Smarter Libraries through Technology

Strengthening the Impact of Print Collections

By Marshall Breeding

Despite increased interest in digital and electronic content, libraries continue to manage print materials as a core part of their work. While much of the new opportunities lie in digital content and services, the future of libraries also depends on how well they can manage the diminishing—yet persistent—print collections. Current trends do not point toward a future of all digital libraries. Rather complex, multi-format collections composed of print and electronic resources will prevail for the indefinite future.

Technologies for managing traditional print collections are well established. The business patterns for acquisitions, cataloging, and circulation were developed several decades ago and form the core of integrated library systems (ILSs). Over the years the initial processes have been significantly enhanced, handing off many processes to external systems. Examples include increasingly automated acquisitions through vendor ordering platforms able to transfer bibliographic, holdings, and item records with little human intervention. Integration protocols, such as SIP2, Z39.50, EDI, and custom APIs, enable transfer of data in and out of the ILS, often replacing tasks manually performed by library personnel.

A variety of different components supplement the ILS in the management of print materials. Self-service kiosks and automated material handling have become more dominant touch points for the circulation of library materials than the traditional service desk. Often, public library patrons interact with the interface of the self-service kiosk just as much as the online catalog. Automated material handling equipment, such as smart book returns and centralized sorters, perform essential logistical tasks and are especially appreciated in busy public libraries.

While most libraries use the online catalog or discovery service provided with their ILS, many have implemented replacement products. BiblioCommons has attracted a growing base of public libraries to their BiblioCore discovery interface and BiblioWeb content management system. Open source discovery interfaces based on VuFind or Blacklight have likewise been implemented successfully in academic and public libraries.

Although some aspects of the ILS have been handed off to other systems, it nonetheless remains core to the public library business infrastructure. It provides the fundamental infrastructure for bibliographic description of the collection, budget, and financial management for materials acquisition and patron data and services.

In the realm of academic libraries, the functionality related to print management lives alongside electronic resource management within the library services platform. While academic libraries have seen electronic resources rise at the expense of print materials, physical collections remain highly valued. As academic library budgets become increasingly constrained to acquire print materials, these institutions are implementing novel strategies to get the most impact of these collections,

primarily through collaboration with peer institutions. In August 2019, for example, a new report was published that describes the work of the Big Ten Academic Alliance to create a collaborative shared collection among its member libraries. The report discusses the processes and strategies that have achieved a shared collection of massive scale and the opportunities to add even more value through additional efforts.[1] The ReCAP (Research Collections and Preservation Consortium) high-density storage facility shared by Princeton University, Columbia University, New York Public Library, and Harvard University serves as another example of increased impact of physical collections. This large-scale, offsite storage facility provides a massive volume of collection materials to the users of each of the member participations.

This issue of *Smart Libraries Newsletter* features the Intelligent Material Management System (IMMS) from Lyngsoe Systems to efficiently manage library collections. This innovative product uses enriched inventory data from the library's ILS and detailed information regarding the shelving and storage locations throughout the library system to achieve substantial savings in logistical costs. The Lyngsoe IMMS illustrates the interest by libraries in implementing technologies that can help optimize their services surrounding their print collections.

Lyngsoe Systems: Intelligent Material Management System (IMMS)

Lyngsoe Systems, a major supplier of automated material handling equipment and related technology products, has recently developed the Intelligent Material Management System. This product was introduced in partnership with the Aarhus and Copenhagen public library systems in Denmark and has since been adopted by other libraries in Scandinavia and the UK. The IMMS is a business application that supplements a library's ILS and self-service and automated material handling equipment to achieve savings in personnel costs through increased efficiency and reduced inventory errors.

Overview of IMMS

The key business objective centers on managing a library's logistics for its collection use more efficiently than could be performed by the ILS alone. It also helps reduce errors that lead to misplaced items, which can be frustrating for library patrons and personnel. The automated distribution of inventory improves patron satisfaction with the library by ensuring that the shelves are stocked with the optimal quantity and mix of materials.

The IMMS operates in tandem with the organization's ILS. The ILS continues to manage most aspects of the library's collection, such as acquisitions, cataloging, and circulation. But rather than depending on the capabilities that might be built into the circulation module, the IMMS manages the flow of library materials for floating collections and routing materials within and between branches. By optimizing routing among branches, materials are delivered rapidly with lower overall logistical costs. It performs these tasks more efficiently through the detailed data it maintains regarding the space available in each shelf location, branch, or other storage facilities. IMMS harvests inventory data from the ILS in bulk during initial setup with ongoing synchronization as it operates. The initial implementation also involves registering each potential shelf location so that the system can fill them to optimal levels relative to content and shelf capacity. The performance of the IMMS in a library system can improve as it is used through the constant accumulation of collection data and use patterns.

IMMS works in conjunction with the library's self-service and automated material handling equipment. Larger library systems would ideally implement a high-speed centralized sorter. New material added to the collection and materials returned to branches would be processed through the central sorter, which would dispatch items to an optimized branch location based on the data and business logic programmed into the IMMS.

Libraries without centralized sorting can also benefit from IMMS. Optimized distribution can be accomplished with smaller, branch-level sorters or even manually. Libraries without sorters, for example, would use a self-service return that instructs the patron to place the item on specific return carts, which are then routed appropriately.

Library personnel operate the IMMS via a web-based interface, used primarily for setting up the system and for generating reports. Most circulation tasks continue to operate through the staff interface of the ILS or through self-service loan and return kiosks. Library personnel would usually use the IMMS on a mobile device with a barcode scanner or RFID

reader for picking requested items from the shelves, collection weeding, responding to relocation requests, or other tasks. Carrying out these tasks on a mobile device avoids the traditional printed pick lists.

Media Hotels and Permanent Storage Facilities

In addition to managing the routing of collection items among branches, IMMS is also able to manage materials in storage facilities. These facilities would use standard library shelving. Rather than following an arrangement, such as by topic or call numbers, IMMS manages the items based on optimal shelving capacity, tracking each item so that it can be retrieved as needed. Items in a storage location are organized according to a warehouse management technique called "chaotic storage," where materials are placed within a bin or shelf unit without regard to call numbers or other conventional shelf ordering. The inventory management system, however, tracks the exact location of each item so that it can be efficiently retrieved when requested. The system can generate intelligent pick lists, ordered so that a staff member can retrieve items by following a straight path without having to continually go back and forth through the storage area.

Library systems with more collection materials than available shelf space in its branches, can also implement what Lyngsoe calls a "media hotel," a designated area to receive and hold items when there is no room at other branches. Lower-use or specialized materials could be held in the media hotel until requested or until sufficient space is available in a branch in need of that type of item. A media hotel would follow the chaotic storage model and locational item placement and retrieval as used in a permanent storage facility.

ILS Interoperability

Lyngsoe has developed a specification for each aspect of interoperability needed between the IMMS and the library's ILS. The IMMS is populated with detailed data regarding the library's collection inventory, its circulation policies, shelving locations available, and other related parameters. It does not collect or process any patron data. Patron data remains entirely within the ILS, which continues to perform patron-facing messaging and account features. This specification defines the scope and format for bulk data transfers needed for initialization as well as real-time web services used in the operation of the system.

Library Implementations

The IMMS was initially implemented in the public library systems in Aarhus and Copenhagen in Denmark, beginning in 2013. As a result of the implementation of IMMS, the Aarhus library, with 19 branches, achieved a 15.7 percent savings in material handling costs and Copenhagen saved 40.9 percent across its 20 branches. The libraries also saw substantial decreases in patron queries related to collection items not in their expected location. A centralized sorting facility was implemented in the Copenhagen library system at the same time as the introduction of IMMS. Lyngsoe Systems concluded in their IMMS evaluation report that:

> Intelligent Material Control is now implemented and in full operation. The measurements have confirmed that the estimated efficiency improvement has been met. In this sense, the project and the newly developed system Intelligent Material Management are considered successful. The present project has therefore developed a new logistics tool that can be implemented as a standard solution for other libraries who may be interested in it. Furthermore, there are opportunities for further development of the technology so that it is adapted to needs and possibilities as these are exposed.[2]

The Helsinki Public Library in Finland implemented IMMS in conjunction with its Sierra ILS to manage materials across its 37 libraries.[3] IMMS was implemented in Helsinki in advance of the opening of the acclaimed Helsinki Central Library Oodi, with the goal of operating this facility without having to increase staffing for the system as a whole.

In August 2019, Liverpool University in the UK implemented IMMS to work with their Sierra ILS. This implementation is the first outside Scandinavia and one of the first academic libraries.

Lyngsoe Systems in the United States

In the United States, Lyngsoe is especially known for its high-performance central sorting systems. Its equipment is used in the BooksOps facility that serves the New York Public Library and the Brooklyn Public Library. The King County Library System in Washington likewise has a central sorting facility based on a Lyngsoe sorter. These two centralized sorting operations are the fastest in the world, each able to achieve peak capacity of about 15,000 items per hour.

In addition to its own direct sales in the United States, it partners with EnvisionWare to distribute its products.[4]

Company Background

Lyngsoe Systems provides logistical hardware and other technology components for a variety of industries, including airports/airlines, healthcare, postal services, manufacturing and supply chain, and customs and shipping, in addition to its family of library products. The company is based in Aars, Denmark with offices in Fredrick, MD and Bolton, Ontario, Canada.

For libraries, Lyngsoe offers a wide variety of products, including automated material handling equipment, self-service hardware and software, security gates, and room booking systems, in addition to the recently introduced intelligent material management system. Lyngsoe offers other specialized library products such as the Book-o-Mat for holds pickup and Holds-Mate for return of materials requested for holds.

The company is majority owned by the CataCap private equity firm based in Copenhagen. Bjerregaard Thomsen serves as company CEO and Jørgen Bardenfleth chairs its Board of Directors. Lyngsoe Systems employs a workforce of about 200 globally.

Business Chronology

- 1952: Lyngsoe Systems is founded as a division of Søren T. Lyngsø AS, based in Copenhagen to develop logistics products for the energy, marine, and environmental sectors.
- September 1994: Lyngsoe Systems division changes ownership through a management buyout.
- 1999: Lyngsoe Systems opens sales and support office in Frederick, MD in the United States.
- 2000: Lyngsoe Systems invests in Net-Mill International AS, a firm specializing in mobile internet technologies.
- 2001: Lyngsoe Systems opens an office in Toronto, Canada.
- March 2014: Private equity firm CataCap acquires majority share in Lyngsoe Systems.

Gobi and Oasis

EBSCO Information Services and ProQuest both have diversified businesses that include book marketplace and ordering platforms. GOBI, originally created by YBP Library Solutions, was acquired by EBSCO in 2015. ProQuest acquired the OASIS and MyiLibrary platforms from Ingram Content Group in April of the same year. ProQuest has begun the development of a new content acquisition platform branded as Rialto. The two companies compete in many different areas of content and technology.

ProQuest and EBSCO also cooperate in some areas. Both companies offer major academic book platforms. Following their respective acquisitions of GOBI and OAISIS, the two companies entered a partnership to offer their book content on each other's respective platforms, continuing the arrangements in place prior to the acquisitions. In August 2019, the two companies announced that they have renewed this partnership for an additional four years.

In related news, ProQuest has named Pep Carrera as the new President of its Books business unit. Carrera comes to ProQuest from VitalSource, the division of Ingram Content Group involved with digital textbooks.

Mergers of Non-profit Organizations Now Complete

The March 2019 issue of *Smart Libraries Newsletter* described the anticipated merger of the DuraSpace into Lyrasis. The respective boards of directors of these two non-profit organizations have given final approval to the merger. As of July 1, 2019, the personnel and activities of DuraSpace are part of the Lyrasis organization.

Likewise, the merger of NFAIS into NISO has been finalized. NISO announced that the transfer of assets and other organizational details were completed by June 30, 2019. Key NFAIS activities such as its advocacy and educational activities, annual conference and the NFAIS Humanities Roundtable will continue within the NISO organization. NISO recently hired Jason Griffey as Director of Strategic Initiatives to support new activities of the expanded organization.

Smart Libraries Q&A

What should we consider when looking at print management systems?

Print management systems help libraries deal with the dreaded tasks associated with helping patrons print. These systems can be a source of revenue to offset the costs and to reduce unwanted or accidental printing. Public printing involves consumable materials like paper and toner or ink as well as the costs of the printers themselves. While some libraries can absorb these costs into their budgets, others need to recover the costs or not offer the service. Ever since the early days of public workstations, libraries have struggled to find effective and cost-effective ways to manage public printing.

There are a variety of print management solutions available, each with a somewhat different features and capabilities. Some of the possible components or capabilities include:

Channeling print requests through a management system dramatically reduces excessive print requests.

- A payment and release station. This computer runs software that traps the print jobs and holds them until payment has been made. The software will be programmed with the cost per page or other factors.
- The release station may include a device that accepts cash payment, a credit card reader, and point of sale software.
- Print management systems may also interface with a university's card system, transferring charges to the student account.
- The print management software will manage a queue of requests, presented in a way that the user can select their job, make payment, and release it for printing. Unpaid jobs usually expire and are automatically deleted after a set interval. Accidental jobs can be removed by the user or a staff person.
- Some print management systems can communicate with the library's ILS for sign-in and to charge to a library account.

- Each library computer enabled for printing would be configured so that the print requests are directed to the queue associated with the print release station. Some systems have software on the computer where the user would provide an email address or provide account information without having to interact with a print release station.
- It is essential to purchase printers able to handle the appropriate volume use. In a library, these printers do not necessarily need to be of the industrial scale that would be seen in commercial services, but even a moderate level of use would likely be more than a low-cost personal printer could handle.

This approach is well suited for printing from public access desktop or laptop computers provided by the library. These can be configured and controlled to interact with the print management system.

These products have proven effective in reducing excess or unclaimed printing. Even with minimal or no cost, channeling print requests through a management system dramatically reduces excessive print requests.

Print management systems may also be used to allocate costs for staff and administrative use. Such a deployment would not necessarily require payment for release but would track printing performed by individuals and departments for internal budget control.

It's a bit more complex to enable printing from a patron's own laptop or mobile device. For many libraries, this scenario may be in more demand than printing from library-provided computers. Mobile printing can be handled through a designated WiFi-enabled printer, which could be associated with a print release station. Some mobile print solutions require the installation of an app on the device, which would either handle the payment options directly or route the request to the release station. Mobile print apps would naturally need to be available for both iOS and Android devices. Printing from personal laptops would usually involve the selection of the WiFi-enabled printer within the building's wireless network.

Print management systems may be available as discrete products or as part of a broader suite of related software, such as public computer scheduling, room reservations, or other

utilities. Some of the major print management solutions for libraries include:

- The LPT:One print management system, which was developed by EnvisionWare and follows the traditional print release station model. This is a full-featured system with many different payment and interoperability options. Available at https://www.envisionware.com/print-management/.
- PrinterOn for Libraries, which is a mobile printing solution, available directly from PrinterOn or through EnvisionWare. Available at https://www.printeron.com/industries/libraries.html.
- Uniprint and Mobileprint products offered by Pharos. The company is one of the original products in this category and is especially oriented to university-wide solutions. Available at https://pharos.com/uniprint/.
- Print Manager Plus, a software-only print management environment, offered by Print Manager. The company serves many different business sectors and offers a version of the product suitable for libraries. Available at https://www.printmanager.com/products/print_manager_plus_library.htm.
- CybrariaN offers one of the original Public Computer Print Cost Recovery products. Available at http://www.cybrarian.com/Solutions/Print_Cost_Recovery.htm.

Especially in higher educational settings, print management tends to be managed at the institutional library rather than having a library run its own approach. The university or college IT department is usually responsible for the selection, implementation, and maintenance of these systems, which are provided as part of the general technical infrastructure. Libraries may provide front-line support within their own buildings and may only be responsible for tasks such as reloading paper or toner. For these campus-wide implementations, key requirements would include integrating with student cards or accounts and being able to interface with any other ways that students make payments.

Services such as Google's Cloud Print may obviate some needs for print management services in the library. This service enables flexible printing via a personal or institutional Google account to any enabled printer. By itself, this service doesn't provide cost recovery.

Now that 3D printers have become commonplace in libraries, there may be interest in including them in print management systems. As a routine service, libraries may need to recover some of the costs of filaments, service contracts, or even the devices themselves.

In many ways, times have changed relative to the need for print management systems. Printing is not needed in the same ways as it may have been in the past. Students mostly submit papers electronically, uploading documents through the institutional learning management system. Researchers may prefer to email articles found in library databases rather than printing them. Cloud storage, such as Dropbox or Google Drive, is generally readily available for storing documents. Many may have citation management tools to capture references from articles. The number of use cases where a printed copy is needed as an intermediate or final product has diminished.

While existing implementations may continue to generate revenue in excess of costs, I would look carefully at the return on investment for a new system.

For libraries considering implementing a new print management system, it will be important to carefully review the business case for the system. These products are not inexpensive and may or may not bring in enough revenue to cover all the related equipment, software, service contracts, transaction fees, and personnel costs. There may be non-financial concerns driving the project, such as excessive waste or complaints about missing prints. While existing implementations may continue to generate revenue in excess of costs, I would look carefully at the return on investment for a new system. The business case would also differ between a library-specific project and a campus-wide deployment. For those where the business case justifies replacing an existing system or implementing one for the first time, there are multiple products available with a robust set of capabilities.

Notes

1. Lorcan Dempsey, Constance Malpas, and Mark Sandler, *Operationalizing the BIG Collective Collection: A Case Study of Consolidation vs Autonomy* (Dublin, OH: OCLC Research, 2019), https://doi.org/10.25333/jbz3-jy57.
2. Lyngsoe Systems, "IMMS Final Report to the Fund for Welfare Technology," 2014, https://www.lyngsoesystems.com/media /2996/ims-final-report-to-the-fund-for-welfare-technology -full-report-002.pdf.
3. See Lyngsoe Systems, "Helsinki City Library Introduces the Lyngsoe Systems IMSS — The Machine Learning-based Intelligent Material Management System," news release, May 28, 2019, https://www.lyngsoesystems.com/en/news/helsinki-city -library-introduces-the-lyngsoe-systems-imms-the-machine -learning-based-intelligent-material-management-system/.
4. "Automated Materials Handling in Partnership with Lyngsoe Systems," EnvisionWare, accessed August 20, 2019, https:// www.envisionware.com/automated-materials-handling-in -partnership-with-lyngsoe-systems/.

Questions or suggestions for topics in future issues?

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Contact Samantha Imburgia at **simburgia@ala.org**

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