Project (PKP) is a non-profit research initiative to make publicly funded research freely available through open access. UBC and SFU are major partners in PKP, and the project itself started at UBC.
(<https://pkp.sfu.ca/>)

1. Open Journal Systems (OJS): Open Journal Systems is a widely used open-source platform for journal hosting. OJS offers a complete editorial management system, enabling publishers to handle submissions, peer review, and publication processes. It supports various features, including article versioning, editorial workflows, metadata management, and indexing options. OJS is highly customizable, community-driven, and supported by an active user base. A plugin feature gives OJS an impressive level of extensibility.

2. Open Monograph Press (OMP): Open Monograph Press, PKP project, focuses on hosting scholarly monographs and edited volumes.

Patron self-serve options, kiosks, and self-service options

The market for library automated kiosks changed in response to the evolving needs of libraries during the pandemic. Kiosks offer self-service / touchless functionalities that allow library users to perform various tasks without encountering or requiring the assistance of library staff. Although kiosks preceded the pandemic by decades, the global emergency forced us to seriously think about the possibility of a staff-free circulation desk.

Regarding self-service checkout, there are options to meet all sizes, budgets, and requirements. There are free self-service options built into one ILS. Sitka has a basic self-service checkout system that only requires a device with a browser and barcode scanner. The Thompson Nicola Regional Library uses a similar system.

Large, full feature, pricey devices at the other end of the spectrum can operate as a small branch library or a fully automated reserves desk. These devices are a significant investment but offer the opportunity to decentralize circulation reserves and supply access outside a branch library's space and open hours.

The market for kiosks is competitive. In Canada, Bibliotheca, Convergent Library Technologies, and EnvisionWare are the prominent players with similar product lines. Each vendor sells a line of traditional kiosks up to larger cabinet-style devices. Libraries should evaluate them on cost, features, vendor reputation, support, and integration capabilities when selecting a kiosk solution.

(<https://www.bibliotheca.com/>, <https://www.envisionware.com/>, <http://www.clibtech.com/>)

Meescan (<https://meescan.com/>) sells smaller kiosks but has focused on a different type of self-service product. They focus on the development of self-serve systems based on personal devices like phones or tablets. British Columbia-based Meescan specializes in standalone self-checkout kiosks and mobile self-checkout options using patrons' devices and smartphones. Meescan's solutions prioritize ease of use. UNBC uses Meescan kiosks, and the device at the heart of their kiosk is an Ipad; nothing more is needed.

I would like to see libraries make more use of tablet-based kiosks. Outside libraries, there is a thriving market for tablet-based kiosks for collecting user feedback. Zonka is only one example.

(<https://www.zonkafeedback.com/survey-app-features/customer-feedback-survey-kiosk>) The possibilities for collecting user opinions are exciting and much less intrusive than questionnaires or surveys.

The SIP and NCIP protocols that connect library software with external devices are open and well-supported by all software and hardware vendors. Automated kiosks seamlessly integrate with the library's management systems. All vendors support optical and RFID-coded book tags. Incorporating contactless technologies, such as mobile barcode scanning and NFC (Near Field Communication), is the selling point depending on a library's needs. To future-proof investment in this technology, a selector should acquire devices that can be updated with new hardware modules -for example, a kiosk that features replacement scanning units.

Self-service devices are mature technology with a wide range of options. Base the choice to acquire kiosks on the circumstances unique to your library. The equipment to fulfil any need is readily available.

LIBRARY CONTENT MANAGEMENT SYSTEMS

I have already briefly touched on library content managers. At the risk of repetition, the creation of professional-level websites is complex. Most organizations strive to present the best possible website to the public, and content managers are essential. Consistency is an important attribute of a professional website, so there is a tendency to consolidate websites under the umbrella of a campus-wide CMS. There are many excellent reasons a library would pass on the responsibility of web creation to trained professionals, and often libraries have no choice in the matter. (More on this later.) There are commercial CMS products that offer low-complexity options although they are not primarily library focused, they are an option. These include Weebly, Wix, and Squarespace. However, there are only three viable alternatives for a library website:

1: The CMS imposed on the library by the university. This is not a bad option. Support is close at hand, and the price will be right. Most universities do not charge departments for using the CMS. Responsiveness from the campus web team is often an issue, but this option exchanges flexibility for freedom from technical challenges.

2: Drupal is the choice for campuses that have the technical know-how. There are many other excellent CMS products, including a well-supported open-source product called Drupal. Drupal is a powerful CMS with an active user base and is still actively developed. Many libraries use Drupal (Drupal.org, 2022). For example, Carlton University's MacOdrum library uses Drupal for its library guides. For example (<https://library.carleton.ca/guides/help/academic-integrity>)

Drupal offer amazing flexibility and extensibility. It is technically demanding, and at least one person at the library will need strong HTML/CSS/design skills. Drupal can be hosted locally, or else commercial hosting options are available.

Locally hosted solutions generally provide more customizability. (Erturk & Iles, 2015). Conversely, a library exchanges some autonomy if they choose to use a SaaS solution.

Drupal is a complex software piece requiring a skilled webmaster/administrator. SFU has a technician who works almost exclusively on configuring a locally hosted installation of Drupal. (N. Saklikar, personal communication, May 5, 2023) Drupal is a powerful content manager that fully extensible using plugin modules. For example, Islandora, an open-source framework, can turn a Drupal website into a digital repository. (SFU does use Islandora.) The technician and other web team members can customize a locally hosted application to suit the specific needs of the SFU library.

3: The default option for most libraries is Springshare LibGuides. This product has differentiated itself by being designed for library use, inexpensive, and, above all, easy to use. (Pope, 2015). Springshare's LibGuides is an easy-to-use content management system deployed at thousands of libraries worldwide. The most common use case for LibGuides is that it acts as a complement to the institutional CMS. That is the case for TRU. Royal Roads University uses LibGuides as a tool for librarians to enter content, and then that content uses middleware to push the content into a Drupal website. (R. Croft & C. Keenan, personal communication, May 29, 2023)

Many libraries use LibGuides to make their complete website.

<https://buzz.springshare.com/producthighlights/libguidescms-as-website/academicexamples>

However, spending time and money on a sophisticated, locally hosted CMS such as Drupal does not make sense for small libraries with limited professional staff members. Libguides, which uses a WYSIWYG (What You See Is What You Get) interface and drag-and-drop design features, can build a site with a few pages in only a few hours. Therein lies a problem; LibGuides is well suited to making a libguide, but putting together a complete site is another matter.

If a library uses LibGuides for its entire site, as is the case with Vancouver Island University, they need a person with elevated web design skills. VIU uses LibGuides for their site, and having a LibGuide resource person helps with design issues and ensures the entire site has a consistent look and feel. (J. Blackburn, D. McFarland, D. Sifton, personal communication, April 25, 2023)

Springshare offers consulting services for libraries that need more resources to develop a full site in-house.

<https://blog.springshare.com/2021/04/08/get-one-on-one-help-with-springshare-consulting/>

An effective web site is as vital as to a library as a well-chosen ILS or discovery service. Choosing the correct CMS should be considered in that light.

OBSERVATIONS ABOUT THE STATE OF LIBRARY TECHNOLOGY

I started this environmental scan with a quote from Bill Gates and so it is only fair I end with one from Steve Jobs. According to Steve Jobs, "If you define the problem correctly, you almost have the solution."

The range of software options available to libraries has exploded. Despite consolidations in the industry there are still plenty of choices for ILS/LSPs, CMSs, and discovery layers. There are classes of software that did not exist ten years ago, and development is still ongoing. There is always another option if that is what you are looking for.

This could be seen as a philosophical decision. If your institution has a strong commitment to open source there are solutions for you. If you prefer a commercial solution that offers a full range of options, there is a solution for that.

Perhaps ease of use and maintenance is the primary concern. Well, there are choices to be made there.

It could be that the decision boils down to money. If an institution has lots of it there are full featured options available. If money is scarce there are relatively low-cost ILSs out there. The savings on the ILS can be ploughed back into the discovery layer and other third-party products. An ability to pick and choose might allow you to game the market and save money.

So how do you choose which technological path to take? To paraphrase Steve Jobs, if a library creates a detailed plan, an agreed upon endpoint, and has a realistic assessment of its capacities the answers will be much clearer.

WORKS AND PERSON CITED

PERSONAL COMMUNICATIONS

I would like to express my gratitude to my colleagues at other libraries who generously shared their time and expertise with me.

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Simon Frasier University

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University of Regina

Caitlin Bakker, Dean Mulhall, Barbara Nelke, William Sgrazzutti, and Dale Storie

Vancouver Community College

James Fournie

Vancouver Island University

Jean Blackburn, Dana McFarland, and Daniel Sifton

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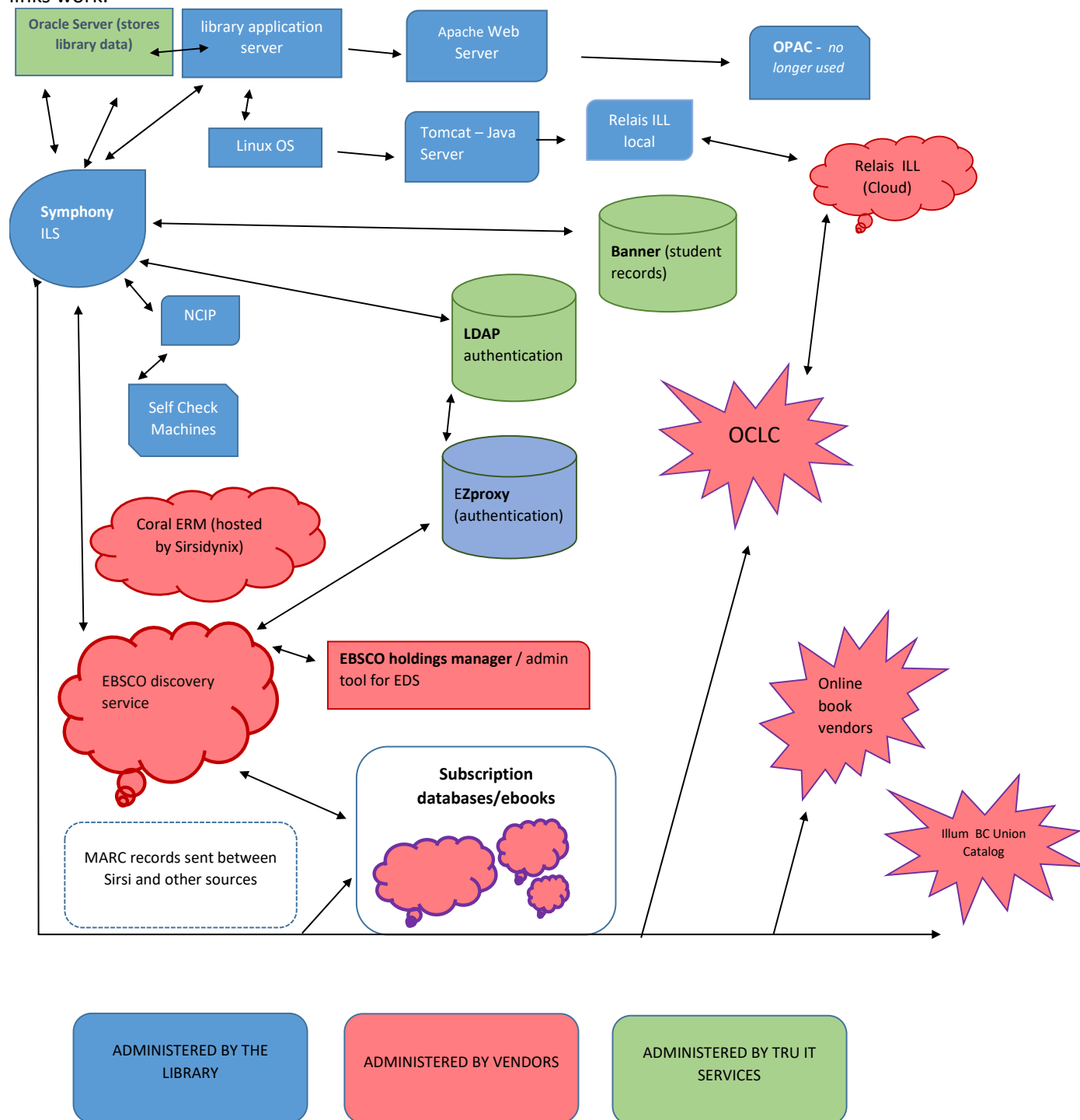
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APPENDICES

APPENDIX A

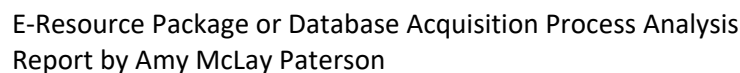
TRU LIBRARY SERVER CONNECTIONS

This diagram displays the link between the library's ILS server, other servers on campus, and external servers and web sites. The work of technical staff in modern academic libraries is making sure all the links work.

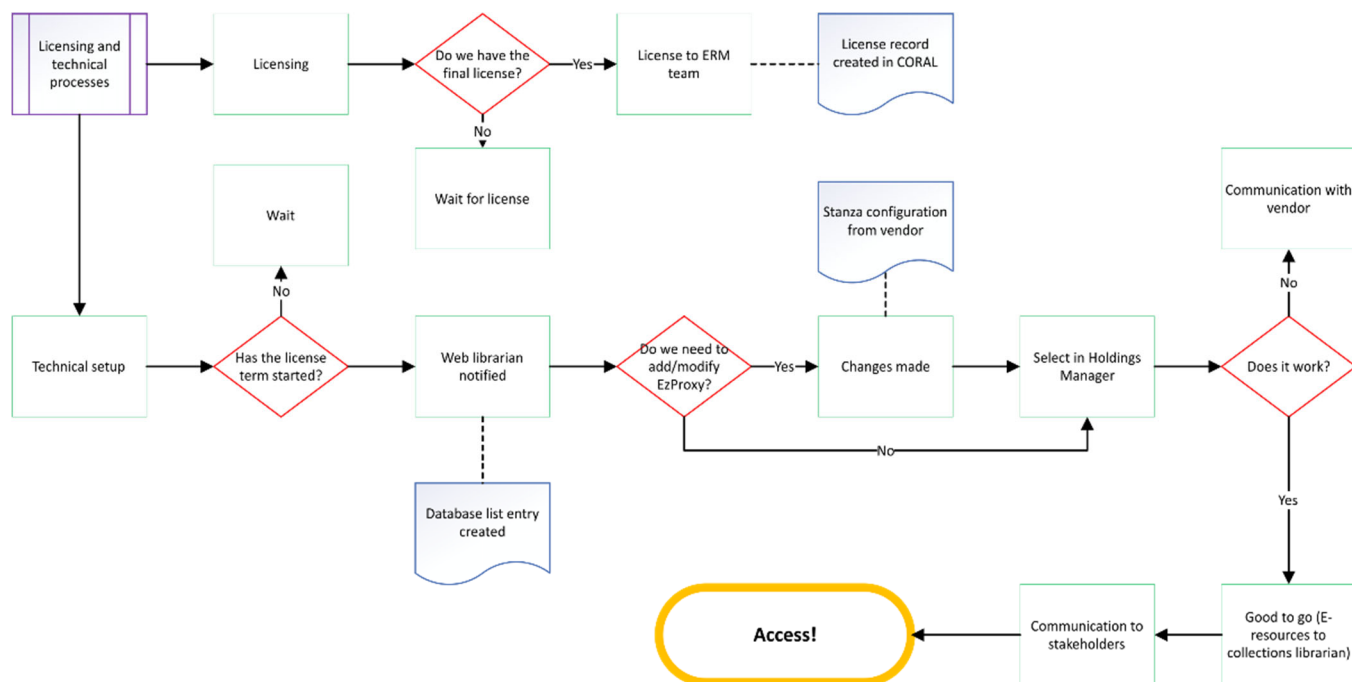


THE STEPS REQUIRED TO CREATE A NEW RESOURCE

Excerpted from E-Resource Package or Database Acquisition Process Analysis
Report by Amy McLay Paterson (2020)



Continues next page



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Question 2 Who is a better writer, Agatha Christie or Ian Flemming?

Considering the highly subjective nature of this question I was surprised at how good the response was.

>>>>>>>>>>>>>>ANSWER>>>>>>>>>>>>>>

That's a subjective question that depends on your personal preferences and tastes. Agatha Christie and Ian Fleming are both famous British authors who wrote in different genres and styles. Agatha Christie is known as the Queen of Crime for her detective novels and short stories featuring Hercule Poirot, Miss Marple, Tommy and Tuppence, and other memorable characters⁶. She wrote with a style that was self-aware, witty, clever, and full of twists and clues⁵⁸⁹. Ian Fleming is known as the creator of James Bond, the iconic spy who appeared in 14 novels and many films. He wrote with a style that was sensual, descriptive, adventurous, and realistic⁷ [^10^]. He used his own experiences as a naval intelligence officer and a journalist to add authenticity to his stories[^10^].

Some possible reasons why you might prefer Agatha Christie over Ian Fleming are:

- You enjoy solving puzzles and mysteries more than action and suspense
- You like reading about diverse settings and historical periods more than contemporary events
- You appreciate humor and irony more than violence and sex
- You value character development more than plot devices

Some possible reasons why you might prefer Ian Fleming over Agatha Christie are:

- You enjoy thrillers and espionage more than whodunits and cozy mysteries
- You like reading about exotic locations and modern gadgets more than rural villages and old-fashioned manners
- You appreciate glamour and luxury more than simplicity and modesty
- You value excitement more than logic

Ultimately, both authors have their own merits and appeal to different audiences. The best way to find out which one you like better is to read some of their works yourself. What do you think?

Source: Conversation with Bing, 2/23/2023 (1) The Mysterious Affair at Styles - Wikipedia.
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APPENDIX D

AI CHAT REFERENCE QUESTION EXAMPLES: HEALTH REFERENCE

Because I am the nursing liaison, and because I live with a subject expert I was curious about the answers Bing Chat would provide if given health information requests.

My first questions was *'how much tylenol can you take in a day?'* My partner is a pharmacist, and she thinks the answers were spot on. At the suggestion of my partner I tried more complicated questions. *'What is the daily dose of doxorubicin and can I take doxorubicin while I am on warfarin?'* The pharmacist rated the answer to this more complex question as satisfactory.

I asked a few questions and in all cases the answers were rated as good. I still recommend Medline Plus as the authoritative source for consumer level health information. Naturally you should tell a patron to speak to a doctor for any personal medical question, especially dosing questions, but as demonstration of the AI technology this exercise was very informative.

It goes without saying that if your doctor uses a tool like this, get another doctor.

Question 1 Tylenol dosing

How much tylenol can you take in a day?

The answer was impressively accurate and readable. The embedded citations are from very reputable sources.

>>>>>>>>>>>>>>>ANSWER>>>>>>>>>>>>>>>

Tylenol is a brand name for acetaminophen, a pain reliever and fever reducer. The dosage of Tylenol depends on your age, weight and the strength of the product⁴. According to the official website of Tylenol^{2,3,5}, the general guidelines for adults are:

For Extra Strength Tylenol (500 mg per tablet or capsule), do not take more than 6 tablets or capsules per day (3000 mg). Under supervision of a healthcare professional, you may take up to 8 tablets or capsules per day (4000 mg).

For Regular Strength Tylenol (325 mg per tablet), do not take more than 10 tablets per day (3250 mg). Under supervision of a healthcare professional, you may take up to 12 tablets per day (3900 mg).

Do not take Tylenol for more than 10 days unless directed by a doctor.

Please note that these are general recommendations, and you should always follow the directions on the label or consult your doctor before taking any medication. Also, be careful not to take other products that contain acetaminophen as it may cause liver damage if you exceed the maximum daily dose⁴.

Source: Conversation with Bing, 2/23/2023(1) Tylenol: Uses, Dosage, Side Effects, Warnings - Drugs.com. <https://www.drugs.com/tylenol.html> Accessed 2/23/2023.

(2) **TYLENOL® Dosing Guidelines | TYLENOL® Professional.**
<https://www.tylenolprofessional.com/adult-dosage> Accessed 2/23/2023.

(3) Adult Dosing | **TYLENOL®**. <https://www.tylenol.com/safety-dosing/dosage-for-adults> Accessed 2/23/2023.

(4) Safe Acetaminophen Dosing For Adults | **TYLENOL®**.
<https://www.tylenol.ca/safety-dosing/adult/dosage-for-adults> Accessed
2/23/2023.

(5) Tylenol (acetaminophen) dosing, indications, interactions, adverse ... <https://reference.medscape.com/drug/tylenol-acetaminophen-343346>
Accessed 2/23/2023.

Question 2 – the difference between a cold and flu

Once again the answer is very good, and the sources are impeccable. I was pleasantly surprised to see the information about COVID 19. Although that information was not specifically requested in our current context it would be fair to say a question about flu or colds might be a round about way of inquiring about COVID. If that was the case the chatbot failed to determine the correct answers.

>>>>>>>>>>>>>ANSWER>>>>>>>>>>>>>>

A cold and a flu are both respiratory illnesses caused by different viruses¹². They have some common symptoms, such as cough, sore throat, runny or stuffy nose and fatigue¹². However, there are some differences that can help you tell them apart:

A flu usually causes a fever or feeling feverish/chills, while a cold rarely does¹².

A flu usually causes muscle or body aches and headaches, while a cold seldom does^{1 2}.

A flu usually has more severe and abrupt symptoms than a cold². A cold is milder and develops gradually³.

A flu can lead to serious complications such as pneumonia and hospitalization, while a cold generally does not^{2 3}.

If you are not sure whether you have a cold or a flu, you should consult your doctor for diagnosis and treatment. You should also be aware of the symptoms of COVID-19, which can be similar to both cold and flu but may also include loss of taste or smell, shortness of breath or difficulty breathing⁴.

Source: Conversation with Bing, 2/23/2023(1) Cold Versus Flu | CDC.
<https://www.cdc.gov/flu/about/qa/coldflu.htm> Accessed 2/23/2023.

(2) Cold Versus Flu | CDC - Centers for Disease Control and Prevention.
<https://www.cdc.gov/flu/symptoms/coldflu.htm> Accessed 2/23/2023.

(3) Flu or Cold? Know the Differences - WebMD.
<https://www.webmd.com/cold-and-flu/flu-cold-symptoms> Accessed 2/23/2023.

(4) COVID-19, cold, allergies and the flu: What are the differences?.
<https://www.mayoclinic.org/diseases-conditions/coronavirus/in-depth/covid-19-cold-flu-and-allergies-differences/art-20503981>
Accessed 2/23/2023.

APPENDIX E

OBSERVATIONS ABOUT MIGRATING LIBRARY SYSTEMS

I visited UNBC to speak with the staff there about their recent migration from Sierra to the OCLC WMS library management platform. I spoke with Geoffrey Boyd, Annelise Down, Trina Fyfe, and Kat Louro about their impressions of the migration process. They were very informative.

I used to work for the Nova Scotia Provincial Library. I participated in many migrations carried out with regional library systems. Here are some very general observations about the migration process I have noted.

- Migrating enterprise level software is a time-consuming process even before the new software is installed. It took UNBC between three to four months to strike a committee and produce an RFP document. The committee took about a year and a half to produce the RFP, wait for responses, evaluate responses and demonstrations, and to make a final decision.
- The composition of the selection committee is very important, it must represent all the major divisions of the library, systems, technical services and access services, and importantly a representative of campus IT. It is not a committee of the whole library, too many members make the process unwieldy. The selectors must take feedback from staff, but they make the decision.
- Bids are evaluated on criteria published in the RFP. Do not assume that a vital feature will be present, if you need something *put it in the RFP*. Specify what are essential features in the RFP and differentiate between what are preferred features.
- Evaluation of bids must be fair, accurate, and transparent. The library must justify their final decision to the applicants who did not win the contract. All members of the selection must make the time to properly document their assessment of each vendor's proposal.
- The vendor of the previous system may offer a service to help with the migration. (By assisting in the migration of data from the old system into a format compatible with the new product.) You will still have a relationship with the previous vendor until your contract expires. Make use of that.
- Having an overlap between two systems can be helpful. Only one system should be visible to the public, but staff appreciate having access to the old system for a while. This access can help when configuring the new system but remind staff the old system is read only.
- Do not try to replicate your old workflows and policies in the new system. That rarely works. Each system has its own way of doing things and staff will have to adjust to that, and eventually they will be able to make the best out of what the new system has to offer.
- You cannot migrate policies from one system to another, and that is a good thing. Treat a migration as an opportunity to have a fresh start. Look at circulation rules, patron categories, loan period, and fine policies. The migration is a perfect opportunity to get rid of policies and workflows that no longer serve the library or patrons.

- Schedule a migration to start at the beginning of summer. That will give you time to work out any issues before students return. Having said that when the students return new issues will arise.