Smart Libraries Newsletter

News and Analysis in Library Technology Developments

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Smarter Libraries through Technology

Technology Transfer as a Model for Sustainability

By Marshall Breeding

It is interesting to consider the roots of the products and companies of the library technology industry. Some emerged entirely through commercial development, hopefully with consultation from the library community. Others came out of open source projects, with broad participation among libraries and commercial developers.

Other products find their roots in libraries themselves. In the earlier days of library automation, it was common for a library to develop a product for its own use, and if successful, share it with other libraries through commercial nor non-profit arrangements. Libraries, however, are not well positioned to provide long-term development or support services. Some of these locally developed library systems eventually faded away. Others found more lasting success through the launch of a new company to take the product forward, enabled through a technology transfer agreement from its home institution. These agreements typically assign an exclusive license for the company to develop and sell the software. Financial arrangements vary and can include joint ownership of the company or commissions on revenue. Technology transfers reward universities for their innovation in creating a product concept, while sparing them the substantial investments in the business infrastructure needed to successfully market a product and ensure its ongoing development. Several startups born out of technology transfers contribute to the recent history of the library technology industry.

Northwestern University and NOTIS

The NOTIS library management system was the most successful automation product for academic libraries during the era of mainframe computing. The software was developed by a team of programmers and librarians at the Northwestern University Libraries beginning in the 1970s. NOTIS had advanced features for its time and attracted interest of many other academic libraries. The library initially had a department dedicated to supporting and marketing the product. NOTIS Systems, Inc. was established in September 1987 as a wholly owned entity of the university. NOTIS became the most prominent system used among large and mid-sized academic libraries in the United States.

Northwestern University sold NOTIS Systems to Ameritech Information Systems in October 1991. At this time, mainframe computers were falling out of favor and NOTIS was in the process of creating a new product based on the emerging client/server architecture. NOTIS became extinct in the early 2000s. Its success marks one of the most successful products created in a library and transferred for commercial distribution.

The Hebrew University of Jerusalem and Ex Libris

Ex Libris and its Aleph integrated library system began with an automation project for the libraries of Hebrew University of Jerusalem. In 1980 programmers in the library developed the Automated Library Expandable Program, or ALEPH. It was originally developed to run on Control Data Corporation mainframes and addressed a comprehensive set of features expected by large academic libraries. Following its successful implementation at its home institution, it was adopted by most other university libraries in Israel.

The November 2005 issue of *Smart Libraries Newsletter* included some additional details:

> In 1983, the success of the effort caught the attention of Yissum, the University's unit empowered to transfer technologies to commercial enterprises. Yissum hired Morag, a veteran of the software industry in Israel, to lead the company established to commercialize ALEPH; the company was called "Aleph Yissum."

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> Another company, Ex Libris, Ltd., was formed in 1986 to market and support the software outside of Israel, allowing Aleph Yissum to focus on the software development and to support its use by Israel-based libraries.
>
> In 1995, Yissum Aleph (owned by HUJ) and Ex Libris, Ltd. (owned by Morag) merged, taking the Ex Libris identity. A year later, the company was reorganized as Ex Libris Group, which stood as the parent company for a growing number of subsidiaries and distributors around the globe.

The partial ownership of Ex Libris by The Hebrew University of Jerusalem continued through the company's sale to Francisco Partners, which acquired full equity from all previous shareholders. With installations in almost all global regions, Aleph proved to be one of the most successful integrated library systems for academic and research libraries. Aleph's original design took place through close partnership with its founding library, reflecting a key advantage of commercializing a locally developed product. Ex Libris subsequently grew through multiple rounds of private equity ownership, culminating with its acquisition by ProQuest.

RapidILL, Created by Colorado State University

A more recent example of a technology transfer can be seen in the acquisition of the RapidILL service from Colorado State University. This service was born out of the catastrophic loss of materials at the CSU Morgan Library, caused by a fast-moving and massive flash flood in July 1997. The flood destroyed almost all the print journal collection, which resided in the lower floors of the building. The Morgan Library created an expedited interlibrary loan service, in partnership with peer institutions, to provide materials needed for research and teaching. Originally deployed as a one-way service providing materials for CSU, the model proved so successful at expedited article delivery that it eventually morphed into a reciprocal service based on multiple pods of institutions committing to quickly provide materials. RapidILL grew to be a highly regarded service, primarily among libraries in North America.

In June 2019 Colorado State University agreed to sell the service to Ex Libris, which was expanding its product family to include additional resource sharing capabilities.

VTLS, Created at Virginia Tech University

VTLS traces its beginnings to the Newman Library at Virginia Tech University. The VTLS integrated library system was originally created by this library in the absence of any existing commercial product that met all its key requirements. VTLS proved its capabilities at Virginia Tech and was licensed for use by many other libraries and consortia. The classic VTLS ILS has become extinct, though Virtua, its successor, continues to be used by many libraries. The July 2014 issue of *Smart Libraries Newsletter* described some of the details of how the product was created in the library and eventually transferred to a new commercial company.

> The Systems Development continued to develop the software, resulting in a complete automation system that included cataloging, serials control, and a public access catalog. In 1980 the Center for Library Automation of the Newman Library was established to market and support VTLS to other libraries. By 1983, the university had sold VTLS to 31 additional libraries and 60 installations were reported by 1985. Acquisitions and Fund Accounting modules were completed in 1989.
>
> July 1, 1985, the project was spun off into a separate company. Virginia Tech Intellectual Properties operated as a nonprofit corporation to facilitate the transfer of technology created within the university to commercial applications. VTIP facilitated the creation of VTLS as for-profit company, which would initially be housed in the recently constructed Virginia Tech Corporate Research Center as its first tenant. The new company was led by Vinod Chachra as its President and CEO. VTLS, Inc. was initially co-owned by Chachra and VTIP. https://librarytechnology.org/document/19606

VTLS was acquired by Innovative Interfaces in July 2014, and its products are no longer actively marketed.

Technology transfer agreements have been the basis of many of the products of the library technology industry. A product initially designed and created in a library will naturally be well aligned with the needs of that institution and its peers. Companies often gain ongoing insights even as those initial relationships become more distant.

This issue of *Smart Libraries Newsletter* features another example of a company originally created through a technology transfer agreement with a university. VitalSource Technologies, which has grown to be one of the major global providers of electronic textbooks and online learning services, was the brainchild of an educator with an entrepreneurial vision in the field of dental science. This company's efforts were some of the first to break through the barriers in the print textbook arena to create a new generation of digital learning services.

Private Equity Firm Francisco Partners to Acquire VitalSource Technologies

Ingram Content Group has entered into a definitive agreement to divest VitalSource Technologies LLC, its business dedicated to electronic textbooks and technologies for the creation of educational resources for academic institutions, corporations, and related organizations. Francisco Partners, a private equity investment firm focused on technology-based companies, has entered into a definitive agreement to acquire VitalSource Technologies. The agreement was signed in April 2021 and is expected to close later in the year.

VitalSource Technologies is a learning technology and digital content company. The company currently serves 8,000 institutions and more than 1,000 publishers and resellers to provide digital course materials and learning solutions to 16 million users globally. VitalSource is based in Raleigh, NC, and has offices in Boston, San Francisco, Seattle, as well as in England and Australia.

The company has developed through an interesting trajectory. From its beginnings as academic research project, it evolved to a founder-led startup created as a university technology transfer and later was a subsidiary of a global company. VitalSource Technologies will now enter a new phase as a portfolio company of Francisco Partners.

Company Beginnings

The company was a pioneer in developing technologies to convert educational content into digital textbooks for online learning environments. Vital Source Technologies was founded by Dr. Todd Watkins, Jr., an educator in the dental program at the University of Texas Health Science Center in San Antonio (UTHSCA) with a joint appointment in Educational Resources. Watkins led the research and development of technologies for computer-based learning technologies and the use of problem-based learning in health science curricula.

While in dental school at the University of North Carolina Chapel Hill, Watkins had developed an early ebook format based on Standard Generalized Markup Language (SGML), the then prevailing syntax for structured documents. As a faculty member at UTHSCA beginning in 1990, Watkin's research included developing ebook applications. The first 1991 prototype, called "Macinstein," was built with Apple Hypercard, which led to an Apple "Seed" Hardware Grant from Apple Computer. The goal of Macinstein was to reanimate static textbooks into a working digital library on laptops.

In June 1994 Watkins founded Vital Source Technologies as a technology transfer initiative of the University of Texas (UT) system, exploring opportunities to commercialize these learning technologies. The UT administration considered the research as more of a product development endeavor than a pure research project. Company shares were split equally between the University and Watkins. William Chesser (now vice president for customer success) joined Vital Source Technologies in 1996 as the company's second employee. Other members of the initial core team included Rick Johnson (now VP for product strategy) and Willie Abrams (vice president for software development). All three have continued in executive positions with VitalSource Technologies through each phase of ownership.

The vision of the company built on Watkins prior research to bring education into the digital age, especially through replacing print textbooks with electronic versions. The company designed the VitalBook and VitalViewer products to support digital courses prior the availability of web-based courses. Due to network bandwidth and computer memory limitations of the time, the early products of the company were delivered on DVD discs. The underlying technologies included digitization of printed materials, XML markup schemas, content syndication, and digital rights management. Complete materials for a course would be digitally packaged into a VitalBook electronic textbook, including core content, notes, microscope slides, and syllabi. Searching across texts was a key advantage over print textbooks. According to Watkins, "At that time these concepts were considered radical."

During this start-up phase, development focused on the publishing and distribution technologies to support the company's initial offerings. The company's VitalViewer was created by licensing and reengineering the Apple DocViewer with a new core document processing engine based on XML and a file structure compatible with both Apple and Windows computers. The company was also the first to use the Sony DVD format to distribute data files rather than video content.

In the 2000-2001 academic year, following a four-year period of research and development, VitalSource Technologies launched its products in educational programs in schools of dentistry.

Vital Source Technologies found its first opportunities as a provider for digital courses for health science learning centers. The initial product provided the entire curriculum for a

four-year dental school program. According to Dr. Watkins, schools of dentistry proved to be an ideal proving ground for the concept of digital textbooks. Other disciplines such as general medicine or nursing represented higher stakes for textbook publishers, which would have been threatened by the possibility of digital textbooks overtaking print versions. Over time, the company expanded into other health science fields, academic disciplines, and corporate training.

Danny Mills, running a San Antonio incubator for technology start-ups (SATEX), secured the initial two rounds of venture capital. These initial investors included Frank Daniels III, who joined the company's board of directors. These investments funded the development of the VitalSource curricula, which were completed in time for initial deployment in 2000. These products were designed to offer features easily used by instructor and students and based on technologies that protect unauthorized access and distribution of copyrighted content. According to Watkins, the initial launch included 80 electronic textbooks with content from 11 publishers adopted by five dental schools.

VitalSource Technologies partnered with multiple publishers through licensing and distribution agreements. Some of the early publishers involved included:

- Harcourt General, Harcourt Health Science (later Elsevier Health)
- McGraw-Hill/Appleton and Lange
- Quintessence Publishing
- Lippincott/Williams & Wilkins/Waverly
- Theime Publishing
- Gold Standard Multimedia for its Integrated Medical Curriculum
- Oxford University Press (2004) reference materials
- Thomson Corporation (2005)

The first round of dental programs deploying VitalSource Technology digital curriculum products in its start-up phase included:

- University of Texas Health Science Center at San Antonio Dental School (2000)
- University of Medicine and Dentistry of New Jersey, New Jersey Dental School
- New York University, College of Dentistry (2000)
- State University of New York at Buffalo, School of Dental Medicine (2000)
- Boston University, Goldman School of Dental Medicine (2000)

The next round of programs included other disciplines:

- University of Mississippi School of Dentistry (2004)
- Seaton Hall School of Law (2004)
- Louisiana State University Health Sciences Center School of Dentistry (2005)
- University Campbell University School of Pharmacy (2004)
- University of Colorado School of Dentistry (2004)
- Fourteen K-12 School districts (2004)

In January 2001, Watkins and Mills recruited board member Frank Daniels III to serve as chief executive officer of VitalSource Technologies in 2001. Watkins continued as a board member while focusing on research into curriculum uses of the technologies. At this time VitalSource sold the managing control of the company to the Daniels family, which had recently sold interests in Total Sports, Inc and the Raleigh, NC based News & Observer, one of the first newspapers to invest in computer technologies. Under Daniels, the company shifted its business model from direct digital content processing and distribution to publisher services.

Dr. Watkins has continued as an entrepreneur. In June 2018, for example, he founded XComP Analytics, Inc., a startup developing analytics technologies to assess the performance of students and educational programs. Watkins was recently awarded three patents in this domain. Watkins currently serves as assistant dean for Dental Education and Informatics for the East Carolina University School of Dental Medicine.

In its first decade of business, VitalSource Technologies was able to build a successful company based on the vision of its founder to bring textbooks and learning programs into the digital age. The company found a receptive niche market among schools of dentistry, a natural fit with the interests of the founder. Its educational products were also adopted by some K-12 School Districts, often in association with programs to place IBM ThinkPad laptops in the hands of students. Success in this niche market demonstrated potential for growth and expansion into the broader realm of digital content and educational technologies.

Positioning VitalSource Technologies for sale begin in January 2004 with the appointment of Clay Dunnagan, an investment banking professional, to lead the company's business development strategies.

Acquisition by Ingram Content Group

In June 2006, VitalSource Technologies was acquired by Ingram Industries, ending its start-up phase and becoming part of a

global company. Dr. Watkins concluded his involvement with VitalSource Technologies at the time of the acquisition. Daniels continued as CEO of VitalSource under Ingram through June 2009. From June 2007 through June 2009 Daniels was also chief commercial officer for Ingram Digital Group.

The company was initially placed within Ingram Digital Ventures. Though under ownership and strategic leadership of Ingram, VitalSource Technologies operated as an independent business unit. The acquisition by Ingram provided access to a global network of publishers and content providers to expand its educational platform. Ingram also acquired additional companies that were merged into VitalSource Technologies to accelerate its growth and business opportunities.

Ingram Restructures

In 2009, Ingram Industries restructured its content and technology businesses, consolidating multiple businesses into a new entity, Ingram Content Group, including Ingram Book Company, Ingram Digital Services, and Vital Source Technologies. Skip Prichard, previously chief operating officer of Ingram Book Company, led the restructuring and became chief executive officer of Ingram Content Group in January 2008, a position he held through June 2012, when he left to become president and CEO of OCLC.

Under Ingram, a number of individuals held leadership positions, though the roles and titles were fluid. Some of the key executives included:

- Shawn Morin, currently CEO of Ingram Content Group, was responsible for the oversight of VitalSource since 2009.
- Kent Freeman was responsible for technology for VitalSource at the time of acquisition and led the company as president from 2009 through 2016, when he was promoted to chief strategy and development officer of Ingram Content group.
- Pep Carrera joined the organization as president and chief operating officer of VitalSource Technologies from April 2016 through July 2019, when he departed to become president of ProQuest Books.
- Kent Freeman returned as president of VitalSource Technologies in August 2019 and will continue to lead the company under the ownership of Francisco Partners.

Expansion through Business Acquisitions

At the time of the acquisition, the core product of VitalSource Technologies was VitalBook digital format, distributed through the VitalSource Bookshelf platform. VitalSource provided the Bookshelf application without cost, supported by the subscription fees associated with the digital course modules purchased through the VitalSource Store. Publishers and organizations were able to create digital courses based on the VitalBook format and the Bookshelf application.

Bookshelf continues as the flagship product for VitalSource Technologies. VitalSource's products and technologies, including the learning platform Bookshelf, are used by 16 million learners in more than 240 countries. VitalSource offers four learning platforms: Acrobatiq by VitalSource (courseware), Bookshelf (digital content), Intrepid (corporate learning), and SmartStart (course creation), and a variety of digital content management tools spanning analytics, sampling, and campus store management (Verba).

Ingram Content Group made multiple acquisitions of related businesses that were integrated into VitalSource Technologies, positioning the company at the forefront of market innovation and digital transformation. The following acquisitions contributed to the consolidation of the electronic textbook arena and expanded its product portfolio.

- VPG Integrated Media, a developer of digital textbook applications, interactive learning objects, and production services for audio, video, and animation, was acquired in June 2011.
- CourseSmart, a provider of digital textbooks to higher education, was acquired by VitalSource Technologies in March 2014.
- Verba Software, founded in 2008 and acquired by VitalSource in April 2017, provided several web-based services enabling campus retailers to promote affordable course materials.
- Intrepid Learning, a collaborative learning platform business serving the corporate training market, was acquired by VitalSource Technologies in December 2017.
- Acrobatiq, acquired by VitalSource in September 2018, provides a learning and data analytics platform based on the Open Learning Initiative out of Carnegie Mellon University.

According to Freeman, VitalSource is well positioned as it moves out of Ingram Content Group into new ownership: "As a recognized innovator in the digital course materials market, VitalSource is best known for partnering with thousands of academic institutions, publishers, and resellers to deliver extraordinary learning experiences to millions of active users globally–and today VitalSource is also powering new, cutting-edge technologies designed to optimize teaching and learning for maximum results."

Acquisition by Francisco Partners

Under Ingram Content Group, VitalSource Technologies developed into a mature business with a portfolio of products and services and a substantial global client list. Through the pending sale to Francisco Partners, VitalSource Technologies becomes part of a private equity firm with a track record of shepherding mid-level technology-based companies though new phases of business expansion. It will continue to be led by the current executive team. Francisco Partners invests in tech companies in multiple business sectors, including healthcare, higher education, internet infrastructure, and financial services. The firm has raised over $24 billion of capital since its founding in 1999.

Francisco Partners has invested in the library technology sector previously. The company owned Ex Libris from June 2006 through August 2008. It also acquired Endeavor Information Systems from Elsevier and merged the company into Ex Libris, creating the leading systems provider for academic and research libraries. During the period, investments from Francisco Partners drove the development of the Primo discovery product and Verde for electronic resource management as well as accelerating the development of the SFX link resolver and knowledgebase.

Francisco Partners brings substantial experience in supporting companies involved with educational technologies. Some of its portfolio companies in the educational sector include:

- BARBRI, a provider of legal education products and services (March 2021) https://www.barbri.com
- Civitas Learning (Feb 2019) https://www.civitaslearning.com/about
- Discovery Education (Feb 2018) https://www.discoveryeducation.com
- Renaissance Learning (May 2018) https://www.renaissance.com

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Smart Libraries Q&A

Each issue Marshall Breeding responds to questions submitted by readers. Email questions to Patrick Hogan, Managing Editor, at phogan@ala.org.

What skills or knowledge should libraries wanting to get involved in research data management develop in staff?

In recent years academic libraries have increased their involvement with research data management. Providing services to help manage data sets related to scientific research will benefit researchers, strengthen the strategic position of the library within the institution. These services align with the core expertise of library professionals.

The skills or expertise needed by a library professional will depend on multiple factors. Some roles may involve assisting researchers with procedures related to applicable policies for data. In other scenarios, a data scientist in the library may have a role in data manipulation or analysis.

Preserving data lies at the heart of scientific research. Experimental processes and data analysis have to be reproducible. While library professionals will not likely be involved in data collection, they may play a role for preserving data sets for validation of analysis or for follow-on research.

An academic library ideally will have defined the scope of services it provides for research data support. It should be clear to researchers what level of service they can expect, and the library must plan how to allocate resources or acquire the corresponding technology tools. As a library become involved in research data services, it will do well to be sure that the resources are reasonably scaled according to anticipated interest by researchers. Although this type of service can improve the standing of the library when executed well, it could be a source of frustration if not executed well.

The Research Data portal for the Purdue University Libraries serves as a good example of a well-defined set of services.[1]

Skills in this area fall into policy and planning. Librarians will want to thoroughly review existing policies and services

offered through the institutional office of research to avoid overlapping services and to identify any gaps or supplementary services that could be offered through the library. Any proposed services will need to be carefully negotiated with all stakeholders. Researchers and administrators will naturally be protective of their data assets. Libraries will want to tread carefully as they propose new services.

One of the areas of potential library involvement involves the data management plans required by most funding agencies. These plans describe the policies, procedures, and platforms that ensure the preservation of research data and its availability to other researchers as may be required by the terms of a grant. The National Science Foundation, for example, describes its data management plan requirements.[2] Librarians interested in this aspect of research data management would need to have a detailed understanding of the data management plan requirements of each of the major agencies that funds research in the institution and develop templates or other tools to facilitate the preparation of this section of a grant proposal.

Libraries may also be involved in providing the technical and administrative infrastructure to fulfill aspects of the plan. In many institutions the library will operate a data repository that provides secure and controlled access to research data and the associated metadata for each dataset. A research data repository may be an extension of an institutional repository provided for local copies of scholarly articles, preprints, or other research outputs. Skills and training related to data repositories would address managing the repository and understanding the metadata formats and vocabularies used to describe datasets.

Some libraries may purchase specialized research services applications. Ex Libris markets its Esploro environment to libraries supporting a wide range of services supporting institutional research.[3] Elsevier's Pure[4] and Kuali Research[5] are usually sold directly to the university's office of research.

Research datasets can require massive digital storage. Libraries offering services for research data repositories will need to acquire and manage large-scale digital storage, including capacity for redundancies needed for disaster recovery and long-term preservation. Related skills include familiarity with digital preservation frameworks such as the OAIS Reference Model (http://www.oais.info/) or pragmatic approaches that ensure long-term availability of datasets held in the repository.

Some library professionals may take a more active role with the data itself. Such a "data librarian" would work in many different contexts. Some of the possible applications would include:

- Collection and analysis of data related to the library's own systems and services.
- Assisting researchers with public data sets or with proprietary data sets the library might license for the institution's research or teaching activities.
- Specialized geospatial data sets.
- Data manipulation or analysis in collaboration with faculty research or student projects.

Working with data at this level requires more advanced expertise as well as related technologies. Some libraries may opt to have a data scientist on staff holding advanced degrees in statistics or other analytical fields or with related experience in the business sector.

Library professionals interested in more involvement with data management and analysis may be interested in learning programming languages such as R, an environment for statistical computing, graphics, and analytics. Some may prefer general programming languages such as Python or Ruby on Rails. Some researchers may use more traditional statistical tools such as SAS or SPSS. The choice of programming tools will depend on what the institution's research community is using.

Library professions working with data may also work with analytics engines such as Oracle Business Intelligence or Tableau.

I anticipate that research data management will continue to be one of the fastest growing specializations of academic libraries. Gaining new skills in this area may prove to be a fruitful direction of professional development and career advancement. The options and opportunities range from an introductory level of building awareness of institutional policies and practices to working toward a dedicated role as a data librarian.

Notes

1. "Research Data," Purdue University, https://www.lib.purdue.edu/researchdata
2. "Dissemination and Sharing of Research Results - NSF Data Management Plan Requirements," National Science Foundation, https://www.nsf.gov/bfa/dias/policy/dmp.jsp
3. "Esploro: Showcase research work and expertise," ExLibris, https://exlibrisgroup.com/products/esploro-research-services-platform
4. "Pure: The world's leading Research Information Management System, Elsevier, https://www.elsevier.com/solutions/pure
5. "Kuali Research: More research less burden," Kuali, https://www.kuali.co/products/research

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Marshall Breeding's expert coverage of the library automation industry.

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