Neal-Schuman Library Technology Companion

A BASIC GUIDE FOR LIBRARY STAFF

SIXTH EDITION

John J. Burke

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Preface

Technology infuses every aspect of every day in every library, and thus basic technology skills are a prerequisite for everyone who works in a library. I wrote the first edition of the *Neal-Schuman Library Technology Companion: A Basic Guide for Library Staff* eighteen years ago. Much in the book has changed since that time, reflecting the huge changes in libraries. Talk of modems has become talk of makerspaces. DOS and dot matrix printers have passed into the void. While I was greatly concerned with protecting technology then, today that has become a desire to protect users' privacy. Now in its sixth edition, the book is designed to give colleagues a sound and sensible way to consider, access, and use library technologies to better meet the needs of our users. This book provides a one-stop overview of all technologies used in libraries today. The world of information technology changes at a relentless pace, and today's library managers, new librarians, support staff members, and students need a simple way to become informed and stay current.

The pages that follow describe the broad scope of systems, software, and specialized devices available to libraries and show how they are integrated into our institutions' unique processes. The book offers basic definitions, suggests applications and uses, considers implementation issues, and troubleshoots potential problems. All busy professionals need to learn how to evaluate these technologies and assess their usefulness, so the guide provides essential know-how in planning, security, purchasing, and more. Perhaps most important, a solid grounding in the topic will make library staff members more comfortable when speaking with colleagues or interacting with patrons.

This sixth edition of the guide represents a complete update of the book. The first section of the book offers context on how technologies impact library work and a look at technologies that are currently in use. The next section covers the fundamental technologies that library staff members and patrons use, followed by a section on technology tools that we use to present services to our patrons. The largest section examines the library technology environment and how to build and maintain it. A final section addresses possible future developments in library technology and offers resources for keeping track of these developments as they happen. The book also includes a completely new feature: Library Insights. I interviewed twelve librarians and library staff members to share how they work with a given technology in their library settings. Chapter 2 is completely updated with the results of a fourth survey of technology skills and tasks among library staff members. Those survey results are also shared in several of the other chapters. Chapter 8 now includes guidelines for libraries marketing with social media. Chapter 10 now includes descriptions of virtual reality and augmented reality. Chapter 17 is fully updated with new sources for tracking down technology information. There are many new sources for further information identified at the end of each chapter. I hope that the flow of the book is both logical and representative of the technologies we use and the environment in which we use them.

The *Neal-Schuman Library Technology Companion* contains seventeen chapters arranged in five parts:

PART I Library Technology in Context

- **Chapter 1,** "The Universe of Library Technology," delivers a historical overview of the technologies that have impacted libraries.
- **Chapter 2,** "Survey Says: How Library Staff Members Are Using Technologies," provides context to the study of these information technologies and services by revealing the results of a fourth survey of working library staff members and the technologies they regularly use and a comparison to the results of the surveys in the third, fourth, and fifth editions.

PART II Mission Critical Technologies

- **Chapter 3,** "Free Information Resources: Part of the Library Arsenal," discusses the crucial role of free Web information in supporting library research.
- **Chapter 4,** "Library Electronic Resources: E-books, Full-Text Articles, and Streaming Media," addresses this mainstay area of library collections.
- **Chapter 5,** "Organizing Information to Make It Easier to Find: Library Systems, Discovery Layers, and More," reveals opportunities to expand the possibilities of the library catalog.
- **Chapter 6,** "Computing Devices in Libraries: Desktops, Laptops, Tablets, and Mobile Devices," covers the many options library patrons and staff members have for taking on computing tasks.

PART III Technology That Makes Library Services Run

- **Chapter 7,** "Library Websites and Web Services," emphasizes the importance of creating an Internet presence for your library with unique services for patrons.
- **Chapter 8,** "Social Networking and Patron Participation: Marketing and More," highlights the importance of social networking tools and technologies for reaching and interacting with our patrons.
- **Chapter 9,** "How Library Staff Learn and Teach: Screencasts, Distance Learning, and Learning Management Systems," demonstrates how technology can aid in staff development and training and how library staff members can fulfill their educational roles.
- **Chapter 10,** "Makerspaces and Libraries," explores the possibilities for adding creative activities and technologies to libraries.

PART IV Building and Maintaining the Technology Environment in Libraries

- **Chapter 11,** "The Right Technology at the Right Time: Planning, Evaluating, Buying, and Implementing Technology," offers a guide for purchasing equipment, putting systems into operation, and starting a technology

planning process.

- **Chapter 12,** "Meeting and Supporting Patron Technology Needs: Universal Design and Adaptive/Assistive Technologies," helps ensure that your technologies meet and serve the needs of a wide range of users.
- **Chapter 13,** "Building the Technology Environment: Infrastructure, Ergonomics, and Sustainability," will help make any facility comfortable, accessible, and sustainable for the long run.
- **Chapter 14,** "Protecting Technology and Technology Users: Securing Collections, Enhancing Computer Security, and Protecting Privacy," presents guidance for protecting the library and its patrons from physical and digital dangers.
- **Chapter 15,** "The Death of Technologies: Preservation Issues and Saying Goodbye," explains current technologies for recording information and the challenges ahead for retrieving that information from dying and dead technologies.

PART V Where Library Technology Is Going and How to Stay Informed

- **Chapter 16,** "Our Technological Futures: Maintaining Library Services in Infinite Possibilities," looks ahead to how technology may and will impact our patrons, our libraries, and our tradition of service.
- **Chapter 17,** "Keeping Track of Technology Changes," presents resources for learning more about the latest developments and issues.

A glossary of useful terms is located at the end of the book. Terms found in the glossary appear in **BOLDFACE CAPITALS** within the text.

There is a great deal of information within these pages, but there is even more to discuss. Follow me on Twitter @TechCompanion6 for updated resources and materials, and reply to me with your questions and comments. You may also reach me at techcompanion @gmail.com.

PART I

Library Technology in Context

CHAPTER 1

The Universe of Library Technology

Libraries have long played an essential role in containing, preserving, and sharing information. People throughout the world have, over thousands of years, produced and relied on a variety of forms of information, including creation stories, herd counts, business orders, tax rolls, and personal correspondence. These facts, philosophies, and communications were recorded because individuals in these societies saw some purpose in sharing such information with others in the present and, in some cases, preserving it for future generations. The explosion of information we have seen over the past five decades is merely the latest skirmish in a long-running battle: How can individuals and societies maintain their collections of facts, history, images, **DATA**, and fiction as the amount of these items increases so rapidly? Over thousands of years, libraries were adopted as a mechanism for accomplishing these purposes; were it not for libraries, we would have little or no knowledge of past generations or cultures.

At each step along the way, libraries would have failed in their efforts without **INFORMATION TECHNOLOGY (IT)** of various kinds. We tend to imagine technology as specifically involving computers and electronic devices, but technology encompasses both the products and the processes that people create. Handling information requires a diverse collection of practical tools and processes. Looking at technology in the library world, processes would include the methods for rebinding books, classifying the items in a collection, or creating descriptive metadata for digital items, and full-text periodical databases, mobile devices, and library shelving units are examples of products. Information technology as a whole, then, includes any items or methods for containing, transmitting, and storing information.

TRENDS IN LIBRARY TECHNOLOGIES

Two main goals have driven library staff to use technology: better serving the needs of the library's community and streamlining the workflow of the staff.

The technologies that have impacted and continue to impact the library world fall into three main groups: (1) those created specifically for libraries and library work, (2) those created within the larger world and adapted for use in libraries, and (3) those created in the world and brought into libraries without much alteration.

The first group would encompass developments such as Melvil Dewey's classification system, the card catalog, and the **MACHINE-READABLE CATALOGING (MARC) RECORD**. In the second group we find such examples as the shaping of computer inventory control systems to work as library management systems to host library catalogs and manage circulation and cataloging systems, the molding of online databases to include periodical citation information and full-text articles, and libraries' own alterations of website design for internal purposes. We see many examples of the third group in staff use of standard technology, such as **E-MAIL**, telephones, copiers, bar-code readers, RFID (radio frequency identification) tags, and many computer applications.

TEN KEY DEVELOPMENTS IN LIBRARY TECHNOLOGY

Many information technologies have been created over the years. The library itself is a technology developed to handle information storage and retrieval. This section discusses ten key developments in information technology that have affected libraries over the centuries, in roughly chronological order. Some of these technologies are still in full use today, whereas others have been replaced or had their roles reduced. They represent processes for retaining or organizing information as well as manufactured tools or other products. All technology is designed to meet a particular need, and while few needs ever disappear completely, humanity is always finding new ways to better address long-standing needs. It is important to remember the former roles of obsolete technologies as we look at today's technologies and toward the technologies that may replace them in the future.

DEVELOPMENT 1 Writing and Paper

The development of written language and alphabets is the starting place for a discussion of information gathering. Writing's roots can be seen in prehistoric cave paintings—an early pictographic method of communicating information by drawing symbols and pictures to represent concepts. Pictographs allow individuals to preserve information (at least in the short term) for their own use and also to share with others. If one writes on something that will last (the next key development in technology for libraries), the information can be passed on beyond the life of that individual and perhaps for many generations.

Compare writing to another method for passing information along through time: memorization. In many cultures, oral history worked because skilled individuals were able to memorize genealogies, stories, and historic cultural events and recount them as needed. While memorization can be an effective way to preserve sets of information, there are some difficulties for its long-term use.

First, because only one person or a small number of people can remember the information, there is the danger of accidents, illnesses, or other untimely deaths completely wiping out the information. In addition, access to the information is limited because only those who have memorized it can reveal it. Second, because the information is memorized in a distinct pattern, it can be difficult for the person to recall individual bits of information (e.g., the date of a battle, the name of an individual's daughter) without recounting larger parts of what he or she has memorized. Third, even with exceptional effort at memorization, some details are bound to be lost or corrupted. Intentional corruption can also occur because there is no written record to use for comparison. The safety, accessibility,

and integrity of the memorized information have great potential risks, which a written record can overcome.

The physical manifestation of writing has a huge impact on how easy it is to pass along the information. There are two elements of sharing information to consider: time and distance. Rock paintings and stone tablets are handy to show to folks who live nearby and to share with future generations, but they are awfully difficult to send to a friend in the next valley. This element of transporting information guided the development of writing material from caves and rocks to stone tablets, to papyrus scrolls, to goatskin or calfskin (vellum), to linen- and now tree-based paper. Paper is relatively cheap to produce in quantity, is lightweight, and can last for a fairly long period of time. Its development made information much more mobile and also easier to duplicate.

DEVELOPMENT 2 The Printing Press and Books

With a system of writing and a medium to place it on, the communication of ideas could be accomplished relatively easily and cheaply. Paper writings were bound into books (a form that originally used vellum for the pages) and passed along. However, making multiple copies of a work remained a laborious process.

Enter the Gutenberg revolution of the fifteenth century. The invention of movable type and the printing press, first in China and then independently in Europe by Johannes Gutenberg, gave people the ability to make their writings available to a larger audience at a much quicker pace. Humanity entered into a time period in which improvements and innovations changed the publishing process and the audience for books. Printing became faster, paper grew cheaper, and literacy increased among the populace. These changes set the stage for libraries to develop on a large scale: many books were being printed and people wanted to read them. Libraries had existed in earlier civilizations (notably among the Babylonians, Romans, and Greeks) but had been available only for small elites. Printing allowed information to reach a wider audience and libraries to serve as intermediaries between the growing amounts of literature and a growing literate population.

DEVELOPMENT 3 Classification Systems

Libraries have had to deal with ever-increasing amounts of printed materials since the dawn of the printing press. Once the number of books in a library exceeded the librarian's memory, a method for locating a specific item or finding materials on a topic was needed. One major breakthrough in organizing and using this information was the development of **CLASSIFICATION SYSTEMS**.

Unlike today, where libraries tend to choose among two or three "universal" systems, classification schemes of the past were tied to a given library or collection, meeting the local needs of that particular entity. Every library featured its own way to organize materials by broad categories of knowledge. A tremendous change came about in 1876 with the development of the Dewey Decimal Classification System. Melvil Dewey's subject-oriented system for organizing books caught on and was adopted by a large number of libraries. Today, the vast majority of public libraries and school libraries, and even some academic libraries, use the system. The Library of Congress Classification System, developed to organize that library's immense holdings, was later adopted by libraries (primarily

academic ones) as an alternative standard. Both systems work on a similar principle: arrangement of the collection by the subject matter of the item.

Classification systems helped libraries tame the growing mass of information. With them, library users could freely browse the collection by topic to find what they needed. The adoption of standardized systems also let the staff of many libraries work together more smoothly and made it easier for patrons to understand how to use multiple libraries. With this innovation in place, library staff could move to make their service more efficient and their users' experiences more fruitful.

DEVELOPMENT 4 The Card Catalog

The creation and standardization of a tool to help people locate the information in a library was an impressive development in information technology. While libraries had been organized by local models of a classification system for years, the invention of the **CARD CATALOG** in 1791 in France (using the backs of playing cards, which at the time were blank), and the substantial growth of its use by libraries from the 1850s onward, gave library users an additional method for finding items beyond browsing the shelves. It also enhanced the work of libraries in at least two ways. First, it improved the ability of the library staff to locate materials and therefore provide service to their patrons. The card catalog allowed the library's collection to be searched from one location without having to browse and scan the shelves. It added convenience as well as the ability to use multiple entry points (author, title, and subject) to access the collection.

Second, the creation of a relatively easy-to-use tool to find library information allowed the public to participate directly in the research process. The catalog was fairly straightforward: if you wanted to find books by Zora Neale Hurston, you looked in the drawers for the *H*s and then browsed through the cards until you found her works. Once catalogs became standardized, it was easy for patrons to walk into any library and see what was available on a subject, browse works written by a given author, or confirm whether a given title was held. The card catalog was the first example of an end-user searching tool: the patron gained the freedom to search, and library staff discovered a new instructional endeavor.

DEVELOPMENT 5 Library Systems and the MARC Record

With classification systems and card catalogs in use, library staff members were doing a fine job of managing information. There came a point, however, when technology developments from beyond the library suggested that there could be easier ways to manage large collections of materials and provide broader access to the catalog for a large number of users. Librarians looked to the power of computers to help make libraries more efficient. Several libraries joined forces with computing professionals in the late 1960s to create the first automated library systems, which operated from large **MAINFRAME** computers and had **TERMINALS** for library staff and users to access the systems. Each item in the catalog was represented in a MARC **RECORD**, which contains bibliographic information along with subject headings, call numbers, and other useful information (see figures 1.1 and 1.2 for current examples). As we will see in chapter 5, these systems allow libraries to keep track of the items they own and are circulating without a large number of cards and reams of paper. The

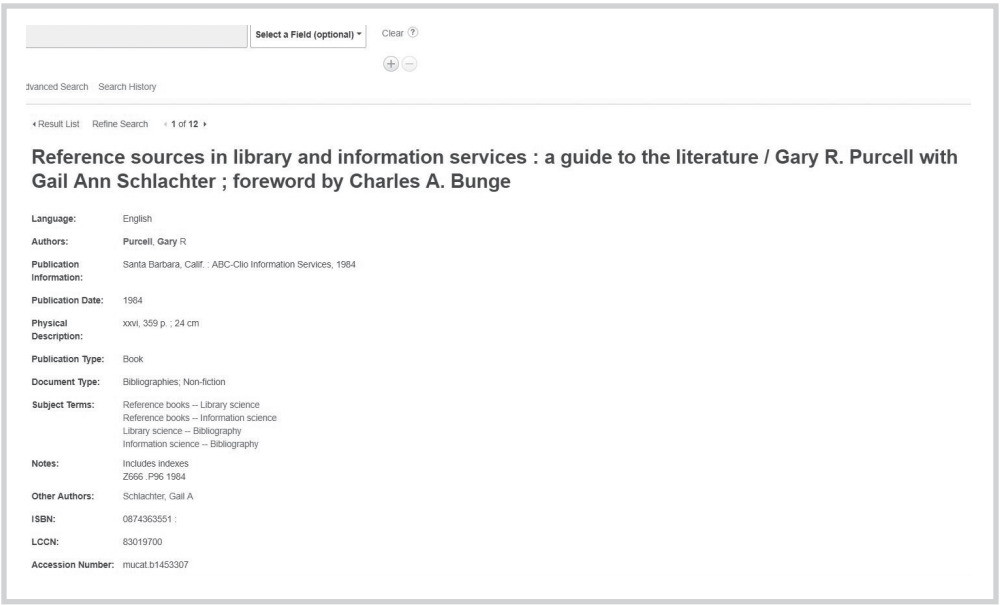

FIGURE 1.1 Screenshot of a library catalog record for an item

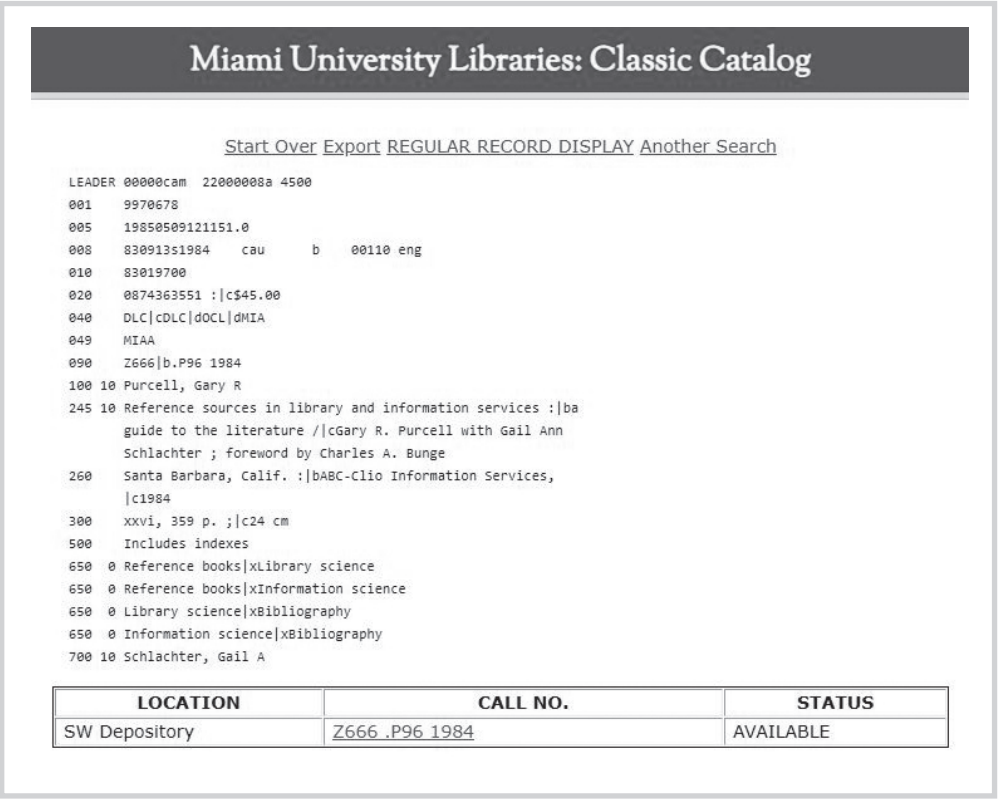

FIGURE 1.2 Screenshot of a MARC record for the same item

quest for these systems drove libraries into the computer age, setting the foundation for today's world of digital information.

DEVELOPMENT 6 Personal Computers

PERSONAL COMPUTERS (PCs) and computing devices have made a huge impact on society, including in libraries (see chapter 6). PCs increased libraries' computing power and allowed greater flexibility in choosing their local office and **MANAGEMENT SOFTWARE** than was possible with mainframes. PCs also provided a platform for libraries to experiment with new media types, such as CD-ROMs (**COMPACT DISC READ-ONLY MEMORY**), and to start accessing remote information services (periodical databases, shared cataloging databases, and eventually the Internet). In a relatively short period of time, libraries moved from having just one or two PCs in the back room to offering dozens and then hundreds of machines to the public. Today's library is unimaginable without the personal computer as both a staff resource and a means for the public to access library resources. The original desktop devices were a key step leading to the use of laptops, tablets, and other mobile devices as methods for interacting with library resources.

DEVELOPMENT 7 Online Searching

An exciting development of the computer age for libraries was the computerization of periodical indexes and other resources by companies which could then provide them to libraries using a telephone line and a modem. Starting in the 1970s, libraries were able to access resources they could not afford to keep in house and to search these electronic resources much more easily than could be accomplished by manually paging through their print predecessors. Companies such as Dialog, BRS, and LexisNexis offered libraries access to periodical indexes and full-text newspapers, magazines, journals, and reference sources. Users could choose one or more indexes or periodical titles to search and then enter terms to locate related citations, abstracts, or articles.

The advent of online searching meant that for the first time, libraries could make available resources that they did not physically own. Connecting to these online services could be expensive (users were charged a set fee per minute), but many libraries were willing to offer this service to their patrons. Early online searching was done by library staff members, partly because the command language for searching was difficult to learn and partly because of the expensive connection fees. Eventually, the methods of searching grew easier (and pricing plans began to change) and library patrons, known as end users, could more successfully attempt searching on their own. The move toward our current situation of the virtual, online library was under way.

DEVELOPMENT 8 Audiovisual or Media Items

As with computers, audiovisual or **MEDIA ITEMS** were created within society at large and came to libraries as a new way of packaging information. Adding media items such as films, **VIDEOCASSETTES**, **COMPACT DISCS**, and **DVDs** to libraries over the years (see table 1.1) dramatically changed their collections. These new media also caused challenges for the staff in terms of their shelving, location, and protection. The rich diversity of nonbook formats

TABLE 1.1 Timeline of invention dates for audiovisual items

AUDIOVISUAL MEDIUM	DATE INVENTED
Phonograph LP record	1948
Audiocassette	late 1950s
VHS videocassette	1976
Videodisc	1978
Compact disc	1982
CD-ROM	1984
MP3	1995
DVD	1995
iPod	2001
YouTube	2005
Netflix's streaming service	2007
iPhone	2007
Amazon Kindle	2007
Android Mobile Phones	2008
iPad	2010

NOTE: The dates for CD-ROMs and earlier media were taken from Walt Crawford's *Current Technologies in the Library: An Informal Overview* (Boston: G. K. Hall, 1988). Dates for the MP3 file format and later media forms were confirmed in *Wikipedia*.

has allowed libraries to better serve their communities, who expect to have access to a wide variety of media. The consumers' expectations that these kinds of media will be included in collections caused libraries to rethink their collection development and organization practices and to more readily adopt new media. ***AUDIOVISUALS*** is the more historic term, but it is still used in some libraries. *Media* has become a fairly common replacement term, with some collection areas in libraries labeled only with the type of item included in them (e.g., DVDs). With the move toward streaming video and audio, shelving is destined to fade as an issue. But the addition of audiovisual resources to library collections eventually led libraries to provide access to databases of audio recordings and collections of streaming video. It also started libraries down the path of accepting other technologies into the collection and laid the groundwork for a host of modern library services, from public computers to e-books to makerspaces.

DEVELOPMENT 9 The Internet

The **INTERNET** has had a strong presence in libraries and library planning for more than twenty-five years. From the early days of library Gopher sites and the first websites to today's full-text periodical indexes, e-books, and mobile apps, the Internet has become the

mainstay of the library world. The linking together of **SERVERS** into **NETWORKS** has revolutionized communications and information seeking, giving people the ability to access collections of information and services through their individual computing devices. What started with four computers in 1969 now reaches across the world and into nearly every area of life. It may not reach absolutely everyone, as we will discuss in chapter 12, but everyone is impacted by it.

The Internet continues to stimulate library staff to retool their delivery of services to patrons and to constantly consider how they can best present the wealth of free online information alongside library-purchased print and digital resources. Libraries use the Internet to access resources and then as a delivery mechanism to provide them to patrons within and beyond the library. They offer to help library patrons by answering reference questions via text messages, chat, or e-mail in an attempt to assist no matter the time of day and wherever patrons are located. They are working to organize library-licensed resources on their websites to help patrons find what they need. Libraries can claim many Internet successes yet still face several challenges. In a world of ever-present access to information, where does the library fit in? This topic is discussed in future chapters.

DEVELOPMENT 10 A Society That Wants and Requires Technology

Developments in libraries are influenced by the expressed needs and expectations of each library's community. As noted with some of the earlier developments on this list, society often creates something new and libraries decide to include it in their collections. This process has been influenced and driven by our patrons requesting items or by people in our communities taking an interest in new media or services before we actually adopt them. The receptiveness of our communities to new technologies will continue to shape libraries in the future.

Technological changes are not always greeted willingly by library users, however. As society grows more dependent on various information technologies, some patrons find themselves caught in the digital divide. They are often required to use computers or access materials on the Internet to complete homework or fill out government forms or pursue commercial activities, and yet some patrons cannot afford access to the required technologies. Libraries are taking on the responsibility of providing this access.

WHAT ARE LIBRARIES USING TODAY?

Libraries today exhibit a wide variety of technologies and technology applications. The central technology is Internet and Web-based resources, as suggested earlier. Library staff and patrons make daily use of resources provided through the Internet and interactions with one another online. At the same time, most libraries offer a collection composed of several different formats for storing information (books, periodicals, electronic reference sources, DVDs, streaming media, e-books). Traditional materials, print-based books and journals and container-based items like DVDs, continue to be added, but their portion of the library acquisitions budget will continue to drop.

I hope books will never disappear, but I am pretty sure that DVDs are on their way out (though I wonder about long-term access to streaming media titles). We have to

recognize that the information work of libraries may change in its particulars, but library staff members are still in the business of providing access to materials and technologies that people cannot afford and often have difficulty navigating on their own. It is crucial for us to understand library technologies to help make the right decisions for our libraries as we respond to the needs of our patrons. The rest of this book looks at current library technologies in detail and examines what the future may hold.

QUESTIONS FOR REVIEW

1. What are the three sources from which library technologies come?
2. What current technology, in your view, could have as large an impact as the ten key developments in this chapter?
3. Is there an unmentioned key historical development that you would add to the list of ten?
4. How would you define the term *technology*?
5. Describe the impact that you have seen one of the ten developments have in your own library.

SELECTED SOURCES FOR FURTHER INFORMATION

Basbanes, Nicholas A. *On Paper: The Everything of Its Two Thousand Year History.* New York: Alfred A. Knopf, 2013.
The book is a vast history of paper and the importance of this substance and the many activities that it touches.

Battles, Matthew. *Library: An Unquiet History.* New York: W. W. Norton, 2004.
Battles's book is an intriguing look at the ancient origins of libraries and their development into the modern age.

Crawford, Walt. *Current Technologies in the Library: An Informal Overview.* Boston: G. K. Hall, 1988.
This source gives an excellent history of the technologies available in 1988, from microfilm to computers.

Devereaux, Peter, and Carla Diane Hayden. *The Card Catalog : Books, Cards, and Literary Treasures.* San Francisco: Chronicle Books, 2017.
This source provides a history of the card catalog and shows some amazing images of card catalogs and the cards that populated them. The images include some of the French playing cards that were used as catalog cards.

King, David Lee. "Chapter 1: Why Stay on Top of Technology Trends?" *Library Technology Reports* 54, no. 2 (2018): 6–13.
This first chapter of King's *Library Technology Report* issue addresses the importance of looking out for new developments and trends to guide our future work. It also provides examples of technology adoption and technology life cycles that can inform our perspective of changes in libraries over time and yet to come.

Musmann, Klaus. *Technological Innovations in Libraries, 1860–1960: An Anecdotal History.* Westport, CT: Greenwood Press, 1993.
This is an interesting history of library technologies developed, adopted, or adapted during a century of monumental change for libraries.

Sharma, Ravindra N., ed. *Libraries in the Early 21st Century: An International Perspective.* Vol. 1. Berlin: Walter de Gruyter, 2012.

This collection provides individually authored chapters on the history and development of libraries worldwide with a special focus on technology.

Srinivasan, Ramesh. *Whose Global Village? Rethinking How Technology Shapes Our World.* New York: New York University Press, 2017.

This work examines how the Western view of an interconnected global village really looks from the perspective of people elsewhere in the world and in different strata of the digital divide.

Wiegand, Wayne A. *Irrepressible Reformer: A Biography of Melvil Dewey.* Chicago: American Library Association, 1996.

Wiegand's work provides a full history of Dewey's life and his impact on librarianship, from his invention of the classification system to his work in the American Library Association (ALA) and his efforts to professionalize library work.

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