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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 designed the Neal-Schuman Library Technology Companion: A Basic Guide for Library Staff, Fifth Edition, 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 is designed to be 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 adoption 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 fifth edition of the guide represents a complete reorganization and update of the book. The book now starts with a section that 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 library staff members use to present services to 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 two wholly new chapters, chapter 3 on free information resources and chapter

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10 on library makerspaces. A fully updated chapter 2 reveals the results of a third survey of technology skills and tasks among library staff members, and chapter 17 provides new up-to-date sources for tracking down technology information. I hope that the new flow of the book is more logical and representative of the technologies libraries use and the environment in which library staff 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 Technology” provides context to the study of these information technologies and services by revealing the results of a third survey of working library staff members and the technologies they regularly use, as well as a comparison to the results of the surveys in the third and fourth 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 Catalogs, Discovery Layers, and More,” reveals the opportunities to expand the possibilities of the library catalog.
- **Chapter 6**, “Computing Devices in Libraries: Desktops, Laptops, Tablets, and Mobile Devices,” shows how 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 value of social-networking tools and technologies for 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 in Libraries,” explores the possibilities for adding creative activities and technologies in libraries.

Part IV

“BUILDING AND MAINTAINING THE TECHNOLOGY ENVIRONMENT IN LIBRARIES”

- **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 your 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 15**, “The Death of Technologies: Preservation Issues and Saying Good-Bye,” 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 can 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.

The book closes with a glossary of useful terms; boldfaced terms appearing within the text are included here.

There is a great deal of information within these pages, but there is even more to discuss. Follow me on Twitter @TechCompanion5 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
The Universe of Library Technology

Libraries have long played an essential role in containing, preserving, and sharing information. Countless civilizations have, over thousands of years, produced and relied on various types of information, from creation stories to herd counts to tax rolls. These facts, philosophies, and communications were recorded because individuals in these societies saw some purpose in sharing such lore and information with others in the present and in preserving it for future generations. The explosion of information we have seen over the past four decades is merely the latest skirmish in a long-running battle: how can 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 civilizations.

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 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 use of 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 for hosting library catalogs and managing 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 and their work 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.
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 along information through time: memorization. In many cultures, oral history worked because skilled individuals (e.g., called griots in West Africa) were able to memorize genealogies, stories, and historic cultural events and recount them as needed. Each oral traditionalist or storyteller would train someone, usually beginning in childhood, to memorize the information and pass it on to succeeding generations. While memorization can be an effective way to preserve sets of information, its long-term use presents some difficulties.

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. Cave 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 cave walls to stone tablets, to papyrus scrolls, to goatskin or calf skin (vellum), and 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 for only 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, the need arose for a method of locating a specific item or finding materials on a topic. 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 (DDC)
system. Melvil Dewey’s subject-oriented system for organizing books caught on and was adopted by a large number of libraries. Today, 95 percent of public and school libraries and 25 percent of academic libraries use the system. The Library of Congress Classification (LCC) 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 libraries work together more smoothly and made it easier for patrons to understand how to use multiple libraries. With this innovation in place, libraries 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 classification systems 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 Louisa May Alcott, you looked in the drawers for the As 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, find 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, libraries 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 and their descendants, which operated from large mainframe computers and had “dumb” terminals for library staff and users to access the systems. Each item in the catalog was represented in a MARC (machine-readable cataloging) 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 paper. The 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 the CD-ROM (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 as a means for the public to access library resources. The original desktop devices were a key step to lead into laptops, tablets, and other mobile devices as methods for interacting with library resources.
FIGURE 1.1

Screenshot of a library catalog record for an item

Reference sources in library and information services: a guide to the literature / Gary R. Purcell with Gail Ann Schlachter; foreword by Charles A. Bunge

FIGURE 1.2

Screenshot of a MARC record for the same item

Reference sources in library and information services: a guide to the literature / Gary R. Purcell with Gail Ann Schlachter; foreword by Charles A. Bunge
An exciting development of the computer age for libraries was the computerization of periodical indexes and other resources by companies that 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 would 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.

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 videocassettes, compact discs (CDs), and DVDs (digital versatile discs or digital videodiscs) to libraries over the years (see table 1.1) changed the complexion of the collection. These new media also caused challenges for the staff in terms of their shelving, location, and protection. The rich diversity of nonbook formats 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 with only 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.

### TABLE 1.1

**Timeline of invention dates for audiovisual items**

<table>
<thead>
<tr>
<th>Audiovisual Medium</th>
<th>Date Invented</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phonograph LP record</td>
<td>1948</td>
</tr>
<tr>
<td>Audiocassette</td>
<td>late 1950s</td>
</tr>
<tr>
<td>VHS videocassette</td>
<td>1976</td>
</tr>
<tr>
<td>Videodisc</td>
<td>1978</td>
</tr>
<tr>
<td>Compact disc</td>
<td>1982</td>
</tr>
<tr>
<td>CD-ROM</td>
<td>1984</td>
</tr>
<tr>
<td>MP3</td>
<td>1995</td>
</tr>
<tr>
<td>DVD</td>
<td>1995</td>
</tr>
<tr>
<td>Netflix</td>
<td>1997</td>
</tr>
<tr>
<td>iPod</td>
<td>2001</td>
</tr>
<tr>
<td>YouTube</td>
<td>2005</td>
</tr>
<tr>
<td>iPhone</td>
<td>2007</td>
</tr>
<tr>
<td>Amazon Kindle</td>
<td>2007</td>
</tr>
<tr>
<td>Android mobile phones</td>
<td>2008</td>
</tr>
<tr>
<td>iPad</td>
<td>2010</td>
</tr>
</tbody>
</table>

*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.*

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### Development 9

**THE INTERNET**

The **Internet** has had a strong presence in libraries and library planning for more than twenty 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 reconsider how they can best present the wealth of free online information alongside library-purchased print and digital resources. Library staff members 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 or where 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 LIBRARIES ARE USING TODAY

Libraries today exhibit a wide variety of technologies and technology applications. The key central technology is the Internet and Web-based resources, as suggested earlier. Most libraries offer a collection composed of a number of different formats for storing information (books, periodicals, electronic reference sources, DVDs, streaming media, e-books). But daily use of resources provided through the Internet and online interactions with patrons and colleagues have joined the ever-wider provision of resources in electronic form, meaning that libraries are entirely invested in this direction. Traditional materials, print-based books and journals and container-based items like DVDs, are still being added, but their portion of the library acquisitions budget will continue to drop.

I hope books will never disappear (DVDs can go, 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 of making efficient pathways to and informed browsing of selections of information. 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 development that you would add to the list of ten?
4. How would you define the term technology?
5. Describe an impact of one of the ten developments that you have witnessed in your own library.

Selected Sources for Further Information


www.alastore.ala.org
This article provides an overview of the digital divide and the roles that librarians and information professionals can play in bridging it.


This book is a vast history of paper that discusses the importance of this substance and the many activities that it touches.


Battles’s book is an intriguing look at the ancient origins of libraries and their development into the modern age.


Digital libraries and their development are the focus of this book, which looks to the past and future of the technologies and the social connections involved in this process.


This source gives an excellent history of the technologies available in 1988, from microfilm to computers.


This is an interesting history of library technologies developed, adopted, or adapted during a century of monumental change for libraries.


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


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 and his efforts to professionalize library work.
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